CITY OF WILMINGTON, NC

RE-BID INVITATION

BIDS ARE DUE:	**APRIL 2, 2026, at 3:00 PM**
PRE-BID MEETING:	**NO PRE-BID MEETING**
PROJECT NAME:	**DOWNTOWN ALLEY IMPROVEMENTS**
PROJECT NUMBER:	**2TRSRT2110**
CONTRACT NUMBER:	**ALLE-IH-0326**
PROJECT DIRECTOR:	**AARON BECKNER – 910-341-0062**
PROJECT ENGINEER:	**ZACH ROMAN – 910-341-0213**
PROJECT MANAGER	**ZACH ROMAN – 910-341-0213**

SUBMIT BIDS TO:

PURCHASING MANAGER
P. O. BOX 1810
929 N. FRONT ST., 10th FLOOR
WILMINGTON, N. C. 28402-1810
(910) 341-7830

BIDDERS NAME: _____

ADDRESS: _____

_____

TELEPHONE: _____

EMAIL: _____

DOWNTOWN ALLEY IMPROVEMENTS
ALLE-IH-0326

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ADVERTISEMENT FOR RE-BID
CITY OF WILMINGTON, NC
DOWNTOWN ALLEY IMPROVEMENTS
CONTRACT NUMBER: ALLE-IH-0326

Pursuant to North Carolina General Statute 143-129, sealed proposals addressed to the Purchasing Manager, P. O. Box 1810, 929 N. Front Street, 10TH Floor Wilmington, NC 28402, and marked "DOWNTOWN ALLEY IMPROVEMENTS'' will be received until 3:00 p.m., Thursday, April 2, 2026, at which time they will be publicly opened and read at the Purchasing Division, 929 N. Front Street, 10th Floor Room 1069, Wilmington, NC. The City will receive SINGLE PRIME BIDS ONLY for this project.

Project Description: The project generally consists of utility improvements and alley surface demolition and replacement at Quince Alley, Henderson Alley, and Wilkerson Alley in historic downtown Wilmington.

All firms submitting bids for the proposed work must be properly licensed under Chapter 87, N. C. General Statutes. The bidder's license number must appear on the outside of the envelope.

In accordance with the City of Wilmington's Minority/Disadvantaged Business Policy, the bidder shall make good faith efforts, as defined by the Bid Specifications, to subcontract 14% of the dollar value of the prime contract to businesses which are at least 51% owned and controlled by minority, socially, and/or economically disadvantaged individuals (MBE/DBE's). A complete copy of the City of Wilmington's MBE/WBE policy is available for inspection at the Purchasing Manager's Office.

Potential Subcontract opportunities which may exist on this project include, but may not be limited to Concrete, Curb & Gutter, Hauling, Erosion Control, Traffic Control, Utilities, Grading, Suppliers, and other items not specifically referenced herein.

If the bidder fails to achieve the contract goal stated herein, it is required to provide documentation demonstrating that it made a good faith effort in attempting to meet the established goals. A bid which fails to meet these requirements will be considered non-responsive and will be rejected.

A Pre-Bid Conference was held at 3:00 p.m., Thursday, February 19, 2026, at 929 N. Front Street, 10th Floor Room 1070, Wilmington, NC. All parties interested in the project are invited to attend.

Plans, Specifications and Bid Documents can be obtained by clicking the Link. For assistance, please contact Kathy Bryant at kathy.bryant@wilmingtonnc.gov.

Potential subcontractors may secure a list of potential prime contractors from the City's website, www.wilmingtonnc.gov.

The City of Wilmington does not discriminate on the basis of race, sex, color, age, national origin, religion or disability in its employment opportunities, programs, services, or activities.

Bids for this project shall be guaranteed by all bidders for a period of 90 calendar days following the bid opening. **The City of Wilmington Reserves the Right to Reject any and all Bids.**

Daryle L. Parker
Purchasing Manager
March 20, 2026

BIDDER'S CHECKLIST

1. READ AND UNDERSTAND ALL SPECIAL NOTICES.

2. SIGN AFFIDAVIT OF NON-COLLUSION A-1 AND A-2.
   HAVE THIRD PARTY NOTARIZE PAGE A-3

3. SIGN AFFIDAVIT OF COMPLIANCE WITH NC E-VERIFY STATUTES

4. READ AND UNDERSTAND MBE/DBE PROVISIONS MBE-1 TO MBE-4.

5. COMPLETE, SIGN AND SUBMIT WITH THE BID, AFFIDAVIT A "AFFIDAVIT OF GOOD FAITH COMPLIANCE" LISTING OF THE GOOD FAITH EFFORT INDICATING ALL ACTIONS UNDERTAKEN, AS DESCRIBED IN THE FORM, TO RECRUIT MINORITY PARTICIPATION ON THIS PROJECT. (AFFIDAVIT A)

6. SUBMIT A LISTING OF PARTICIPATING SUBCONTRACTORS AND SUPPLIERS.

7. PORTION OF WORK TO BE PERFORMED BY M/WBE FIRMS (AFFIDAVIT C)

8. BIDDERS GOOD FAITH EFFORTS (AFFIDAVIT D)

9. LIST ALL FIRMS CONTACTED TO PERFORM SUBCONTRACT WORK IN ACCORDANCE WITH THE SPECIAL NOTICE. (Subcontractor Contact Schedule)

10. COMPLETE THE PROPOSAL SECTION AND SIGN.

11. ALL ADDENDA ISSUED FOR THIS PROJECT HAVE BEEN SIGNED OR ACKNOWLEDGED ON THE PROPOSAL PAGE.

12. THE BID SURETY IS ENCLOSED AND PROPERLY EXECUTED.
    REFERENCE PARAGRAPH G-1.04.2, PAGE G-2.

13. BID ENVELOPE SEALED AND MARKED WITH THE BIDDERS NAME, LICENSE NUMBER, PROJECT NAME AND NUMBER. NOTE: MULTIPLRIME AND SINGLE PRIME BIDS FROM THE SAME BIDDER MUST BE IN SEPARATE CLEARLY MARKED ENVELOPES.

14. ENVELOPE ADDRESSED AND MARKED:

    PURCHASING MANAGER
    CITY OF WILMINGTON
    PO BOX 1810
    929 N. FRONT STREET, 10th FLOOR
    WILMINGTON, NC 28402
    BID NAME: _____

15. THE BID MUST BE MAILED OR DELIVERED TO THE ABOVE ADDRESS SO THAT RECEIPT IS PRIOR TO THE TIME AND DATE OF THE BID OPENING. BIDS RECEIVED AFTER THE SPECIFIED TIME WILL NOT BE CONSIDERED. THE CITY OF WILMINGTON ASSUMES NO RESPONSIBILITY FOR MAIL DELIVERY.

SPECIAL NOTICE TO ALL BIDDERS

MARCH 23, 1990 REV: 3-2020

1. Bid Rigging Affidavit

In accordance with the City of Wilmington's Bid Rigging and Conflict of Interest Ordinances, an Affidavit and Certificate of Non-Collusion and Non-Suspension is enclosed, Pages A-1, A-2 and A-3. The affidavit must be properly filled out, sealed and attested in order for your bid to be considered.

2. Subletting

Paragraph G-1.15, SUBLETTING OR ASSIGNMENT OF CONTRACT, of the City's General Specifications. All bidders must submit with their bid a listing of subcontractors contacted to submit proposals for this project. The listing must indicate the subcontractors to be used, the dollar amount of the proposed subcontract work, and type of work to be performed. If no subcontractors are to be utilized, this must be specified. This must be submitted at the time of the bid opening in order for the bid to be considered.

If subcontract firms are contacted but their proposals rejected for any reason the bidder must complete the justification form included in the bid document.

3. The City reserves the right to waive any immaterial defects in the bid documents.

4. Minority Business Policy

The MBE/WBE/HUB/DBE statement, MBE-4, must be properly filled out in order for your bid to be considered.

5. Federal Funding

This project may be funded in whole or in part with Federal funds and all bidders are advised to pay strict attention to the Federal requirements which may be attached. Bid packages which include Affirmative Action under Section 3 require that each bidder submit with his bid an Affirmative Action Plan. The City will not require bidders to submit their plan with the bid. However, it will be required and must be submitted by the lowest responsible bidder and approved by the City prior to beginning work.

Paragraph 5 applies only if Federal Regulations are included in the Bid Documents.

If you have any questions concerning these requirements, please contact my office.

Daryle L. Parker
Purchasing Manager

STATE OF NORTH CAROLINA

COUNTY OF NEW HANOVER

AFFIDAVIT AND CERTIFICATE OF NON-COLLUSION, NON-SUSPENSION AND NON-CONVICTION

The undersigned, being first duly sworn, deposes and says:

1. I understand that for the purposes of this affidavit, the term "bidder" shall include the person(s), firm(s), or corporation(s) signing this affidavit, the undersigned's subcontractor(s), subsidiary(ies) and affiliate(s) and any officer, director, employee or agent of the bidder; and the term "conviction" shall include guilty pleas, pleadings of nolo contendere and similar pleas.

2. This Affidavit and Certificate is made in accordance with Article 3 of Chapter 133 of the North Carolina General Statutes; I certify that this proposal is made without prior understanding, agreement, or connection with any person(s), firm(s), or corporation(s) making bids or proposals; I further certify that the bidder has not entered into any agreement with any other bidder or prospective bidder or with any other person(s), firm(s) or corporation(s) relating to the price named in said proposal, nor any agreement or arrangement under which any person(s), firm(s) or corporation(s) is to refrain from bidding, nor any agreement or arrangement for any act or omission in restraint of free competition among bidders; I understand collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards; and I further certify that the bidder will abide by all terms of this bid or proposal.

3. The bidder is not suspended or debarred from bidding by any federal or state governmental agency that is providing funds for this contract.

4. The bidder is not presently charged in an indictment or information with engaging in any conspiracy, combination, or other unlawful act in restraint of trade or any similar charges in any federal court or a court of this or any other state.

5. The bidder, within one year immediately preceding the date of this affidavit, has not been convicted of charges or engaging in any conspiracy, combination, or other unlawful act in restraint of trade or similar charges in any federal court or a court of this or any other state.

6. If, during the time of this proposal, from the date advertised to the date bids are opened, the bidder is indicted or convicted of bid-rigging, I understand this proposal shall be rejected and not considered for award.

7. I hereby affirm that all information contained in this affidavit is true, correct, accurate and complete, and any untrue, incorrect, inaccurate or incomplete statements will result in the disqualification and rejection of this proposal. I certify that I am authorized to sign this bid and to make the representations set forth herein on behalf of myself and the bidder.

This the _____ day of _____, 2026.

COMPANY NAME _____

BY: _____
(Owner, Partner, or Corporate President, Vice President or Assistant Vice President only)

ATTEST:

_____
(Secretary, Assistant Secretary, Cashier or Assistant Cashier only)

(CORPORATE SEAL)

(TO BE EXECUTED ON BEHALF OF THE CONTRACTOR)

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public, certify that
(Name)
_____ personally came
(Name of Secretary, Assist. Sec., Cashier, Assist. Cashier)

before me this day and acknowledged that he (she) is _____
(Secretary, Assist. Sec.,
_____ of _____, a
Cashier, Assist. Cashier) (Name of Corporation)

corporation, and that by authority duly given and as the act of the corporation, the foregoing Affidavit

was signed in its name by its _____,
(President, Vice President, Assist. Vice President)

sealed with its corporate seal, and attest by himself (or herself) as its

_____.
(Secretary, Assist. Sec., Cashier, Assist. Cashier)

WITNESS my hand and official seal, this the _____ day of _____, 2026.

_____
Notary Public

My Commission Expires: _____

(NOTARY SEAL)

Rev. 3/98 AFF-MBE.DOC

STATE OF NORTH CAROLINA

COUNTY OF NEW HANOVER

AFFIDAVIT of COMPLIANCE with N.C. E-VERIFY STATUTES

I, _____ (hereinafter the "Affiant"), duly authorized by and on behalf of _____ (hereinafter the "Employer") after being first duly sworn deposes and says as follows:

1. I am the _____ (President, Manager, CEO, etc.) of the Employer and possess the full authority to speak for and on behalf of the Employer identified above.

2. Employer understands that "E-Verify" means the federal E-Verify program operated by the United States Dept. of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law.

3. ____ Employer employs 25 or more employees in the State of North Carolina, and is in compliance with the provisions of N.C. Gen. Stat. §64-26. Employer has verified the work authorization of its employees through E-Verify and shall retain the records of verification for a period of at least one year.

____ Employer employs fewer than 25 Employees and is therefore not subject to the provisions of N.C. Gen. Stat. §64-26.

4. All subcontractors engaged by or to be engaged by Employer have or will have likewise complied with the provisions of N.C. Gen. Stat. §64-26.

5. Employer shall keep the City of Wilmington informed of any change in its status pursuant to Article 2 of Chapter 64 of the North Carolina General Statutes.

Further this affiant sayeth not.

This the _____ day of _____, 20____.

_____
Affiant

STATE OF NORTH CAROLINA
COUNTY OF _____

Sworn to and subscribed before me, this the _____ day of _____, 20____.

_____ [NOTARY SEAL]
Notary Public

My commission expires: _____

CITY OF WILMINGTON

MBE/WBE/HUB/DBE POLICY STATEMENT

SPECIAL NOTICE

1. ALL FIRMS SUBMITTING BIDS FOR THIS PROJECT MUST MAKE A GOOD FAITH EFFORT, AS DEFINED ON PAGES MBE-1 TO MBE-3, TO SUBCONTRACT 14% OF THE WORK TO CERTIFIED MBE/WBE/HUB/DBE FIRMS. THIS REQUIREMENT APPLIES EVEN THOUGH THE BIDDER HAS THE CAPABILITY OF PERFORMING ALL WORK WITH HIS OWN FORCES OR IF THE BIDDER IS A CERTIFIED MBE/WBE CONTRACTOR.

2. **AS PART OF THE SUBMITTED BID DOCUMENT BIDDERS MUST SUBMIT A LISTING OF ALL SUBCONTRACTORS CONTACTED OR ATTEMPTED TO CONTACT FOR WORK ON THIS CONTRACT. THE LIST MUST INCLUDE THE FIRM NAME, CONTACT PERSON, PHONE NUMBER, TYPE OF SUBCONTRACT WORK, INDICATION AS TO MBE/WBE/HUB/DBE FIRM OR NON-MBE/WBE/HUB/DBE FIRM, AND DOLLAR AMOUNT OF THE WORK. THE LISTING MUST INDICATE THE FIRM TO BE UTILIZED FOR THE SUBCONTRACT WORK. A FORM IS INCLUDED HEREIN FOR THIS LISTING.**

A FORM IS INCLUDED HEREIN FOR THIS PURPOSE HOWEVER, BIDDERS MAY SUBMIT THE DATA ON THEIR OWN FORM.

3. AS PART OF THE SUBMITTED BID DOCUMENTS, ALL BIDDERS MUST SUBMIT, THE ENCLOSED "AFFIDAVIT OF GOOD FAITH COMPLIANCE". THE AFFIDAVIT MUST INCLUDE EVIDENCE OF THE GOOD FAITH EFFORTS MADE BY THE BIDDER TO CONTRACT WITH AND HIRE MBE/WBE/HUB/DBE FIRMS AS SUBCONTRQACTORS FOR THIS PROJECT.

A LISTING OF GOOD FAITH EFFORTS THAT THE CITY WILL REVIEW AND CONSIDER IS CONTAINED IN THE BID DOCUMENT.

"The bidder/proposer shall make good faith efforts, as defined in the bid specifications, to subcontract **14%** percent of the dollar value of the prime contract to business owned and/or controlled by minority, socially, and or economically disadvantaged individuals (MBE/WBE/HUB/DBE's).

Bidders are required to submit information concerning MBE/WBE/HUB/DBE's which will participate in the contract. The information will include (1) name and address of each MBE/WBE/HUB/DBE; (2) a description of the work to be performed by named firm; and (3) the dollar value of the work of the contract. If the bidder fails to achieve the contract goal stated herein, it is required to provide documentation demonstrating that it made good faith efforts in attempting to meet established goals. A bid that fails to meet these requirements will be considered non-responsive."

MBESUPP 6/93

SPECIAL PROVISION
MINORITY/DISADVANTAGED BUSINESS ENTERPRISE PROGRAM
CITY OF WILMINGTON, NC

POLICY:

It is the policy of the City of Wilmington that MBE/WBE/HUB/DBE enterprises as defined in NCGS 143-128(g)(1)(2) and (3) shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part by City funds under this agreement. Consequently, the MBE/WBE/HUB/DBE requirements of NCGS 143-128 apply to this bid and any subsequent contract.

MBE/WBE/HUB/DBE OBLIGATION:

The City and its contractor agree to ensure that MBE/WBE/HUB/DBE's have the maximum opportunity to participate in the performance of contract and subcontracts financed in whole or in part with City of Wilmington funds provided under this agreement. In this regard, bidders and contractors shall take all necessary and reasonable steps in accordance with NCGS 143-128 to ensure that MBE/WBE/HUB/DBE firms have the maximum opportunity to compete and perform under this bid, any change orders and any subsequent contract. The City of Wilmington and its contractors shall not discriminate on the basis of race, color, national origin, or sex in the award and/or performance of this contract.

NOTICE:

All bidders, potential contractors, or subcontractors for this contract are hereby notified that failure to carry out the City of Wilmington policy and MBE/WBE/HUB/DBE obligation, as set forth herein, shall constitute a breach of contract which may result in the termination of the contract, or other such remedy as deemed appropriate by the City.

SUBCONTRACT CLAUSES:

All bidders and potential contractors hereby assure the City that they will include the above clauses in all subcontracts which offer further subcontracting opportunities. The terms, conditions and requirements of each contract between the contractor and each subcontractor performing work under a subdivision of branch of work listed in the bid documents shall incorporated by reference the terms, conditions and requirements of this contract between the CITY and the CONTRACTOR.

CONTRACT AWARD:

Bidders are hereby advised that meeting the MBE/WBE/HUB/DBE subcontract goals or making a "GOOD FAITH EFFORT" as defined below to meet such goals are conditions for being awarded this contract. The City proposes to award the contract to the lowest responsible bidder submitting a reasonable bid, provided s/he has made a "GOOD FAITH EFFORT" as defined below to meet the established MBE/WBE/HUB/DBE participation goals.

Bidders are advised that the City has the sole authority to determine if the bidder has made a "GOOD FAITH EFFORT" toward meeting the MBE/WBE/HUB/DBE goals to qualify for contract award. The City reserves the right to reject any and all bids submitted.

SUBSTITUTION OF MBE/WBE/HUB/DBE SUBCONTRACTORS
MBE/WBE/HUB/DBE firms identified in the bid document may not be substituted or replaced without just cause and only with the written approval of the CITY. If a substitution is agreed to by the CITY, the CONTRACTOR must make a good faith effort to replace the MBE/WBE/HUB/DBE with another MBE/WBE/HUB/DBE firm.

MBE/WBE/HUB/DBE SUBCONTRACT GOALS:

The attainment of goals established for this contract are to be measured as a percentage of the total dollar value of the contract. The goals established for this contract are as follows: 14%* MBE/WBE/HUB/DBE *
*MBE/WBE/HUB/DBE GOALS ARE ACCOMPLISHED VIA SUBCONTRACTS PERFORMED BY CERTIFIED BUSINESSES. SUBCONTRACTS MAY INCLUDE SUPPLYING OF MATERIALS.

AVAILABLE MBEWBE/HUB/DBE's

MBE/WBE/HUB/DBE firms may be utilized by the bidder provided they meet the minimum requirements as established by NCGS 143-128 and are certified seven (7) days prior to award in accordance with the MBE/WBE/HUB/DBE program.

Bidders may access the N. C. Dept. of Administration, NCDOT web site for certified firms. Failure to achieve the goal and failure to contact known MBE/WBE/HUB/DBE firms on all lists referenced herein may not qualify as a good faith effort to identify and hire MBE/WBE/HUB/DBE firms.

MBE/WBE/HUB/DBE firms certified by the Department of Transportation or Department of Administration may be counted toward to established goal.

Firms listed by the bidder as certified which are not on the Department of Transportation or Department of Administration's list of certified firms must provide evidence of certification.

CONTRACTORS REQUIRED SUBMISSIONS:

If the bidder fails to meet the contract goals established herein, s/he must submit information, which will assist the City in determining whether or not the bidder made acceptable "GOOD FAITH EFFORTS" to meet the contract goals. **Failure to meet the goals by lack of "GOOD FAITH EFFORTS" will disqualify the bidder's proposal**.

The bidder shall complete all forms included herein which pertain the verification of MBE/WBE/HUB/DBE participation and/or good faith efforts made as part of the bid.

DEFINITION
"GOOD FAITH EFFORT"

In accordance with the North Carolina Administrative Code 01-NCAC 301.0101 and the North Carolina General Statutes, the bidder must earn a minimum of 50 points from the good faith efforts listed below in order to be deemed to have made a good faith effort. If the bidder meets the 14% goal, the bidder shall be deemed to have met the good faith effort.

The following is a list of items which the contractor and the city may use in making a determination as to the acceptability of contractors "GOOD FAITH EFFORT" in meeting the goals established herein.

(1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed. **10 POINTS**

(2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due. **10 POINTS**

(3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation. **15 POINTS**

(4) Working with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses. **10 POINTS**

(5) Attending any prebid meetings scheduled by the public owner. **10 POINTS**

(6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors. **20 POINTS**

(7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing. **15 POINTS**

(8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit. **25 POINTS**

(9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible. **20 POINTS**

(10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands. **20 POINTS**

PAY REQUESTS AND MAINTENANCE OF RECORDS:

The contractor shall maintain adequate records of the MBE/WBE/HUB/DBE's performance and payments and shall submit regular reports to the City. These reports shall be sent with the contractors monthly "REQUEST FOR CONTRACT PAYMENT". The request shall include a breakdown of the amount of the payment to be made by the City which will be paid to the MBE/WBE/HUB/DBE's identified in the bid documents.

PROHIBITED AGREEMENTS:

Agreements between the bidder/proposer and a MBE/WBE/HUB/DBE in which the MBE/WBE/HUB/DBE promises not to provide subcontracting quotations to other bidders/proposers are prohibited.

ATTACH THIS PAGE TO THE BID

City of Wilmington - AFFIDAVIT A – **"AFFIDAVIT OF GOOD FAITH COMPLIANCE"**

Listing of the Good Faith Effort

Affidavit of_____
(Name of Bidder)

I have made a good faith effort to comply under the following areas checked:

The bidder must earn a minimum of 50 points from the good faith efforts listed below in order to be deemed to have made a good faith effort.

- ☐ **1 -** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed. **10 points**
- ☐ **2**.-Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due. **10 points**
- ☐ **3** - Broken down or combined elements of work into economically feasible units to facilitate minority participation. **15 points**
- ☐ **4** - Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses. **10 points**
- ☐ **5** - Attended prebid meetings scheduled by the public owner. **10 points**
- ☐ **6** - Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors. **20 points**
- ☐ **7** - Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing. **15 points**
- ☐ **8** - Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit. **25 points**
- ☐ **9** - Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible. **20 points**
- ☐ **10** - Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands. **20 points**

Total Points_____

In accordance with GS143-128.2(d) the undersigned will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon execution of a contract with the Owner. Failure to abide by this statutory provision will constitute a breach of the contract.
The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of_____
Subscribed and sworn to before me this _____day of _____2026
Notary Public_____
My commission expires. _____

City of Wilmington - AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

**********(NOTE: THIS FORM IS NOT TO BE SUBMITTED WITH THE BID PROPOSAL)*********

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 14% of the bidders total contract price, then the bidder must complete this affidavit.
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of _____, County of _____
Subscribed and sworn to before me this _____ day of _____ 2026
Notary Public_____
My commission expires_____

City of Wilmington AFFIDAVIT D – Good Faith Efforts

**********(NOTE: THIS FORM IS NOT TO BE SUBMITTED WITH THE BID PROPOSAL)*********

If the goal of 14% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of: _____
(Name of Bidder)

Project Name: _____

I do certify the attached documentation as true and accurate representation of my good faith efforts.
(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions. Examples of documentation include, but are not limited to, the following evidence:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 2026

Notary Public_____

My commission expires. _____

POTENTIAL SUBCONTRACTING OPPORTUNITIES

CONTRACT NAME: DOWNTOWN ALLEY IMPROVEMENTS

CONTRACT NUMBER: ALLE-IH-0326

WORK ITEM DESCRIPTION: Concrete, Curb & Gutter, Hauling, Erosion Control, Traffic Control, Grading, Utilities, Suppliers, and other items not specifically referenced herein.

THE ABOVE LISTED AREAS OF SUBCONTRACT OPPORTUNITIES ARE THE AREAS THAT HAVE BEEN IDENTIFIED BY THE CITY STAFF AND/OR THE CITY CONSULTANTS FOR THE ABOVE REFERENCED PROJECT.

THE LIST IS BY NO MEANS EXHAUSTIVE AND BIDDERS ARE ENCOURAGED TO SEARCH FOR OTHER AREAS OF POTENTIAL SUBCONTRACTING OPPORTUNITIES. THE BIDDERS EFFORTS IN THIS REGARD WILL ALSO BE A CONSIDERATION IN THE CITY'S REVIEW OF THE GOOD FAITH EFFORT.

IF THERE ARE NO IDENTIFIED AREAS OF POTENTIAL SUBCONTRACT OPPORTUNITIES FOR A PARTICULAR CONTRACT THEN THE BIDDER MUST MAKE A GOOD FAITH EFFORT TO IDENTIFY OTHER AREAS OF POTENTIAL SUBCONTRACT WORK.

THE REQUIREMENT TO MAKE A "GOOD FAITH EFFORT" APPLIES TO ALL CONTRACTS ESTIMATED BY THE CITY TO BE IN EXCESS OF $100,000. THE POLICY DOES NOT APPLY TO CONTRACTS BELOW $100,000.

THE CONTRACT GOAL FOR MBE/WBE/HUB/DBE PARTICIPATION IS 14%.

MBE/WBE/HUB/DBE Web Sites

North Carolina Department of Administration
www.doa.state.nc.us/hub

North Carolina Department of Transportation
www.ncdot.org

Bidders should furnish evidence as part of the post bid submittal that the above referenced web sites were used in attempting to contact MBE/WBE/HUB/DBE firms and as part of their good faith efforts.

REPORT OF PARTICIPATING SUBCONTRACTORS AND SUPPLIERS

Please supply data for all subcontractors and suppliers, whose services will be utilized on the project being bid upon by your firm. This document must be completed and submitted along with the bid proposal.

BIDDER'S NAME_____ PROJECT: _____

BID IS FOR: GENERAL CONSTRUCTION ( ); ELECTRICAL ( ); HVAC ( ); PLUMBING ( )
AMOUNT OF BID $_____ VALUE OF SUBCONTRACTS $_____

PERCENTAGE OF **CERTIFIED MBE/WBE/HUB/DBE** PARTICIPATION
_____%

CERTIFIED MBE/WBE/HUB/DBE SUBCONTACTORS AND SUPPLIERS:

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME:
_____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

PLEASE LIST BELOW ALL OTHER SUBCONTRACTORS AND SUPPLIERS AND NON-CERTIFIED MBE/WBE/HUB/DBE's.

PERCENTAGE OF OTHER SUBCONTRACTORS, SUPPLIERS AND NON-CERTIFIED MBE/WBE/HUB/DBE's _____%

OTHER SUBCONTRACTORS & SUPPLIERS AND NON-CERTIFIED MBE/WBE/HUB/DBE's:

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____
==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____
==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____
==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____
==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____
==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____
==========

NAME OF FIRM: _____ PHONE: _____
ADDRESS: _____ OWNER'S NAME: _____
_____ ( ) SUBCONTRACTOR ( ) SUPPLIER
WORK/SERVICE TO BE PERFORMED: _____
AMOUNT TO BE PAID $ _____ % OF TOTAL _____

COMPLETE AND SUBMIT ALONG WITH AFFIDAVIT C OR AFFIDAVIT D

In order for the City to determine the Good Faith Effort performed by the bidder, the bidder must list ALL firms contacted to perform subcontract work for the project.

SUBCONTRACT CONTACT SCHEDULE

PRIME CONTRACTOR: _____
PROJECT NAME: _____
DATE: _____

DATE CONTACTED	NAME & ADDRESS OF PERSON/BUSINESS CONTACTED	PHONE NUMBER	SERVICE PROVIDED	PERSON MAKING CONTACT	CERTIFIED MBE/WBE/HUB/DBE/WBE? YES/NO	RESPONSE	PRICE QUOTED

I HEREBY CERTIFY THAT THE SUBCONTRACTORS LISTED ABOVE WERE CONTACTED BY MY FIRM, AND REQUESTED TO SUBMIT QUOTES ON THE ABOVE REFERENCED PROJECT. ALL INTERESTED SUBCONTRACTORS WERE NEGOTIATED WITH IN GOOD FAITH.

I hereby certify that the above referenced information is true and accurate.
Inaccurate information provided in the bid document will be reported to the North Carolina Attorney Generals office and result in investigations and/or legal action against the bidder.

SIGNED: _____ TITLE: _____ COMPANY: _____

GENERAL PROVISIONS
Section G

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INSTRUCTION TO BIDDERS

SPECIAL NOTICE

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G-1.01 The name of a certain brand, make, manufacturer, or definite specification is to denote the quality standard of the article desired, but does not restrict bidders to the specific brand, make, manufacturer, or specification named; it is to set forth and convey to the prospective bidders the general style, type, character, and quality of the article desired.

G-1.02 The award of each contract will be made to the lowest responsible bidder as soon as practicable; provided, that in the selection of equipment or materials a contract may be awarded to a responsible bidder other than the lowest in the interest of standardization, or if ultimate economy is clearly evident.

If the project is being bid under the single and multiprime bidding methods, the CITY reserves the right to award the contract in whichever manner is in the best interest of the CITY taking into consideration the total cost of the project, including but not limited to contract administration and preparation costs.

The award of the contract represents a preliminary determination as to the qualifications of the bidder, the availability of funds for the project, and other matters precedent to the City's execution of the contract. No legally-binding acceptance of the offer set forth in the Contractor's bid occurs until the City executes the contract.

G-1.03 If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications, or other proposed contract documents, he may submit to the Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. An interpretation of the proposed documents will be made only by addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. The City of Wilmington will not be responsible for any other explanations or interpretations of the proposed documents.

GENERAL SPECIFICATIONS

G-1.04 SEALED PROPOSALS REQUIRED: INSTRUCTIONS: In accordance with the attached copy of advertisement and the following specifications, proposals will be received by the City Council of the City of Wilmington, North Carolina, at 929 N. Front Street 10th Floor, Purchasing Manager's Office, on the date and time designated in the Advertisement, when they will publicly open and read the proposals properly submitted for Municipal Improvements in the City of Wilmington, North Carolina. Firms submitting single and multiprime bids must enclose these in separate sealed, clearly marked envelopes.

If bids are requested for single and multiprime contracts, bids will be received, but not opened, for the separate prime contracts one (1) hours prior to the deadline for submission of single prime bids. All bids will be opened at the time for receipt of the single prime bids.

G-1.04.1 Proposals must be placed in a sealed envelope and addressed to The Purchasing Manager, City of Wilmington, North Carolina. The envelope shall show the name and address of the bidder and be plainly marked to show the project name and number and section (if applicable), as given in the Advertisement. The envelope must also be marked on the face to show the Contractor's North Carolina Contractor's License Number. Bid forms are contained in this bound copy of the Contract Documents, copies of the proposal pages may be submitted. All

information entered on proposal forms must be original and in ink. Submission of the entire document is not required. However, bidders are cautioned to submit all required forms, as referenced in the bound document, properly signed with the sealed bid. Bid forms will be filled in and completed in all respects as required herein.

Firms submitting bids for Single and Multi-Prime bids on the same project must submit each bid to the Purchasing Manager in a separate, properly identified sealed envelope.

Failure by the bidder to properly complete the Bid Proposal, Affidavit of Non-Collusion, MBE/WBE/HUB/DBE forms or other documents will be cause for declaring the bid non-responsive and cause for rejection.

G-1.04.2 Each proposal shall be accompanied by a cash deposit or certified check, said check to be payable to the City of Wilmington, and to be drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, in an amount equal to not less than five percent (5%) of the proposal. In lieu of making a cash or certified check deposit, as above provided, a bidder may file a bid bond executed by a corporate surety, licensed under the laws of the State of North Carolina to execute such bonds, said bid bond to be in an amount equal to not less than five percent (5%) of the amount of the bid, and said bid bond to be conditioned so that the surety will, upon demand, forthwith make payment to the City of Wilmington upon said bond if the bidder fails to execute the contract as provided below, and upon failure to forthwith make payment, the surety shall pay to the City an amount equal to the amount of said bid bond. Said deposit of cash, certified check, or bid bond to be forfeited to the City of Wilmington in the event of the bidder's failure to execute the contract within ten (10) days after award, as required by Section 143-129 of the General Statutes of North Carolina, Volume 3, as amended.

Deposits will be retained by the City, as property of the several bidders until the award of the contract is made, or all bids are rejected, after which the deposits will be returned.

G-1.04.3 No bid may be withdrawn for a period of ninety (90) days after being filed.

G-1.04.4 The work contemplated in these specifications, and the prices named in the proposals will be considered to include all cost of supplying, delivering, and all labor necessary for the incorporation of all materials into the work, and the use of all tools, machinery and equipment of every name and description that is used in carrying out the plans and specifications under this contract.

G-1.04.5 Bidders are cautioned to carefully examine the proposed location of work, as well as the plans and specifications, and to go over the whole project thoroughly with the Engineer before submitting their bids. It is understood and agreed that the quantities in the specifications, or as shown on the plans are approximate only, and no claim will be made against the City Council for any excess or deficiency, and no allowance will be made for the failure of the bidder to estimate correctly the difficulties attending the execution of the work.

G-1.04.6 Bidders are cautioned to adhere strictly to the spirit of the specifications in submitting their tenders, and it will be considered bad form to submit a proposal, expecting concessions after being awarded the contract by proposing the use of inferior materials and methods of construction for cheapening the work. The Engineer, Owner, or City desires to aid the Contractor in every legitimate way to carry on the work economically and expeditiously as set out in these specifications, and no alternate bids will be allowed unless requested in the proposal.

G-1.04.7 Where bids are received on Unit Prices, the City Council reserves the right, to authorize an increase of fifty percent (50%) of the amount of work set out in the proposal, or to decrease it to an extent equal to fifty percent (50%) of actual cost of the original work predicted on the unit prices given in the proposal. Such increase or decrease shall not vitiate or annul the

contract agreement hereinafter entered into. In the event of a discrepancy in the unit prices and the extended prices the unit prices shall prevail.

G-1.04.8 The bidder shall be required to produce substantial evidence that he is properly qualified to carry on the work as set out in the specifications. The qualifications required of all bidders are as follows: Thorough knowledge and experience in work of this character; labor and equipment in such quantities and quality as to enable the Contractor to carry on the work economically and expeditiously; financial condition must be such as not to require aid from the City Council, other than the regular monthly estimates.

G-1.04.9 The City Council will not consider any bid or award of contract to any person, firm, or corporation, who has defaulted in any obligation to the City of Wilmington, or who, in the opinion of the Council, failed to perform his work satisfactorily as to character or time.

G-1.04.10 The City reserves the right to reject any and all bids, or to accept the bid, or bids on the entire project, or any section of the project, as given in the Proposal, which, in its opinion, is to the best interest of the City.

G-1.04.11 The Contractor's attention is especially called to the fact that he will be requested by the Council and will be expected to push this work with all speed possible.

G-1.05 CONTRACT SURETY OF PERFORMANCE BOND: Contractor shall furnish and deliver to the City a Payment Bond and a Performance Bond covering the faithful performance and completion of the work included in this Agreement and payment for all materials and labor furnished or supplied in connection with the work included in this Agreement. Said bonds shall be issued and furnished to the City prior to, and as a condition precedent to, commencement of the work of this Agreement. Each of the Payment Bond and Performance Bond shall be furnished on behalf of the Contractor, shall name the City of Wilmington obligee, and shall be in the amount of one hundred percent (100%) of the contract price. Such bond(s) shall be solely for the protection of the City. The Payment Bond and the Performance Bond shall be issued by a surety of financial standing having a rating from A.M. Best Company equal to or better than A and must be included on the approved list of sureties issued by the United States Department of Treasury. The surety bond must be in the form set forth in NCGS 44A-33, without any variations there from. The Contractor shall provide surety bond wherein Surety waives notice of any and all modifications, omissions, additions, changes and advance payments or deferred payments in or about the Contract, and agrees that the obligations undertaken by the Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, and advance payments or deferred payments. The surety bond must set forth no requirement that suit be initiated prior to the time stipulated in applicable North Carolina Statutes of Limitation.

G-1.06 INSURANCE REQUIREMENTS: Before commencing any work, the Contractor shall procure insurance in the contractor’s name and maintain all insurance policies for the duration of the contract of the types and in the amounts listed in Section G-1.06. The insurance shall provide coverage against claims for injuries to persons or damages to property which may arise from operations or in connection with the performance of the work hereunder by the contractor, his agents, representatives, employees, or subcontractors, whether such operations by himself/herself or anyone directly or indirectly employed by him/her.

G-1.06.1 COMMERCIAL GENERAL LIABILITY: Contractor shall maintain Commercial General Liability (CGL) and if necessary, Commercial Umbrella Liability insurance with a total limit of not less than $5,000,000 each occurrence for bodily injury and property damage. If such CGL insurance contains a general aggregate limit, it shall apply separately to this project/location or the general aggregate shall be twice the required limit. CGL insurance shall be written on Insurance Services Office (ISO) “occurrence” form CG 00 01 covering Commercial General Liability or its equivalent and shall cover the liability arising from premises, operations,

independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

The City of Wilmington, its officers, officials, agents, and employees are to be covered as additional insureds under the CGL by endorsement CG 20 10 or CG 20 33 **AND** CG 20 37 or an endorsement providing equivalent coverage as respects to liability arising out of activities performed by or on behalf of the contractor; products and completed operations of the contractor; premises owned, leased or used by the contractor; and under the commercial umbrella, if any. The coverage shall contain no special limitations on the scope of protection afforded to the City of Wilmington, its officers, officials, agents, and employees.

There shall be no endorsement or modification of the CGL or Umbrella Liability limiting the scope of coverage for liability arising from explosion, collapse, underground property damage, or damage to the named insured's work, when those exposures exist.

The insurer shall agree to waive all rights of subrogation against the City of Wilmington, its officers, officials, agents and employees for losses arising from work performed by the contractor for the City of Wilmington.

G-1.06.2 WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY**:** Contractor shall maintain Workers' Compensation as required by the general statutes of the State of North Carolina and Employer's Liability Insurance. The Employer's Liability, and if necessary, Commercial Umbrella Liability insurance shall not be less than $5,000,000 each accident for bodily injury by accident, $5,000,000 each employee for bodily injury by disease, and $5,000,000 policy limit.

The insurer shall agree to waive all rights of subrogation against the City of Wilmington, its officers, officials, agents and employees for losses arising from work performed by the contractor for the City of Wilmington.

The U.S. Longshore and Harborworkers Compensation Act endorsement shall be attached to the policy when the services will be on or in close proximity to navigable waterways. The Maritime Coverage endorsement (WC 00 02 01) shall be attached to the policy when the contracted services involve the use of watercraft.

G-1.06.3 BUSINESS AUTO LIABILITY: Contractor shall maintain Business Auto Liability and, if necessary, Commercial Umbrella Liability insurance with a limit of not less than $5,000,000 each accident. Such insurance shall cover liability arising out of any auto, including owned, hired, and non-owned autos. Business Auto coverage shall be written on ISO form CA 00 01, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in ISO form CA 00 01.

Pollution liability coverage equivalent to that provided under the ISO pollution liability-broadened coverage for covered autos endorsement (CA 99 48) shall be provided, and the Motor Carrier Act endorsement (MCS 90) shall be attached when those exposures exist.

Contractor waives all rights against the City of Wilmington, its officers, officials, agents and employees for recovery of damages to the extent these damages are covered by the business auto liability or commercial umbrella liability insurance obtained by Contractor pursuant to G-1.06.03 of this agreement.

The contractor's Business Auto Liability insurance shall be primary as respects the City of Wilmington, its officers, officials, agents, and employees. Any other insurance or self-insurance maintained by the City of Wilmington, its officers, officials, and employees shall be excess of and not contribute with the contractor's insurance.

G-1.06.4 OWNERS AND CONTRACTORS' PROTECTIVE LIABILITY INSURANCE: Contractor shall maintain Owners and Contractors Protective Liability (OCP) insurance on behalf of the City of Wilmington, as named insured, with each occurrence limit of $5,000,000.

G-1.06.5 BUILDERS RISK INSURANCE: DELETED

G1-1.06.6 INSTALLATION FLOATER:

1. Contractor shall purchase and maintain in force Installation Floater insurance for the installation of material. Such insurance shall be written in an amount equal to the replacement cost of the material. The insurance shall apply on a replacement cost basis.
2. Insured property shall include portions of the work located away from the site but intended for use at the site and shall also cover portions of the work in transit.
3. Installation Floater insurance shall name City of Wilmington as loss payee.
4. Installation Floater insurance shall, at a minimum, cover the perils insured under the ISO special causes of loss for (CP10 30).
5. Installation Floater insurance shall include coverage for flood. (Required is there is a flood exposure.)
6. Any deductible applicable to the Installation Floater shall be paid by the Contractor.
7. If the City of Wilmington is damaged by the failure of the Contractor to maintain Installation Floater insurance, then the Contractor shall bear all reasonable costs properly attributable to that failure.

G1-1.06.7 PROFESSIONAL LIABILITY INSURANCE: DELETED

G1-1.06.8 ENVIRONMENTAL PROFESSIONAL LIABILITY INSURANCE: DELETED

G1-1.06.9 BAILEE COVERAGE (INCLUDING TRANSIT): DELETED

G1-1.06.10 CONTRACTORS POLLUTION LIABILITY INSURANCE: DELETED

G1-1.06.11 PROTECTION & INDEMNITY: DELETED

G1-1.06.12 ABUSE/MOLESTATION COVERAGE: DELETED

G1-1.06.13 ACCIDENT INSURANCE: DELETED

G1-1.06.14 ELECTRONIC DATA LIABILITY INSURANCE: DELETED

G1-1.06.15 FIDELITY COVERAGE: DELETED

G1-1.06.16 GARAGE LIABILITY AND/OR COMMERCIAL GENERAL LIABILITY: DELETED

G1-1.06.17 GARAGEKEEPER'S LEGAL LIABILITY: DELETED

G1-1.06-18 ON-HOOK CARGO: DELETED

G1-1.06-19 NETWORK SECURITY AND PRIVACY LIABILITY: DELETED

G1-1.06-20 TECHNOLOGY ERRORS & OMISSIONS: DELETED

G1-1.06-21 RAILROAD PROTECTIVE LIABILITY INSURANCE: DELETED

G1-1.06.6 DEDUCTIBLES AND SELF-INSURED RETENTIONS: The contractor shall be solely responsible for the payment of all deductibles to which such policies are subject, whether or not the City is an insured under the policy.

G1-1.06.7 MISCELLANEOUS INSURANCE PROVISIONS: The policies are to contain, or be endorsed to contain, the following provisions:

1. Each insurance policy required by this contract shall be endorsed to state that coverage shall not canceled by either party except after 30 days prior written notice has been given to the City of Wilmington, PO Box 1810, Wilmington, NC 28402-1810.
2. If Contractor's liability policies do not contain the standard ISO separation of insureds provision, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.

G1-1.06.8 ACCEPTABILITY OF INSURERS: Insurance is to be placed with insurers licensed to do business in the State of North Carolina with an A.M. Best's rating of no less than A VII unless specific approval has been granted by the City.

G1-1.06.9 EVIDENCE OF INSURANCE: The Contractor shall furnish the City with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements prior to commencing the work, and thereafter upon renewal or replacement of each certified coverage until all operations under this contract are deemed complete. Evidence of additional insured status shall be noted on the certificate of insurance as per requirements in Section G1-1.06. This Certificate shall be in six (6) counterparts and, when the contract is signed by the Contractor, a copy thereof shall be inserted in each copy of the contract documents and upon insertion shall become a part of such documents.

With respect to insurance maintained after final payment in compliance with requirements, an additional certificate(s) evidencing such coverage shall be provided to the City with final application for payment and thereafter upon renewal or replacement of such insurance until the expiration of the period for which such insurance must be maintained.

G1-1.06.10 SUBCONTRACTORS: Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates for each subcontractor. All coverage for subcontractors shall be subject to all of the requirements stated herein. Commercial General Liability coverage shall include independent contractors' coverage, and the contractor shall be responsible for assuring that all subcontractors are properly insured.

G1-1.06.11 CONDITIONS:

1. The insurance required for this contract must be on forms acceptable to the City.
2. The contractor shall provide that the insurance contributing to satisfaction of insurance requirements in G1-1.06 shall not be canceled, terminated or modified by the contractor without prior written approval of the City.
3. The contractor shall promptly notify the Safety & Risk Manager at (910) 341-5864 of any accidents arising in the course of operations under the contract causing bodily injury or property damage.
4. The City reserves the right to obtain complete, certified copies of all required insurance policies, at any time.
5. Failure of the City to demand a certificate of insurance or other evidence of full compliance with these insurance requirements or failure of the City to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
6. By requiring insurance herein, the City does not represent that coverage and limits will necessarily be adequate to protect the Contractor and such coverage and limits shall not be

deemed as a limitation of Contractor's liability under the indemnities granted to the City of Wilmington in this contract.

7. The City shall have the right, but not the obligation of prohibiting Contractor or any subcontractor from entering the project site or withhold payment until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by the City.

G-1.07 DELETED

G-1.08 DELETED

G-1.09 DELETED

G-1.10 DELETED

G-1.11 PAYMENT OF EMPLOYEES: The Contractor, and each of his Sub-contractors, shall pay each of his employees, engaged in work on this project, in full (less deductions made mandatory by law) not less often than on the Contractor's regular pay days, which shall be normally each week.

G-1.12 PAYMENT: Payment by the City to the Contractor will be made under either one of the following procedures:

G1.12.1 Public Construction Contracts equal to or greater than one hundred thousand dollars ($100,000)

A. The City shall retain five percent (5%) of any periodic payment due a Contractor.

B. When the project is fifty percent (50%) complete, the City, with written consent of the surety, shall not retain any further retainage from periodic payments due the Contractor if the Contractor continues to perform satisfactorily and any nonconforming work identified in writing prior to that time by the Architect, Engineer, or City has been corrected by the Contractor and accepted by the City Engineer, Architect, Engineer, or Project Manager. If the City determines the Contractor's performance is unsatisfactory, the City may reinstate retainage for each subsequent periodic payment application up to the maximum amount of five percent (5%). The project shall be deemed fifty percent (50%) complete when the Contractor's gross project invoices, excluding the value of materials stored off-site, equal or exceed fifty percent (50%) of the value of the contract, except the value of materials stored on-site shall not exceed twenty percent (20%) of the contractor's gross project invoices for the purpose of determining whether the project is fifty percent (50%) complete.

C. 50% complete means:
   - Gross project invoices, excluding material stored off site, of the value of the contract
   - The value of materials stored on-site shall not exceed 20% of the gross project invoices

G-1.12.2 PAYMENT ON UNIT PRICE CONTRACTS: Not later than 30 work days after receipt of a City approved invoice the City will make partial payment to the Contractor, on the basis of a duly certified approved estimate by the City Engineer, Project Architect or City Project Manager of the work performed during the preceding calendar month by the Contractor, in accordance with item 12.1.1 above.

G-1.12.3 PAYMENT ON LUMP SUM CONTRACTS, THIRTY DAYS OR MORE IN DURATION: Not later than 30 work days after receipt of a City approved invoice and acceptance of work performed during that period, the City will make partial payment to the Contractor on the basis of a duly certified approved estimate by the City Engineer, Architect, Designer or Project Manager of the work performed during the preceding calendar month by the Contractor, and the value of the materials on the job, but not installed. The City will retain five percent (5%) of the amount of each such estimates in accordance with item 12.1.1 above. For purposes of preparing these monthly estimates, after the execution of the Contract, the Contractor will be required to submit to the City Engineer, Architect, Designer or Project Manager a breakdown of his lump sum bid in sufficient detail to permit an accurate determination of the progress of the work.

G-1.12.4 UNSATISFACTORY PERFORMANCE AND RETAINAGE: Retainage of the maximum of 5% may be reinstated if performance of the Contractor is unsatisfactory as determined by the City.

G-12.5 Within 60 days after the submission of a pay request and one of the following occurs, as specified in the contract documents, the owner with written consent of the surety shall release to the contractor all retainage on payments held by the owner: (i) the City receives a certificate of substantial completion from the Project Manager, Architect, Engineer, or Designer in charge of the project; or (ii) the owner receives beneficial occupancy or use of the project. However, the City may retain sufficient funds to secure completion of the project or corrections on any work. If the City retains funds, the amount retained shall not exceed two and one-half (2 ½) times the estimated value of the work to be completed or corrected. Any reduction in the amount of the retainage on payments shall be with the consent of the contractor's surety.

G1.12.6 Release of Retainage shall be in accordance with G.S. 143-134.1.

G1.12.7 There will be no retainage on periodic or final payments made by the City or prime contractor on public construction contracts in which the total project costs are less than one hundred thousand dollars ($100,000).

G-1.12.8 PAYMENT ON LUMP SUM CONTRACTS, THIRTY DAYS OR LESS IN DURATION: Where the time for completion of work, as stated in the proposal, is thirty (30) calendar days, or less, the City will make one payment in full upon completion of work and acceptance by the City Council. No partial or interim payments will be made.

G-12.9 The Prime contractor and all Subcontractors working on the project shall comply with G.S. 143-134.1in regards to payments to all subcontractors

G-12.9 Nothing in this section shall prevent the City from withholding payment to the contractor in addition to the amounts authorized under G.S. 143-134.1 for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

G1-12.10 Payment to Subcontractors by Prime Contractor or General Contractor

In accordance with N.C. Gen. Stat. § 22C, within seven days of receipt by the prime contractor of each periodic or final payment, the prime contractor shall pay the subcontractor based on work satisfactorily completed or service satisfactorily provided under the subcontract. Additionally, the Contractor shall pay the undisputed portions of subcontractors' invoices within one hundred five (105) calendar days of the date of subcontractor's invoice, independent of any payment by the

City to the Contractor. If the Contractor withholds any retainage pending final completion of any subcontractor's Work, the Contractor is required to pay the retainage so withheld within seven (7) calendar days after such subcontractor completes his Work satisfactorily, regardless of any payment of retainage by the City to the Contractor. The Contractor's failure to pay subcontractors as provided herein shall be a material breach for which the City may cancel the Contract.

If any periodic or final payment to the subcontractor is delayed by more than seven days after receipt of periodic or final payment by the prime contractor, the prime contractor shall pay the subcontractor interest, beginning on the eighth day, at the rate of one percent (1%) per month or fraction thereof on unpaid balance as may be due.

A subcontract on a contract governed by this section may include a provision for the retainage on periodic payments made by the prime contractor to the subcontractor. However, the percentage of the payment retained: (i) shall be paid to the subcontractor under the same terms and conditions as provided to the Prime Contractor and shall not exceed the percentage of retainage on payments made by the owner to the prime contractor. Subject to section G-1.12.4, any percentage of retainage on payments made by the prime contractor to the subcontractor that exceeds the percentage of retainage on payments made by the owner to the prime contractor shall be subject to interest to be paid by the prime contractor to the subcontractor at the rate of one percent (1%) per month or fraction thereof.

Nothing in this section shall prevent the prime contractor at the time of application and certification to the City from withholding application and certification to the City for payment to the subcontractor for unsatisfactory job progress; defective construction not remedied; disputed work; third party claims filed or reasonable evidence that claim will be filed; failure of subcontractor to make timely payments for labor, equipment, and materials; damage to prime contractor or another subcontractor; reasonable evidence that subcontract cannot be completed for the unpaid balance of the subcontract sum; or a reasonable amount for retainage not to exceed the initial percentage retained by the owner.

The Prime contractor shall comply in all respects with G.S. 143-134.1.in all manners in payments to any and all subcontractors.

Neither the City's nor contractor's release of retainage on payments as part of a payment in full on a line-item of work shall affect any applicable warranties on work done by the contractor or subcontractor, and the warranties shall not begin to run any earlier than either the owner's receipt of a certificate of substantial completion from the architect, engineer, or designer in charge of the project or the owner receives beneficial occupancy.

G-1.13 COMMENCEMENT AND COMPLETION OF WORK: The Contractor for the construction of improvements under this contract shall commence work under his contract within ten days after written notice by the City PURCHASING MANAGER, and shall fully complete all work thereunder within the time stated in the proposal form.

G-1.14 EXISTING CONDITIONS: The Contractor, in signing this contract, acknowledges that he has read these Specifications and is familiar with their terms; that he has studied the plans and drawings, which are entirely clear to him; that he has been over the ground where the work is to be done, and has fully acquainted himself with the existing conditions; that he is fully prepared to sustain all losses or damages incurred by the action of the elements, or from any unforeseen obstructions, or encumbrances that may be encountered in the prosecution of the work; is prepared to provide the necessary tools, appliances and machinery, skilled and unskilled labor and materials of all kind as specified, and to guarantee that on completion, all work will be in strict compliance with the plans and specifications.

G-1.15 SUBLETTING OR ASSIGNMENT OF CONTRACT: The Contractor shall keep the work under his own control, and shall not assign, by power of attorney, or otherwise, nor sublet the work or any part thereof, without the written consent of the City. The Contractor shall perform on the site and with his own organization work equivalent to at least thirty percent (30%) of the work to be performed under this Contract. If, during the progress of the work hereunder, the Contractor requests a reduction of such percentage, and the City Manager determines that it would be to the City's advantage, the percentage of the work required to be performed by the Contractor's own organization may be reduced; provided prior written approval of such reduction is obtained by the Contractor from the City Manager. The Contractor shall submit in writing the name of such Sub-contractor as he intends employing, the portion of the work which he is to do, the dollar amount of the work, indication as the MBE/WBE/HUB/DBE status of the subcontractor, his place of business, and such other information as the City may require, in order to know whether said Sub-contractor is reputable, reliable and able to properly perform the work he proposes to do and to determine the effort made by the bidder in securing MBE/WBE/HUB/DBE subcontractors. Also, with respect to each Sub-contractor, the Contractor shall either submit certification by his insurance carrier that such Sub-contractor is covered under the provisions of his policy, or submit a certificate from the Sub-contractor's insurer that the Sub-contractor is covered, in accordance with Paragraphs G-1.05 through G-1.10, inclusive.

The Contractor shall not, either legally or equitably, assign any of the monies payable under this Contract, or his claim thereto, except by consent of the City.

Written consent by the City to sublet or assign any portion of the contract shall not be construed to relieve the Contractor, or surety, of any responsibility for the fulfillment of the Contract.

INTENT OF SPECIFICATIONS

G-1.16 INTENT: The intent of these specifications is to provide for the work herein enumerated to be constructed of the best materials of their respective kinds, and perfectly suited to the work contemplated. The work to be fully completed in every detail for the purpose designed, and it is hereby understood that the Contractor, in accepting this contract, agrees to furnish skilled labor, and everything necessary to complete the work in a workmanlike and satisfactory manner.

G-1.17 CONTRACT: In order that the contractor may understand the scope of the work to be performed and the details of its construction, several documents have been prepared, and it is understood and agreed by and between the contracting parties that the following documents form, and are essential parts of the complete contract: Advertisement, Information for Bidders, General and Technical Specifications, Proposal, Specific Contract, Contractor's Bond, Drawings, Plans, Maps, MBE/WBE/HUB/DBE policy and Profiles, attached or herein described, and others that may be prepared from time to time governing and illustrating the work to be done under the terms of the contract, and all of which shall have the same weight as if embodied herein.

G-1.18 SPECIFICATIONS: The General Provisions of the Specifications give in detail the duties and obligations of the two parties to the contract, the procedure of the work, and manner in which payments are to be made under the contract. The Technical Specifications, following, give in more detail the characteristics and requirements of the several classes of materials and special instructions governing the methods of construction. Where there is conflict, the Technical Specifications shall always take precedence over the General Specifications.

DEFINITIONS

G-1.19 DEFINITIONS: Wherever in the Specifications, Proposal, Contract, or Bond the following terms, pronouns, or abbreviations used in their stead, occur, the intent and meaning shall be interpreted as follows:

A. N. S. I.
American National Standards Institute

A. S. T. M.
American Society for Testing and Materials

A. W. S.
American Welding Society

A. W. W. A.
American Water Works Association

A. A. S. H. T. O.
American Association of State Highway and Transportation Officials

Bid Bond
BID BOND: The security to be furnished by the bidder as guaranty of good faith to enter into a contract with the City for the proposed work, if such work is awarded to him.

Bidder
The person, or persons, partnership, firm or corporation submitting a proposal for the work contemplated.

Change Order
A written order from the Engineer signed by the Contractor and the City of Wilmington authorizing addition, deletion or revision in the work or an adjustment in the price or time for completion. All change orders must be approved by the City Manager and all change orders exceeding $500,000.00 must be approved by Wilmington City Council.

City
The word City in these specifications refers to the City of Wilmington, North Carolina, the party of the second part to the contract, also referred to herein as the "Owner".

City Council or Council
The word Council, or City Council, refers to the City Council, the governing body of the City of Wilmington.

Contractor
The person, or persons, partnership, firm or corporation who enters into the contract awarded him by the City.

Drawings
All drawings, or reproductions thereof, pertaining to the construction of the work, which are approved by the Engineer for such purpose.

Engineer
The word Engineer, as used in these specifications, refers to the consulting engineer whose name appears on the drawings and/or to the City Engineer, and to his or their properly authorized assistants, limited to the duties entrusted to them.

Extra Work
A written order to the Contractor, signed by the Engineer, ordering a change in, or an addition to the work done, from that originally shown by the drawings and specifications.

An authorized Change order shall be issued for this work.

F. S.

Federal Specifications

General Specifications

All requirements and provisions contained in this document.

Performance Bond

The approved form of security executed by the Contractor and his surety, guaranteeing complete execution of the contract.

Bond Proposal

Written offer submitted by the bidder in the required manner to perform the work contemplated.

N. C. S. H. C. or N. C. H. C. Specifications

North Carolina State Highway Commission, Raleigh, North Carolina, and to their "Standard Specifications of Roads and Structures," latest edition.

Request for Contract Payment

The form supplied by the City and completed by the Contractor to request periodic payments on the contract. This form also includes a MBE/WBE/HUB/DBE payment form.

Special Provisions

Statements modifying or changing the requirements or provisions of the General Specifications, or adding new requirements or provisions thereto.

Specifications

The General Specifications, Special Provisions, and all written or printed agreements and instructions pertaining to the performance of the work, and to the quantity and quality of the materials to be furnished under the contract.

Standard Details

The Standard Detail drawings, or reproductions thereof, which pertain to the standard method of construction of the work, and which are approved by the Engineer.

Surety

The corporate body which is bound with and for the contractor, that is primarily liable with the contractor, for the acceptable performance of the contract and for the completion of the work.

Phrases

Wherever, in the specifications, or upon the drawings, the words "As required", "As permitted", or words of like import are used, it shall be understood that the direction, requirements, or permission of the Engineer is intended; and similarly the words "approved", "acceptable" and "satisfactory", or words of like import shall mean approved, acceptable, or satisfactory to the Engineer.

MBE/WBE/HUB/DBE POLICY

The policy adopted by City Council. A copy of the entire policy is available for inspection at the office of the Purchasing Manager.

G-1.20 INTERPRETATIONS AND CORRECTIONS: It is agreed by and between the contracting parties that the Engineer shall make all necessary explanations as to the meaning and intent of these specifications, and correct any errors, discrepancies or omissions that occur in the plans and specifications; it is further agreed that the Engineer shall, in all cases, determine the amount, quality, acceptability, and fitness of the several classes of work which are to be paid for under the contract; and it is also agreed that the Engineer shall act as referee upon all questions arising between the parties of this contract; and in all differences that occur between contractors working on adjoining sections concerning the work to be done under the terms of the contract, and the Engineer's decision shall be final and binding.

G-1.20.1 INTERPRETATIONS OF PLANS AND/OR SPECIFICATIONS PRIOR TO RECEIPT OF BIDS: If any prospective bidder feels that there are items within the plans or specifications, in the work proposed, or upon the site contemplated, which need clarification or interpretation, he shall, prior to the date and time for the receipt of bids, address a written statement to the Engineer, covering the points which he feels need clarification. It shall be the responsibility of the person addressing the inquiry to see that such a request is in the hands of the Engineer in sufficient time for proper consideration and answer. Upon receipt of such a written request, the Engineer will make a determination and if, in his opinion, interpretation, clarification and/or change should be made in the plans and/or specifications, he will inform each holder of the plans and specifications in writing of his decision or findings in the matter in question. No other procedure will be followed in interpretation or addendum to these specifications, and the City of Wilmington will not be responsible for any change unless made in accordance with this procedure.

Questions related to the proposed project, including questions concerning the plans and specifications will be addressed by the City or Engineer up to Seven (7) calendar days prior to the bid opening. No addenda will be issued after this time.

G-1.21 FIELD WORK: The Engineer shall give all necessary base lines and bench marks and information of like character for the guidance of the contractor, and all the work shall accurately conform thereto. Any work done without established lines, grades, may be ordered removed and replaced, without additional expense to the City.

G-1.22 INSPECTION: All materials and workmanship will be inspected by the Engineer, and the Contractor will be held to the spirit of the specifications at all times, the intent of such inspection being simply to obtain work of a high character, and one in which both parties to the contract can take pride.

G-1.23 ALTERATIONS: It is agreed by the contracting parties that the Engineer may at all times, before or after the commencement of the work, make alterations, or changes in the location, alignment, grades, materials and methods of construction that is desired, regardless of whether the location of such work be as shown on the plans upon which bids have been invited, and such change shall not vitiate or annul this contract, but the Engineer will determine the value of said work, and should such change diminish the amount of work to be done, no claim shall be made by the Contractor for damages on the grounds of anticipated profits from the part disposed with, but should the plan of a particular piece of work be altered or changed after commencement of said work and result in extra cost to the Contractor, the Engineer shall determine and certify a fair equitable value therefor, and his decision shall be final and binding.

G-1.24 INSPECTORS: Should it be found necessary, in the opinion of the Engineer, to appoint inspectors to pass upon the quality, amount, and general character of the work and the materials incorporated therein, such person, or persons, who, in the opinion of the Engineer, are deemed competent, may be appointed. The duties of this office are purely supervisory, and their decisions are subject to review by the Engineer.

EXTRA WORK

G-1.25 EXTRA WORK: The Contractor shall do any work not otherwise herein provided for when, and as ordered by the Engineer in writing by himself or specially authorized assistants. In the event that a mutually agreed price is not arrived at prior to the accomplishment of this extra work, the Contractor shall keep a strict account of the labor, equipment, and material used on said extra work, and shall give the Engineer an itemized statement each day of the amount. He shall further furnish the Engineer with bills, accounts and vouchers relating to the cost and access to all accounts concerning this work.

G-1.25.1 Request for reimbursement for Extra Work must be submitted by the Contractor within ten (10) days of the date upon which such extra work is accomplished, and subject request for reimbursement must bear on its face the authorizing number of the written order issued by the Engineer.

G-1.25.2 No request for reimbursement on account of additional work will be honored by the Engineer unless previously authorized by him in the manner stated.

G-1.26 PROTECTION: When such work is being carried on under the written instructions of the Engineer, and the work is damaged from whatever cause due to the carelessness or neglect of properly protecting it, or the use of improper materials, or inferior workmanship, such part thereof as the Engineer directs shall be removed and replaced by the Contractor at his own expense.

G-1.27 PAYMENT: For all such extra work, as authorized under the terms of Paragraph G-1.25, where it is possible for the Contractor and the Engineer to arrive at a mutually agreeable price (either lump sum or unit price) for this extra work in advance of the actual accomplishment of said work, this price may be used. In the event that this is not possible or practicable, the Contractor shall receive the reasonable cost of said work, plus ten percent (10%) of such cost. The decision of the Engineer shall be final upon all questions of the amount and value of extra work. The Engineer will include in such valuation the cost to the Contractor of all materials used, all labor, Social Security and insurance on labor only, common and skilled, labor foremen, and the fair rental of all machinery used for the period of such use. The Engineer will not include in this valuation any cost or rental of small tools, buildings, any portion of the time of the Contractor or superintendent, clerical help, overhead expenses or any allowance for the use of capital, these items being considered as covered by the ten percent (10%) added to the reasonable cost.

G-1.28 TIMEKEEPER: The Engineer shall have the right to appoint a timekeeper to represent the City on extra work, and the Contractor shall furnish him all necessary facilities for obtaining a correct record of the time and the materials incorporated in the work. The Engineer shall have the right to designate what force shall be employed, the compensation therefor and the foreman shall be approved by the Engineer.

GENERAL INSTRUCTIONS

G-1.29 OBSERVANCE OF THE LAW: In all operations connected with the work, the Contractor shall observe and obey all the precepts of the law, the ordinances and regulations of the Federal, City, County and State. The Contractor shall provide and maintain such barriers, signals, red lights, and watchmen to effectually prevent any accident in consequence of the work, and the Contractor shall be responsible and liable for all damage to life or property occasioned in any way by his acts or that of his agents.

G-1.30 DISPOSITION OF CLAIMS: In the event of injuries or damages to persons or property of any kind legally existing along, or adjacent to the work, the Contractor agrees to make repairs or payment for damages or injuries as may be necessary, and should the Contractor fail to promptly

repair or satisfy any legal complication that arises, after being notified in writing by the Engineer, the right is conferred upon the CITY to deduct the cost thereof from any money due, or to become due, the Contractor under the terms of the contract. All claims arising under this contract shall be settled to the satisfaction of the Engineer within sixty (60) days after notification to the Contractor of such claims, unless proceedings are entered into in a court of law.

G-1.31 PATENTS: Should the Contractor use any patented invention, article or contrivance in the construction or maintenance of the work, or any part thereof embraced in these specifications, the fee or royalty for the use of such patented article as aforesaid shall be included in the Contractor's proposal; and the Contractor agrees to hold the City harmless against any and all demands for such fees or royalties; and before final payment to the Contractor he shall furnish satisfactory evidence that all such claims have been settled.

G-1.32 PRIVATE PROPERTY: The Contractor shall not enter, or occupy with men, tools, machinery and materials, any property except that under the control of the City without the consent of the Engineer, and then only with written consent of the property owner. A copy of this written consent shall be given, or mailed to the Engineer.

G-1.33 LAYING OUT THE WORK: The Engineer will provide a base line for alignment purposes and a benchmark for vertical control. All construction offset stakes, forms, and batterboards shall be set by the contractor and are subject to review and approval by the Engineer, however, such approval of these items shall not relieve the Contractor of his responsibility to construct the work to the line and grade shown on the plans.

G-1.34 UNAUTHORIZED WORK: Any work done without lines, levels and instructions having been given by the Engineer, or without the supervision of an Inspector, will not be estimated or paid for, except when such work is authorized by the Engineer. Work so done, without the authority of the Engineer, may be ordered removed and replaced at the Contractor's cost.

G-1.35 RESPECT FOR FIELD RECORDS: The Contractor shall carefully preserve and maintain the proper position of all lines, stakes and grade boards until authorized to remove them. Any work that shows lack of alignment or grade where the Engineer's control stakes are missing, or the position of the points, stakes, or grades indicate that they have been carelessly maintained, such work shall be removed and replaced at the Contractor's expense. If, in the opinion of the Engineer, the Contractor does not utilize reasonable care in preserving control stakes, he shall be required to pay for all expenses involved in the replacement of these stakes.

G-1.36 INSPECTION OF MATERIALS: The Contractor shall furnish and deliver on the ground where it is to be used all materials suitable for the purpose intended. All materials and workmanship shall be subject to the Engineer's inspection, approval, or rejection at all times, and this inspection and approval during the progress of the work does not relieve the Contractor of repairs or renewal where the work has been damaged, proven defective, or overlooked, and on demand of the Engineer any work found not in conformity with the specifications shall be removed at once and replaced in accordance with the specifications.

G-1.37 WORKERS: Only competent and skilled workers of each class shall be employed on the work, and if the Engineer notifies the Contractor that any common or skilled workers, including those superintending the work, are unfaithful, disobedient, disorderly, or unsatisfactory, such worker, or workers shall be taken off of this project not again employed upon the work without the consent of the Engineer.

G-1.38 PROSECUTION OF WORK: The Contractor shall begin the work provided for under the terms of the contract within ten (10) days after written notice by the Purchasing Manager, and shall diligently prosecute and fully complete same within the time stated in his proposal. The Contractor shall prosecute the work in such manner, time and place as directed by the Engineer,

and he shall carry out without delay all orders and instructions given by the Engineer. During the absence of the Contractor, a qualified representative shall have authority to direct the work and to receive orders and instructions from the Engineer; but this direction by the Engineer for prosecuting the work shall not relieve the Contractor of any of the obligations or liabilities assumed under the contract.

G-1.39 SANITATION: Necessary sanitation conveniences for the use of workers employed upon the work shall be constructed and maintained by the Contractor, in strict accordance with the provisions of the City-County, and State Health Departments. The Contractor shall obey and enforce the aforesaid rules and regulations, including preventative measures where the workers have been exposed to infections and communicable diseases.

G-1.40 PUBLIC TRAFFIC: The Contractor shall maintain, in a safe and practical way, the roadways that are now used by the public or individuals that neither may be unnecessarily delayed nor inconvenienced on account of the work being carried on by the Contractor. The Contractor will be responsible for all injuries, damages to persons or property incurred by such person, or persons, firm or corporation on account of the acts or claims of negligence by the Contractor to the aforesaid while passing over the public or private roadways. The Contractor will be required to repair, or make reparation for any damages that he may have caused to the roadways, public or private, immediately after discontinuing traffic along such route, or when authorized to do so by the Engineer.

G-1.41 BARRICADES AND LIGHTS:

G-1.41.1 Travel upon streets or any intersecting alley, street, or private driveway shall not be inconvenienced needlessly, nor shall any street or alley be wholly obstructed for more than two blocks at any one time, except in special cases where a greater distance may be allowed by the Engineer.

G-1.41.2 Whenever a street is closed, the Contractor shall cause plainly worded signs, announcing such fact, to be placed with proper barricades at the nearest cross street upon each side of such obstruction, and upon intersecting streets.

G-1.41.3 The Contractor shall also maintain sufficient warning lights during the hours of darkness in and about the work which is under way, and it is his full responsibility to see that such lights are lit and kept lit from sunset to sunrise.

G-1.41.4 The Contractor shall also provide and maintain suitable detour signs so as to warn the public of work under way, and to guide them around the work in progress where it would be dangerous for them to proceed through the working area.

G-1.41.5 If required by the Engineer, the Contractor shall also provide watchmen, or signalmen for protection and guidance of the public.

G-1.41.6 All barricades, lights, signage, flagging, and signalmen shall be established and operate in accordance with City requirements and North Carolina Department of Transportation.

G-1.42 DRAINAGE: The Contractor shall maintain an unobstructed flow of the natural and artificial drains at all times, and in the event it is necessary during the prosecution of work to obstruct the free flow of either, the Contractor shall provide for flow of water in such manner that no damage shall result, or a nuisance be created.

G-1.43 CLEANING UP: On the completion of any part of the work, the Contractor shall remove all surplus earth, materials of construction, debris, and refuse from the work as directed by the

Engineer. On the final completion of the work, all debris over the entire contract, which is a result of work by the Contractor, shall be moved or destroyed as directed by the Engineer.

G-1.44 INCIDENTAL WORK: The duties of the Contractor have been set out in these specifications in a broad manner, with the intent of bringing to the attention of the Contractor his responsibilities under the contract, and any details of the work not specifically mentioned, but obviously necessary for carrying on, and the completion of the work shall be considered incidental thereto, and as being a part of, and included with the work for which prices have been named in the proposal, and the Contractor will not be entitled to any additional compensation therefor.

G-1.45 CONTRACTOR'S CLAIM FOR DAMAGES: In the event the Contractor is of the opinion that he should be compensated for damages sustained by reason of some act of the City, its agents or employees, the amount of such claims shall be itemized and a detailed report shall be furnished the Engineer by the Contractor within ten (10) days after the date it is claimed such damages were sustained. If the Contractor fails to file his claim in the manner and within the time named, but presents such claim at a later date when it would be impossible to make a thorough investigation, such claims will be forfeited and invalidated, and payment of the alleged damages will be disallowed.

G-1.46 EXTENSION OF TIME: No extension of time will be made the Contractor for completing the work on account of ordinary and usual delays, such as the condition of the weather, and lack of material, accidents, and the occurrence of such will not relieve the Contractor from the necessity of maintaining the rate of progress agreed upon. The City will have the right, upon the recommendation of the Engineer after investigation, to extend the time for completion when extraordinary delays or accidents of unusual nature are incurred over which the Contractor has no possible control; but such action on the part of the City shall not operate or be construed to waive any of the rights of the City under this Contract and the Performance Bond. In the event the Contractor fails to complete the work in the specified time named in the proposal, and is permitted to continue and complete the work as if such time had not lapsed, such permission shall not be deemed a waiver in any respect by the City of any liability for extra expense thereby incurred arising from the noncompletion of said work, within the specified time, but such liability shall remain in full force against the Contractor.

G-1.47 TIME FOR COMPLETION AND LIQUIDATED DAMAGES: It is hereby understood and mutually agreed, by and between the Contractor and the City, that the date of beginning and the time for completion as specified in the contract of work to be done hereunder are ESSENTIAL CONDITIONS of this contract.

The beginning date of the construction period shall be ten (10) days following the date on the NOTICE TO PROCEED letter duly mailed by the Purchasing Manager to the contractors address indicated in the bid documents.

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will ensure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the City, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the City, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the City the amount specified in the contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the City because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the City would in such event sustain, and said amount is agreed to be the amount of damages which the City would sustain and said amount shall be retained from time to time by the City from current periodical estimates.

It is further agreed that time is of the essence of each and every portion of this contract and of the specification wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be to the essence of this contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the City determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the City; Provided further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to any preference, priority or allocation order duly issued by the City.

G-1.48 SALVAGED MATERIALS: Any used materials removed from the site of the construction, such as granite curb, manhole and catch basin castings, pipe, fill materials, which materials will not be re-used under this contract, are the property of the City of Wilmington. Pipe, curb, castings, etc., shall be carefully removed by the Contractor and delivered to the City Lot at Tenth and Fanning Streets, where a receipt will be given. Excess fill material will be dumped on disposal areas indicated by the Engineer. The Contractor will be charged with any salvaged materials which he cannot account for as having delivered, as specified.

G-1.49 FINAL ESTIMATE: The Engineer shall certify to the City in writing when, in his opinion, the Contractor has performed all that is set out in the contract and the specifications relative to the construction, and the Engineer shall show in such certificate the amount of work done from actual measurement, and the value of such work under and according to the prices named in the proposal. The City, on acceptance of said certificate, shall pay unto the Contractor within thirty (30) days thereafter the amount remaining due, and that part of the estimate remaining unpaid and including all moneys retained in the monthly estimates and for other causes under the contract.

The acceptance by the Contractor of the final payment shall release the City of any and all claims, liabilities and obligations to the Contractor for any and all work done and materials furnished, or for any act of the City or its agents or employees affecting the same. Before final payment is made, the Contractor shall submit an affidavit to the Engineer, stating that he has fully paid all bills for equipment, materials, or labor used on this project.

G-1.50 INSPECTION AND TESTING MATERIALS: Whenever in these contract documents, inspection and testing of materials is called for, the selection of bureaus, laboratories and/or agencies for such inspection and testing is subject to the approval of the Engineer.

G-1.50.1 Documentary evidence satisfactory to the Engineer that the materials have passed the required inspection and testing must be furnished to the City by the Contractor prior to the incorporation of such materials in the work, when required by the Engineer, and rejected materials must be promptly removed from the premises.

G-1.50.2 Wherever an outside testing laboratory is employed for testing of materials to be incorporated in this contract, the City of Wilmington shall employ and pay said laboratory for services rendered.

G-1.51 CONTRACTOR'S USE OF PUBLIC WATER: The Contractor shall comply with all requirements of the Cape Fear Public Utility Authority for use of public water.

G-1.52 PRECAUTIONS PRIOR TO AND DURING EXCAVATION OF ANY STREETS: No excavation, tree removal or clearing shall be begun by the Contractor upon any street within the City, or any area upon which work is to be done under this contract until he has notified and arranged for an authorized representative of the utility companies and departments which maintain underground systems within the City of Wilmington (water, sewer, electric, telephone and gas) to go over all areas to be graded, excavated or cleared, and designate the location of all hidden or underground facilities, lines, cables, pipes, or other structures and adequately mark these for proper protection during the progress of the proposed construction. The City will use its best offices to require that the owners of utilities which are in physical interference with the work relocate their utilities with utmost speed when these obstructions are encountered. In case any obstruction so located or placed as to interfere with the work, is unexpectedly encountered, the Contractor shall at once notify the Engineer of the locality and circumstances, and the place shall be passed over until satisfactory arrangements can be made. The Contractor shall make no claim against the City for damages arising out of such a delay.

G-1.52.1 Any utility which requires relocation due to physical interference with the proposed construction will be required to be relocated by the owners by the City under its franchise agreement with the operators of said utility.

G-1.52.2 Any utility line which, in the opinion of the Engineer, does not require relocation due to physical interference with the proposed project shall be the responsibility of the Contractor to protect during the progress of the work. In the event of damage to any such line upon which a repair cost is claimed, this claim shall be paid by the Contractor. Where the utility owner has given incorrect or insufficient information to the Contractor as to the location of its underground lines, then the Contractor shall be relieved of the costs of repair, which shall then be borne by the utility company or operating department.

G-1.52.3 Under no circumstances, however, shall machine excavation, grading or cut of any nature be made in a street, or areas where high voltage underground cable or gas distribution lines, services, or mains are situated without the continuous presence of an authorized representative of the owning utility who is capable of "shutting down", "cutting off", discontinuing, or taking such other action as may be necessary to prevent a dangerous condition or occurrence of said utility lines, cables or facilities are damaged during such operations.

G-1.52.4 Should the location or position of any underground or surface obstruction be such that in the opinion of the Engineer its removal, replacement, realignment, or change is required for the prosecution of the work, and it shall be deemed desirable or expedient by the Engineer, the Contractor shall perform such work as may be required as Extra Work under this Contract. (See G-1.25, G-1.26, G-1.27, and G1.28).

G-1.53 RIGHTS-OF-WAY: The City shall furnish all needed rights-of-way for the project, but in the event that any certain rights-of-way and grounds necessary for the purpose of this Contract be not acquired by the City until after the beginning of the work, the Contractor shall so arrange the procedure of work as to allow time for the acquisition of such rights-of-way, and the City will not reimburse, or be liable to the Contractor for any losses resulting from, or incident to, such delay. As soon as the rights-of-way in question have been acquired, the Contractor shall at once proceed with the work thereon with such forces as will insure its prompt completion, but if there is such delay in procuring the right-of-way in question that there will not remain a reasonable length of time before the date set for the completion of this particular work, this fact shall operate so as to extend the time for completion of the particular work affected and to compensate for the actual time lost.

G-1.54 USE OF A PORTION OF THE WORK: Whenever, in the opinion of the Engineer, any portion of the work is completed, or is in an acceptable condition for use, it shall be used for the purpose intended. Such use shall not be held in any way as an acceptance of that portion of the work

used, or as a waiver of any of the provisions of these specifications. Necessary repairs or renewals in any section of the work due to defective materials, defective workmanship, or natural causes, under the instructions of the Engineer shall be performed by the Contractor at no additional cost to the City.

G-1.55 EXCISE TAX ON MATERIALS OR FEDERAL TRANSPORTATION TAX, EXEMPTION THEREON: Wherever existing Federal Laws concerning Federal Excise Taxes and Federal Transportation Tax provide that the City of Wilmington is exempt from payment of such tax on items purchased by it, and these laws and regulations permit the extension of this exemption to the Contractors performing work for the City, the City will supply affidavits as to the existence and nature of the Contract, as requested by the Contractor for his use in filing with his vendors and transportation agencies to make his purchases for work under this Contract exempt from such taxes; providing (1) that the Contractor shall have filed an affidavit with the City that his bid on this contract does not include any costs of said taxes, and (2) that the materials for which he will request exemption from tax will be only those materials, which upon completion of the Contract will have actually been incorporated into the work under this Contract, and upon receipt of final payment by the Contractor will become the property of the City of Wilmington.

G-1.56 REQUIRED RECORDS ON SALES AND USE TAX: In order that the City may substantiate a refund claim for sales and use taxes, the Contractor shall furnish the City certified statements in triplicate, setting forth the cost of building materials, supplies and fixtures, and equipment which become a part of, or are annexed to any building or structure being erected, altered, or repaired under contract with the City and the amount of sales and/or use taxes paid thereon.

In the event the Contractor makes several purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices and the sales and use taxes paid thereon. Such statement must also include the cost of any tangible personal property withdrawn from the Contractor's warehouse stock which is incorporated in the work, and the amount of sales and use tax paid thereon by the Contractor. The Contractor shall also obtain similar certified statements by his Sub-contractors and submit them to the City.

Bidders are reminded that an additional Two percent (2%) North Carolina Sales Tax is now collected on all sales made within certain counties. Purchases within these counties will require separate certified statements for this 2% tax. This statement shall give the vendors name, invoice number, total amount of invoice, date of invoice, the amount of the special 2% tax paid and the County in which the purchase was made. In the event that the Contractor wishes to file a combined certified statement showing the 4% tax and the 2% tax separately, this will be acceptable provided he gives the counties in which the 2% tax was paid.

This certified statement must be submitted to the City Engineer monthly, and all certified statements shall be submitted before final payment is made for work performed under this contract.

G-1.57 SURFACE AND SUB-SURFACE STRUCTURES: The Contractor shall be held responsible for the proper replacement of all bridges, crossings, or like structures.

In case any pipe or other obstruction, located or placed so as to interfere with the work is unexpectedly encountered, the Contractor shall at once notify the Engineer of the locality and circumstances, and the place shall be passed over until satisfactory arrangement can be made, without any claim for damages arising from such delay.

Should the location or position of any underground or surface obstruction be such that, in the opinion of the Engineer it must be relocated, and he deems it desirable or expedient that the Contractor undertake the necessary work, the Contractor will undertake to accomplish such work

as directed by the Engineer, as provided under the sections of these Specifications dealing with Extra Work.

The Contractor is to take all risks and shall be responsible for all expenses and damage attending the presence or proximity of any gas or water pipe, or public or private sewers or drains, conduits, or other structures located in such a manner as shall not, in the opinion of the Engineer, require shifting, accommodating, or removing.

G-1.58 SETTLEMENT OVER EXCAVATION: The Contractor shall be entirely responsible for all settlement over any and all trenches and excavations which may have been cut along the line of his work at any time prior to the completion of his contract, and for a period of twelve (12) months after completion of his contract.

G-1.59 TEMPORARY SUSPENSION OF WORK: The Engineer shall have the authority to suspend the work, wholly or in part, for such period or periods as may be deemed necessary due to unsuitable weather, or other such conditions as are considered unfavorable for the suitable prosecution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given, or perform any or all provisions of the Contract. If it should be necessary to stop work for an indefinite period, the Contractor shall store all materials necessary in such a manner that they will not deteriorate or become damaged in any way, and he shall take every precaution necessary to prevent damage or deterioration of the work performed, provide suitable drainage by opening ditches, shoulder drains, etc., and erect structures where necessary. The Contractor shall not suspend the work without authority from the Engineer. Neither the failure of the Engineer to notify the Contractor to suspend the work on account of bad weather, nor permission from the Engineer to continue work during bad weather shall be cause for the acceptance of any work which does not comply in every respect with the Contract and Specifications.

G-1.60 EQUAL OPPORTUNITY REQUIREMENTS: The Contractor agrees that it will in carrying out the terms of this agreement, comply with the provisions of Executive Order 11246 entitled "Equal Employment Opportunity".

In complying with the provisions of Executive Order 11246, the Contractor agrees as follows:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: 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. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(b) The Contractor will in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

(c) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or worker representatives of the Contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(e) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts by the Department of Housing and Urban Development and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

(f) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 or September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(g) The Contractor will include the provisions of paragraphs (a) through (g) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor.

(h) EXEMPTIONS TO EQUAL OPPORTUNITY CLAUSE: (1) Contracts and sub-contracts not exceeding $10,000.00 (other than Government bills of lading) are exempt. The amount of the contract, rather than the amount of the Federal Financial Assistance shall govern in determining the applicability of this exemption. (2) Except in the case of sub-contractors for the performance of construction work at the site of construction, the clause shall not be required to be inserted in sub-contracts below the second tier. (3) Contracts and sub-contracts not exceeding $100,000.00 for standard commercial supplies or raw materials are exempt.

G-1.61 SAFETY: The contractor and each of his subcontractors shall comply at all times with all regulations of the Occupational Safety and Health Administration and all labor laws and regulations of the State of North Carolina applicable to safety. Such standards include 29 CFR Part 1926 and applicable standards from 29 CFR Part 1910 of the Code of Federal Regulations.

The contractor and each of his subcontractors shall maintain adequate protection against damage to life and property during the work and shall provide and maintain all necessary protective devices until completion and acceptance of the work by the City.

In any emergency threatening life or property not considered by the contractor as coming under the provisions provided in this Section G-1.61 the contractor may act at his own discretion to prevent or alleviate the threatening situation without authorization by the City.

G-1.62 Contractor shall obtain building, electrical, mechanical and plumbing permits for all work under the Contract. <u>There will be no fee for obtaining these permits</u>.

G-1.63 GENERAL CONTRACTOR: In the event the bid and subsequent contract require separate prime contractors for the various phases of the work, the Contractor receiving the GENERAL CONSTRUCTION contract shall act as the General Contractor for the project in regards to scheduling of the work and other duties generally carried out by the General Contractor.

G-1.64 PLANS AND SPECIFICATIONS: All firms receiving award on a section of the contract shall receive free of charge from the City of Wilmington two (2) complete sets of plans and

specifications for the project. For Single prime contracts involving multiple subcontractors, the primary subcontractors (HCAC, Plumbing, and Electrical or specialty item specifically bid as a separate item) shall receive up to two (2) complete sets of plans and specifications. Any further sets required by the contractor shall be charged to the contractor at the cost of reproduction.

G-1.65 DISPUTES: Any disputes in excess of $15,000 shall be processed in accordance with Section 13 of the contract.

Rev. 2/02

STATE OF NORTH CAROLINA CONTRACT NO: ALLE-IH-0326

NEW HANOVER COUNTY

CONTRACT FOR CONSTRUCTION SERVICES

THIS CONTRACT, made and entered into on the date executed by all parties, by and between the CITY OF WILMINGTON, NORTH CAROLINA, a Municipal Corporation located in New Hanover County (hereinafter called "CITY"); and 1. a corporation organized under the laws of the State of _____; 2. a non-profit corporation organized under the laws of the State of _____; 3. an unincorporated association having its principal place of business in _____; 4. a resident of _____; or 5. owner of a partnership organized under the laws of the State of _____, with its principal offices in _____ (hereinafter called "CONTRACTOR").

W I T N E S S E T H:

1. Purpose

The CITY hereby employs the CONTRACTOR to furnish all labor, materials and equipment to perform all work in manner and form as specified by the attached plans, specifications and documents consisting of, but not limited to: Advertisement, Instructions to Bidders, General Conditions, Technical Specifications, Proposal and Affidavit, Contract and Performance and Payment Bonds, which are incorporated as if fully set out, for the following:

DOWNTOWN ALLEY IMPROVEMENTS as specified herein and, on the plans, specifications, contract documents, drawings, addenda and change orders (if any).

2. Term of Contract/Liquidated Damages

The CONTRACTOR shall commence the work to be performed under this contract within ten (10) days of receipt of a written order from the Purchasing Manager and shall complete all work hereunder within 180 calendar days of the date of beginning. The CONTRACTOR further agrees to pay, as liquidated damages, (**SEE SECTION T-15.04 OF THE SPECIAL CONDITIONS)** thereafter as hereinafter provided in Paragraph G-1.47 of the General Conditions.

3. Extra Work

In the event extra work is necessary, not set forth or contemplated in this contract, the CONTRACTOR agrees to faithfully perform all such work under a written change order from the CITY, setting forth and describing fully the work to be done. The CITY hereby agrees to pay to the CONTRACTOR, for any such extra work, upon presentation of properly prepared, itemized statements of cost computed as follows:

(a) The CONTRACTOR shall be allowed to charge for labor used at the actual payroll charges during the time actually spent on extra work, (b) He shall be allowed to add on labor charges the percentage shown in Paragraph 8 of the Proposal for Workmen's Compensation Insurance, Social Security and other payroll charges, (c) The rate for such equipment, this hourly rate to be for operating hours only, (d) The CONTRACTOR shall be allowed to charge for material purchased by him and used on extra work orders the amount charged to him by the vendor upon presentation of paid invoices, (e) The CONTRACTOR shall be allowed to add to the costs of said work arrived at enumerated above ten (10%) percent of materials, cost of equipment and actual payroll cost for overhead and profit.

4. Payment

4.1 The CITY agrees to pay to the CONTRACTOR for the faithful performance of this contract, subject to any additions or deductions as provided for in the Specifications or Proposal, and in accordance with the prices as set forth, subject to any additions which may be due under Paragraph 3 of this Agreement, Unit Prices and/or lump sum price, as set forth in the Proposal, the estimated total cost of _____ ($_____)

4.2 Not later than 30 work days after receipt of a City approved invoice the City will make partial payment to the Contractor on the basis of a duly certified approved estimate by the City Engineer of the work performed during the preceding calendar month by the Contractor, and the value of the materials on the job, but not installed, less ten (5%) percent of the amount of such estimate, which is to be retained by the CITY until all work has been performed strictly in accordance with this contract and until such work is accepted by the CITY.

4.3 Invoices, or estimates or the cost of work performed, through June 30th, must be received by the 10th calendar day of July.

4.4 Upon submission by the CONTRACTOR of evidence satisfactory to the CITY that all payrolls, materials, bills and any other liabilities or costs incurred by the CONTRACTOR in connection with the construction of this work has been paid in full, final payment on account of this contract shall be made within thirty (30) days after completion by the CONTRACTOR of all work covered by this agreement and the acceptance of such work by the CITY.

5. Performance Bond

It is agreed that if, at any time after the execution of this contract and the surety bond attached for its faithful performance, the CITY shall deem the surety or sureties upon such bond to be unsatisfactory, or if for any reason such bond ceases to be adequate to cover the performance of the work, the CONTRACTOR shall, at his expense, within five days after receipt of notice from the CITY to do so, furnish an additional bond or bonds in such form and amount, and with such surety, or sureties, as shall be satisfactory to the CITY.

6. Insurance; Proof of Coverage

The CONTRACTOR shall take out and maintain, during the life of this contract, all insurance required under Paragraph G-1.06 of the General Provisions, and shall, at execution of this contract, attach to each of the counterparts thereof documentary proof of compliance in the form of a Certificate from his insurer, stating the amount, policy numbers, and kinds of insurance carried. This certificate shall also contain a statement by the insurer that he will notify the City of Wilmington by Registered Mail twenty (20) days prior to any cancellation or lapse of the insurance shown on this certificate. It is further agreed that the CONTRACTOR shall furnish the CITY with one memorandum copy of the policy, or policies, shown on this certificate at the time of the signing of this contract.

7. Guarantee

The CONTRACTOR hereby agrees to guarantee, for a period of one year after date of final payment, the work accomplished under this Contract. The CONTRACTOR agrees to repair at no cost to the CITY any defects due to faulty workmanship or materials which may appear in his work during this period.

8. Release and Indemnity

To the fullest extent permitted by law, the CONTRACTOR shall release, indemnify, keep and save harmless the CITY, its agents, officials and employees, from any and all responsibility or liability for any and all damage or injury of any kind or nature whatever (including death resulting therefrom) to all persons, whether agents, officials or employees of the CITY or third persons, and to all property proximately caused by, incident to, resulting from, arising out of, or occurring in connection with, directly or indirectly, the performance or nonperformance by CONTRACTOR (or by any person acting for the CONTRACTOR or for whom the CONTRACTOR is or is alleged to be in any way responsible), whether such claim may be based in whole or in part upon contract, tort (including alleged active or passive negligence or participation in the wrong), or upon any alleged breach of any duty or obligation on the part of the CONTRACTOR, its agents, officials and employees or otherwise. The provisions of this Section shall include any claims for equitable relief or for damages (compensatory or punitive) against the CITY, its agents, officials, and employees including alleged injury to the business of any claimant and shall include any and all losses, damages, injuries, settlements, judgments, decrees, awards, fines, penalties, claims, costs and expenses. Expenses as used herein shall include without limitation the costs incurred by the CITY, its agents, officials and employees, in connection with investigating any claim or defending any action, and shall also include reasonable attorneys' fees by reason of the assertion of any such claim against the CITY, its agents, officials or employees. The CONTRACTOR expressly understands and agrees that any performance bond or insurance protection required by this agreement, or otherwise provided by the CONTRACTOR, shall in no way limit the CONTRACTOR'S responsibility to release, indemnify, keep and save harmless and defend the CITY as herein provided. The intention of the parties is to apply and construe broadly in favor of the CITY the foregoing provisions subject to the limitations, if any, set forth in N.C.G.S. 22B-1.

9. Personnel

It is mutually agreed that CONTRACTOR is an independent contractor and not an agent of the CITY, and as such the CONTRACTOR shall not be entitled to any CITY employment benefits, such as, but not limited to, vacation, sick leave, insurance, workmen's compensation, or pension and retirement benefits.

10. Conflict of Interest

No paid employee of the CITY shall have a personal or financial interest, direct or indirect, as a contracting party or otherwise, in the performance of this agreement.

11. Non-Waiver of Rights

It is agreed that the CITY'S failure to insist upon the strict performance of any provision of this agreement, or to exercise any right based upon a breach thereof, or the acceptance of any performance during such breach, shall not constitute a waiver of any rights under this agreement.

12. Suspension or Termination of Agreement

12.1 In the event that review of Contractor's performance shows non-conformance to the attached scope of service or other terms or conditions contained herein as a result of the Contractor's errors, omissions or negligent acts, the contractor shall be in breach of this Agreement and the City may take corrective action as it deems necessary including, but not limited to, withholding or reduction of payment.

12.2 The City shall also have the right to suspend this Agreement upon written notice to the Contractor. Such suspension may be made for any of the following reasons: (a) violations or non-compliance with the contract terms, (b) violations of OSHA laws or regulations, (c) violations of Federal or State environmental and health laws or regulations, (d) operating City valves without permission, (e) moving City supplied water meters without permission, (f) failure to adequately plan for the protection of underground utilities during construction, (g) violation of any City ordinances or regulations or (h) verbal abuse of any City employees or others. In addition, any such violations may result in the Contractor being disqualified from bidding on future City projects. The written notice of suspension shall state the reasons for suspension and allow for a review period of ten (10) days during which the Contractor shall be provided with an opportunity to respond with an explanation or a justification, and/or shall undertake any reasonable remedial action required by the City. If, in the opinion of the City, the Contractor has not addressed the reasons for suspension at the completion of the ten (10) day suspension period, the City shall have a right to terminate this Agreement whereupon all obligations of the City to the Contractor shall cease.

12.3 The City may, at any time, terminate this contract for the City's convenience and without cause. Upon receipt of written notice from the City of such termination for the City's convenience, the Contractor shall (a) cease operations as directed by the City in the notice; (b) take actions necessary, or that the City may direct, for the protection and preservation of the work; and (c) except for work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing sub- contracts and purchase orders and enter into no further sub-contracts and purchase orders. In the event that this project is terminated for the convenience of the City, the Contractor shall be paid for services performed to the date of termination and costs incurred by reason of such termination, but such costs shall not include anticipated profit on unperformed work. (In no event will the amount due contractor in the event of termination for convenience exceed that amount set forth in Paragraph 4.1 of this Agreement. Contractor shall be paid for all reimbursables, as defined herein, which are due him.)

12.4 If after notice of termination of this contract under the provisions of Paragraph 12.2, it is determined for any reason that the Contractor was not in default under the provisions of such paragraph, or that the default was excusable under the provisions of this contract, the rights and obligations of the parties shall be the same as if the notice of termination had been issued by the City for convenience as set forth in Paragraph 12.3.

12.5 Nothing contained herein shall prevent the City from pursuing any other remedy which it may have against the Contractor including claims for damages.

13. Contract Disputes

In accordance with G.S. 143-128.1(8) the parties agree to mediate contract disputes in excess of $15,000.00. Within ten (10) days of such contract disputes, the parties shall select a mediator that is certified pursuant to all of the parties involved in the dispute. If the parties cannot agree on a mediator or do not timely select a mediator, the City shall select the mediator. The parties and the mediator shall agree upon the mediator's rate of compensation. The parties to the dispute shall share in the payment of the mediator's compensation with the City paying a minimum of one-third of the compensation if the City is a party to the dispute.

14. Assignment of Agreement

It is mutually agreed by the parties hereto that this agreement is not transferable by either party to this agreement without the consent of the other party to this agreement.

15. Subcontracts

The CONTRACTOR shall utilize no subcontracts for carrying out the services to be performed under this agreement without the written approval of the CITY.

16. Entire Agreement

The agreement constitutes the entire understanding of the parties.

17. Binding Effect

The agreement shall be binding upon the heirs, successors, assigns, agents, officials, employees, independent contractors, and subcontractors of the parties.

18. Continuing Obligation

The parties will make and execute all further instruments and documents required to carry out the purposes and intent of the agreement.

19. Reference

Use of the masculine includes feminine and neuter, singular includes plural; and captions and headings are inserted for convenience of reference and do not define, describe, extend or limit the scope of intent of the agreement.

20. Interpretation

All of the terms and conditions contained herein shall be interpreted in accordance with the laws of the State of North Carolina. In the event of a conflict between the various terms and conditions contained herein or between these terms and other applicable provisions, then the more particular shall prevail over the general and the more stringent or higher standard shall prevail over the less stringent or lower standard.

21. Saving Clause

If any section, subsection, paragraph, sentence, clause, phrase or portion of this contract is for any reason held invalid, unlawful, or unconstitutional by any court of competent jurisdiction,

such portion shall be deemed severable and such holding shall not affect the validity of the remaining portions hereof.

22. Other Laws and Regulations

CONTRACTOR will comply with any and all applicable federal, state and local standards, regulations, laws, statutes and ordinances including those regarding toxic, hazardous and solid wastes and any pollutants; public and private nuisances; health or safety; and zoning, subdivision or other land use controls. CONTRACTOR will take all reasonably necessary, proper or required safety, preventative and remedial measures in accordance with any and all relations and directives from the North Carolina Department of Human Resources, the United States Environmental Protection Agency, the North Carolina Department of Environmental Quality, Health Departments, and any other federal, state or local agency having jurisdiction, to insure the prompt prevention or cessation (now or in the future) of violations of either the applicable provisions of such standards, regulations, laws, statutes, and ordinances or any permits or conditions issued thereunder. CONTRACTOR specifically acknowledges and agrees that CONTRACTOR, and any subcontractors it uses, has complied with and shall continue to comply with the provisions of the federal E-Verify program in compliance with Article 2 of Chapter 64 of the North Carolina General Statutes. CONTRACTOR shall maintain adequate safeguards with respect to sensitive customer information in conformance with and pursuant to 16 C.F.R. §681.1 and in accordance with N.C. Gen. Stat. §132-1.10 and §75-65.

23. Amendments

This agreement shall not be modified or otherwise amended except in writing signed by the parties.

24. Non-Discrimination

CONTRACTOR will take affirmative action not to discriminate against any employee or applicant for employment or otherwise illegally deny any person participation in or the benefits of the program which is the subject of this agreement because of race, creed, color, sex, age, disability or national origin. To the extent applicable, CONTRACTOR will comply with all provisions of Executive Order No. 11246, the Civil Rights Act of 1964, (P.L. 88-352) and 1968 (P.L. 90-284), and all applicable federal, state and local laws, ordinances, rules, regulations, orders, instructions, designations and other directives promulgated to prohibit discrimination. Violation of this provision, after notice, shall be a material breach of this agreement and may result, at CITY'S option, in a termination or suspension of this agreement in whole or in part.

25. Authority to Act

Each of the persons executing this Agreement on behalf of CONTRACTOR does hereby covenant, warrant and represent that the CONTRACTOR is a duly organized and validly existing legal entity authorized to transact business within the State of North Carolina, that the CONTRACTOR has full right and authority to enter into this Agreement, and that each and all persons signing on behalf of the CONTRACTOR were authorized to do so.

26. Counterparts.

This Agreement may be executed in several counterparts, including separate counterparts. Each shall be an original, but all of them together constitute the same instrument.

27. No Publicity.

No advertising, sales promotion or other materials of the CONTRACTOR or its agents or representations may identify or reference this Contract or the CITY in any manner absent the written consent of the CITY. Notwithstanding the forgoing, the parties agree that the CONTRACTOR may list the CITY as a reference in responses to requests for proposals and may identify the CITY as a customer in presentations to potential customers.

28. Immunity Not Waived

This Agreement is governmental in nature, for the benefit of the public. CONTRACTOR acknowledges that City reserves all immunities, defenses, rights or actions arising out of City's sovereign status under applicable law. No waiver of any such immunities, defenses, rights or actions shall be implied or otherwise deemed to exist by reason of City's entry into this Agreement.

29. CITY Not Liable For Special or Consequential Damages.

The CITY shall not be liable to the CONTRACTOR, its agents or representatives or any subcontractor for or on account of any stoppages or delay in the performance of any obligations of the CITY, or any other consequential, indirect or special damages or lost profits related to this Contract.

30. Public Records.

CONTRACTOR acknowledges that the CITY is a public entity, subject to North Carolina's public records laws (N.C.G.S. § 132) and that any documents related to this Agreement may be subject to disclosure pursuant to state law in response to a public records request or to subpoena or other judicial process.

If CONTRACTOR believes documents related to the Agreement contain trade secrets or other proprietary data, CONTRACTOR must notify the CITY and include with the notification a statement that explains and supports CONTRACTOR'S claim. CONTRACTOR also must specifically identify the trade secrets or other proprietary data that CONTRACTOR believes should remain confidential.

In the event the CITY determines it is legally required to disclose pursuant to law any documents or information CONTRACTOR deems confidential trade secrets or proprietary data, the CITY, to the extent possible, will provide CONTRACTOR with prompt written notice by certified mail, fax, email, or other method that tracks delivery status of the requirement to disclose the information so CONTRACTOR may seek a protective order from a court having jurisdiction over the matter or obtain other appropriate remedies. The notice will include a time period for CONTRACTOR to seek court ordered protection or other legal remedies as deemed appropriate by CONTRACTOR. If CONTRACTOR does not obtain such court ordered protection by the expiration of said time period, the CITY may release the information without further notice to CONTRACTOR.

31. Minority Business Enterprise (MBE)

The CITY desires that minority business enterprises have the maximum opportunity to participate in the performance of this contract and will:

31.l Promote affirmatively (where feasible) in accordance with North Carolina General Statute l43-l29, together with all other applicable laws, statutes and constitutional provisions, the procurement of goods, services in connection with construction projects for minority owned business enterprises.

31.2 Ensure that competitive and equitable bidding opportunities are followed to afford minority business enterprises participation. Strive to obtain contract and subcontract awards to minority business enterprises.

31.3 Identify and communicate to the minority business enterprises community procedures and contract requirements necessary for procurement of goods and services for construction projects and subcontracts.

31.4 Provide technical assistance as needed.

31.5 Promulgate and enforce contractual requirements that the general CONTRACTOR or all construction projects shall exercise all necessary and reasonable steps to insure that minority business enterprises participate in the work required in such construction contracts.

The CONTRACTOR shall ensure that minority business enterprises have the maximum opportunity to compete for and perform portions of the work included in this contract and shall not discriminate on the basis of race, color, national origin or sex. The CONTRACTOR shall include this special provision, Minority Business Enterprise (MBE), in all subcontracts for this contract. Failure on the part of the CONTRACTOR to carry out the requirements set forth in this special provision may constitute a breach of contract and after proper notification may result in termination of the contract or other appropriate remedy.

A minority business enterprise is defined as a business, with at least fifty-one (51%) percent owned and controlled by minority group members. The minority ownership must exercise actual day-to-day management. Minority group members may consist of Black Americans (an individual of the Black race of African origin), Hispanic Americans (an individual of a Spanish speaking culture and origin at parentage), Asian Americans (an individual of a culture, origin or parentage traceable to the areas of the Far East, Southeast Asia, the Indian subcontinent and the Pacific Islands), Indian Americans (an individual who is an enrolled member of a Federally recognized Indian tribe, or recognized by the tribe as being an Indian, as evidenced by a certification of a tribal leader), American Aleuts or any recognized minority group approved by the CITY.

A Woman Business Enterprise is a business with at least fifty-one (51%) percent owned and controlled by women who exercise actual day-to-day management.

The CONTRACTOR shall exercise all necessary and reasonable steps to ensure that Minority Business Enterprises and Woman Business Enterprises participate in the work required in this contract. The CONTRACTOR agrees by executing this contract that he will exercise all necessary and reasonable steps to ensure that this special provision contained herein on Minority Business Enterprise is complied with.

IN WITNESS WHEREOF, the CITY has caused this agreement to be duly executed in its name and behalf and the CONTRACTOR has caused this agreement to be duly executed in its name and behalf and its corporate seal to be hereunto affixed, and attested to.

CITY OF WILMINGTON, NORTH CAROLINA

BY: _____
Becky Hawke, City Manager

Date: _____

WITNESS:

_____
Daryle L. Parker, Purchasing Manager

APPROVED AS TO FORM:

_____
Ginna Essey, Assistant City Attorney

FINANCE OFFICER'S CERTIFICATION STATEMENT

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act this the _____ day of _____, 2026.

_____
Martha Wayne, Director of Finance

Project String: _____

Org./Obj. _____

Amount of Contract $_____

Req.No.: _____

Federal ID Number: 56-6000239

_____

BY: _____

ATTEST:

_____
Secretary, Assistant Secretary,
Trust Officer

(CORPORATE SEAL)

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public, certify that
(Name)
_____ personally came before me this day and
(Name of Sec., Assist. Sec., Cashier, Assist. Cashier)

acknowledged that he (she) is _____ of
(Secretary, Assist. Sec., Cashier, Assist. Cashier)

_____, a corporation, and that by authority duly given and
(Name of Corporation)

as the act of the corporation, the foregoing Contract: Page C-10, Performance Bond: Page C-11, and

Payment Bond: Page C-12 were signed in its name by its

_____, sealed with
(President or Vice President)

its corporate seal, and attested by himself (or herself) as its

_____.
(Sec., Assist. Sec., Cashier, Assist. Cashier)

WITNESS my hand and official seal, this the _____ day of _____, 2026.

_____
Notary Public

My Commission expires: _____

(NOTARY SEAL)

PERFORMANCE BOND

CITY OF WILMINGTON, NORTH CAROLINA

PRINCIPAL: _____

SURETY: _____

BOND AMOUNT: _____

_____DOLLARS ($_____)

BOND DATE: _____

CONTRACT NUMBER: _____

"KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL AND SURETY above named, are held and firmly bound unto the CITY OF WILMINGTON, NORTH CAROLINA, hereinafter called the CITY, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

"THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain contract with the CITY, numbered as shown above and hereto attached:

"NOW, THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the CITY, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void, otherwise to remain in full force and virtue.

"IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body."

(CORPORATE SEAL)

ATTEST:

PRINCIPAL: _____

_____

Secretary

By: _____

Title: _____

SURETY: _____

WITNESS:

By: _____

_____

Title: _____

PAYMENT BOND

CITY OF WILMINGTON, NORTH CAROLINA

PRINCIPAL: _____

SURETY: _____

BOND AMOUNT: _____

_____DOLLARS ($_____)

BOND DATE: _____

CONTRACT NUMBER: _____

"KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL AND SURETY above named, are held and firmly bound unto the CITY OF WILMINGTON, NORTH CAROLINA, hereinafter called the CITY, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

"THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain contract with the CITY, numbered as shown above and hereto attached:

"NOW, THEREFORE, if the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

"IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body."

(CORPORATE SEAL)

ATTEST:

PRINCIPAL: _____

_____
Secretary

By: _____

Title: _____

SURETY: _____

WITNESS:

By: _____

_____

Title: _____

(TO BE EXECUTED ON BEHALF OF SURETY AGENT)

STATE OF _____

COUNTY OF _____

On this the _____ day of _____, 2026 before me the subscriber, Notary Public of the State of _____, in and for the County of _____, duly commissioned and qualified came _____, to me personally known, and to me personally known to be the individual who executed the foregoing Payment Bond and Performance Bond: Pages C-9 and C-10, and he acknowledges the execution of the same, and being by me duly sworn deposes and says that he has Power-of-Attorney from _____ _____, with their principal offices at _____, to execute the preceding instruments in the amount specified in the Payment Bond and Performance Bond on their behalf, that his signature was duly affixed and he subscribed to the said Payment Bond and Performance Bond by authority and direction of said corporation.

IN WITNESS, I have hereunto set my hand and affixed my official seal at the City of _____, the day and year first above written.

My Commission expires:

_____

_____
Notary Public

(SEAL)

POWER OF ATTORNEY

DOCUMENTS

(Attached hereto original or validated documents which give to individual who signed Contract Bond Power of Attorney for Surety)

INSURANCE CERTIFICATES

(Staple Insurance Certificates as required
under Paragraph G-1.06 to this sheet)

CITY OF WILMINGTON

NORTH CAROLINA

PROPOSAL
FOR
DOWNTOWN ALLEY IMPROVEMENTS
PROJECT NO. 2TRST2110
CONTRACT NO. ALLE-IH-0326

1. The undersigned, having carefully examined the site of the proposed work, the entire Bidding Document, including but not limited to the Advertisement, Special Notice, General Provisions, Technical Specifications, MBE/WBE/HUB/DBE documents and requirements, Federal Requirements (if any), Contract and Plans and/or Standard Details attached hereto, all of which are fully understood and hereby agreed to, proposes to furnish all materials, labor, equipment and plant necessary to complete in-place the specified improvements, in strict accordance with the above mentioned bidding documents.

2. Where an interpretation as to specifications is necessary, or as to the character of the work performed, or as to further instructions relating to the work, before or during construction, the undersigned bidder hereby agrees that (hereinafter called "ENGINEER") shall be the authority and his word shall be final.

3. The prices, as stated, are for the work completed and also to include all charges and expenses for furnishing all labor, materials, equipment and plant for completing the specified work in the manner specified in the specifications, and according to the instructions of the ENGINEER, unless otherwise shown in the Proposal.

4. If awarded this contract, the undersigned agrees to begin construction on the date to be specified in the written order by the Purchasing Manager, and to complete all work within 180 calendar days of the date of beginning. The CONTRACTOR further agrees to pay, as liquidated damages, **(SEE SECTION T-15.04 OF THE SPECIAL CONDITIONS)** for each consecutive calendar day thereafter as hereinafter provided in paragraph G-1.47 of the General Conditions.

5. The undersigned hereby certifies that this Proposal is made without connection with any person or persons making bids or proposals for the above work, and that the bid is in all respects fair and without collusion or fraud.

6. The undersigned further agrees that in case of failure on his part to execute the said contract and bond within ten (10) consecutive calendar days after written notice of award of the contract by the Purchasing Manager , the check or bid bond, or both, accompanying this bid and the monies payable thereon shall be paid into the funds of the City of Wilmington, North Carolina, as liquidated damages for such failure; otherwise the check and/or bid bond accompanying this Proposal shall be returned to the undersigned.

7. The undersigned understands and agrees that if awarded this contract he will execute the contract and post a Performance Bond and Payment Bond to the extent of one hundred percent (100%) of the amount of this contract.

8. The undersigned understands and agrees that all extra work shall be done and paid for as provided under the applicable sections of the specifications. In the event that extra work is necessary, the percentage to be added to the actual payroll cost to cover Social Security, small hand tools, office overhead on labor management only, Workmen's Compensation Insurance and other insurance for labor costs shall be 5% percent.

   All extra work shall be done using actual payroll and material costs, and a profit of ten percent (10%) of the total cost shall be added thereto. All items of materials shall be billed to the CITY on the extra work invoice, and a delivery slip from the vendor shall be submitted therewith to verify actual cost. No additional profit will be allowed on materials other than the normal overall ten percent (10%) above stated. Items not provided for above shall be agreed upon between the CONTRACTOR and the ENGINEER prior to invoicing.

9. The undersigned understands that, if awarded this contract, he must guarantee, for a period of one year after date of final payment, all work accomplished under this contract to the extent that he will repair any defects due to faulty workmanship, or materials which may appear in his work during this period.

10. The undersigned supplies the information recorded below for use in the preparation of the contract documents, in event of contract award:

    10.1 Please indicate type of business organization:

    (a) Proprietorship _____
    (b) Partnership _____
    (c) Corporation _____
    (d) Limited Liability Co. _____

    10.2 If business is a Corporation, please answer the following questions:

Name and title of officers, authorized by Corporate Resolution, who will execute the contract on behalf of corporation (generally President and Secretary).

Firm is incorporated in what state?

_____

If firm is a foreign corporation, does firm have a certificate of authority from the North Carolina Secretary of State? _____

10.3 If business is a Partnership, please answer the following:

Name in full or all general partners and addresses:

_____ Is this a limited or general partnership? _____

If a limited partnership, what is state of registration? _____

If business is a foreign limited partnership, does business have a certificate of authority from the North Carolina Secretary of State? _____

10.4 If business is a Proprietorship, please answer the following:

Name of owner: _____

10.5 If business is a limited liability company, please answer the following:

List the names and title of managers or member-managers who will execute the contract on behalf of the company? _____

What is state of organization? _____

If business is a foreign limited liability company, does business have a certificate of authority from the North Carolina Secretary of State? _____

10.6 For all bidders:

If the business operates under an assumed name, what is the assumed name?_____

_____

Has a certificate of assumed name been filed in the New Hanover County Registry? _____

If so, please provide the recording information. Deed Book _____ at Page _____.

11. Bid Surety Information - Please fill in the applicable paragraph.

11.1 Attached hereto is a cash deposit in the amount of _____ _____ Dollars ($_____), this amount being not less than five percent (5%) of the total bid.

OR

11.2 Attached hereto is a certified check on the _____ Bank of _____ in the amount of _____ _____ Dollars ($_____), made payable to the City of Wilmington, North Carolina. The bank on which the certified check is submitted is warranted to be a member of the Federal Deposit Insurance Corporation, and the amount of the check is not less than five percent (5%) of the total bid.

OR

11.3 Attached hereto is a bid bond in the amount of five percent (5%) of the total bid, said bid bond being indemnified by the _____
(Insert Name of Bonding Company)
whose address is _____. This bond is

executed by a corporate surety licensed to issue such bonds in the State of North Carolina and is made payable to the City of Wilmington. This bid bond is conditioned so that the surety will upon demand make payment to the City of Wilmington upon said bond if the bidder fails to execute the contract the surety shall pay to the CITY an amount equal to the amount of said bid bond in an amount not less than five percent (5%) of the total bid.

12. Additional Information - Please respond to each:

12.1 North Carolina Tax Payer Identification Number:
_____

12.2 Does your company have an Affirmative Action Plan
Yes _____ No _____

13. The undersigned proposes to accomplish the work as described in the following at the unit prices and/or lump sum price shown. In the event of a discrepancy in the unit prices and the extended prices, the unit prices shall prevail.

SEE BID SHEET BELOW

14. The undersigned understands that the award under this Proposal will be made to the lowest responsible bidder as described in Section G-1.02 of the General Provisions, on the proposal page or in Section 15 Special Conditions.

15. The undersigned acknowledges receipt of any issued Addendums to this Project by recording the Addendum number and date acknowledged below:

Addendum #1: _____Dated: _____
Addendum #2: _____Dated: _____
Addendum #3: _____Dated: _____

If awarded the work, I/we agree to begin work as soon as given the notice to proceed and complete the work ready for occupancy within the time limits specified.

This Proposal is submitted by:

_____
Company Name

Signed by: _____
Authorized Person's Signature

_____
Type or Print Name of Person Signing Above

Title: _____

Address: _____

_____ Zip_____

Phone: _____

Date: _____

North Carolina Contractor's License Number: _____

Rev.

Quince Alley					
Alley Improvements (Prepared by City of Wilmington)					
Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1	Mobilization & General Requirements (5% of Bid Max.)	1	LS		
2	Construction Surveying & As-Built Surveying	1	LS		
3	Traffic Control	1	LS		
4	Erosion Control Measures	1	LS		
5	Project Coordination	1	LS		
6	Removal of Alley Pavement	345	SY		
7	Removal of Concrete Sidewalk	30	SY		
8	Removal of Granite Curb	35	LF		
9	Miscellaneous Demolition	1	LS		
10	Brick Alley	345	SY		
11	4" Concrete Sidewalk	30	SY		
12	4' Dia. Storm Drain Manhole	1	EA		
13	8" PVC Storm Drain Pipe, SCH 40	300	LF		
14	Storm Drain over Sanitary Sewer Structural Bridging	1	LS		
15	4" PVC Storm Drain Pipe Cleanout, Sch 40 w/ Cleanout Box	5	EA		
16	6" PVC Roof Leader Lateral, Sch 40	16	EA		
17	4" Air Conditioning Condensate Line Lateral	5	EA		
18	2" Electrical Conduit	665	LF		
19	3" Electrical Conduit	80	LF		
20	4" Electrical Conduit	130	LF		
21	Clean-up and Restoration	1	LS		
22	Incidental Restoration	1	LS		
				Subtotal	

Quince Alley					
Alley Water and Sewer Improvements (Prepared by Cape Fear Public Utility Authority)					
Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
Sewer Rehabilitation or Replacement					
23	8-inch C900 DR18 PVC Sanitary Sewer, 0'-8' Depth	206	LF		
24	4-Foot Diameter Standard Manhole, 0'-8' Depth	2	EA		
25	8" PVC Cored Sanitary Sewer Connection to Existing Manhole	1	EA		
26	Cementitious Patch of 8" or 6” Pipe Hole in Manhole Wall	1	EA		
27	6" PVC Cored Lateral Connection to New Manhole	1	EA		
28	6" PVC Lateral Connection on New PVC	8	EA		
29	6" PVC Lateral Pipe by Open Excavation	50	LF		
30	Sanitary Sewer Cleanout, 6-Inch	9	EA		
Miscellaneous Items					
31	Flowable Fill	2	CY		
32	Perform Additional Excavation (100% * 1')	46	CY		
33	Additional Compacted Stone Bedding	46	CY		
34	Select Backfill (100% * 1')	46	CY		
				Subtotal	

Total Quince Alley Construction Cost	

Henderson Alley					
Alley Improvements (Prepared by City of Wilmington)					
Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1	Mobilization & General Requirements (5% of Bid Max.)	1	LS		
2	Construction Surveying & As-Built Surveying	1	LS		
3	Traffic Control	1	LS		
4	Erosion Control Measures	1	LS		
5	Project Coordination	1	LS		
6	Removal of Street and Alley Pavement	360	SY		
7	Miscellaneous Demolition	1	LS		
8	Brick Alley & Brick Street	360	SY		
9	Concrete Curb	15	LF		
10	Connection to Existing Water St Storm Drainage Catch Basin	1	LS		
11	4' Dia. Storm Drain Manhole	1	EA		
12	8" PVC Storm Drain Pipe, SCH 40	255	LF		
13	4" PVC Storm Drain Pipe Cleanout, Sch 40 w/ Cleanout Box	1	EA		
14	6" Roof Leader Lateral	12	EA		
15	4" Air Conditioning Condensate Line Lateral	1	EA		
16	2" Electrical Conduit	10	LF		
17	3" Electrical Conduit	290	LF		
18	Clean-up and Restoration	1	LS		
19	Incidental Restoration	1	LS		
				Subtotal	

Henderson Alley					
Alley Water and Sewer Improvements (Prepared by Cape Fear Public Utility Authority)					
Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
Sewer Rehabilitation or Replacement					
20	Excavate and Replace Sanitary Sewer with 8" C900 DR18 PVC, 0'-8'	258	LF		
21	4-Foot Diameter Standard Manhole, 0'-8' Depth	1	EA		
22	Connect 8” Sewer to Existing 8” Manhole Opening	1	EA		
23	Brick and Mortar 24" Manhole Opening to Reduce for 8"	2	EA		
24	6" PVC Lateral Connection on New PVC	8	EA		
25	6" PVC Lateral Pipe by Open Excavation	44	LF		
26	Sanitary Sewer Cleanout, 6-Inch	8	EA		
27	Clean, Televise, and Inspect 24-inch Sewer Main Prior to Sliplining	65	LF		
28	Slipline 65' of 24" VCP with 8" DIPS DR17 HDPE	1	LS		
Miscellaneous Items					
29	Perform Additional Excavation (100% * 1')	57	CY		
30	Additional Compacted Stone Bedding	57	CY		
31	Select Backfill (100% * 1')	57	CY		
				Subtotal	

Total Henderson Alley Construction Cost	

Wilkinson Alley					
Alley Improvements (Prepared by City of Wilmington)					
Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1	Mobilization & General Requirements	1	LS		
2	Construction Surveying & As-Built Surveying	1	LS		
3	Traffic Control	1	LS		
4	Erosion Control Measures	1	LS		
5	Project Coordination	1	LS		
6	Removal of Alley Pavement	300	SY		
7	Miscellaneous Demolition	1	LS		
8	Existing Storm Drainage Drop Inlet Demolition	1	LS		
9	Brick Alley	300	SY		
10	Storm Drainage Drop Inlet	1	EA		
11	8" PVC Storm Drain Pipe, SCH 40	195	LF		
12	4" PVC Storm Drain Pipe Cleanout, Sch 40 w/ Cleanout Box	2	EA		
13	6" Roof Leader Lateral	9	EA		
14	4" Air Conditioning Condensate Line Lateral	5	EA		
15	2" Electrical Conduit	20	LF		
16	4" Electrical Conduit	95	LF		
17	Clean-up and Restoration	1	LS		
18	Incidental Restoration	1	LS		
				Subtotal	

Wilkinson Alley					
Alley Water and Sewer Improvements (Prepared by Cape Fear Public Utility Authority)					
Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
Sewer Rehabilitation or Replacement					
19	8-inch C900 DR18 PVC Sanitary Sewer, 0'-8' Depth	159	LF		
20	4-Foot Diameter Standard Manhole, 0'-8' Depth	2	EA		
21	8" PVC Cored Sanitary Sewer Connection to Existing Manhole	1	EA		
22	6" PVC Cored Lateral Connection to New Manhole	3	EA		
23	6" PVC Lateral Connection on New PVC	2	EA		
24	6" PVC Lateral Pipe by Open Excavation	62	LF		
25	Sanitary Sewer Cleanout, 6-Inch	6	EA		
Water Main Replacement					
26	Excavate and Replace Existing 1.25" Steel Water Line with 2"	120	LF		
27	Replace Ex. Water Valve with 2" Gate Valve	1	EA		
28	2" Blow-off Assembly	1	EA		
29	1” Water Service by Open Cut	2	EA		
Miscellaneous Items					
30	Flowable Fill	1	CY		
31	Perform Additional Excavation (100% * 1')	35	CY		
32	Additional Compacted Stone Bedding	35	CY		
33	Select Backfill (100% * 1')	35	CY		
				Subtotal	

	Total Wilkinson Alley Construction Cost	

Total Quince Alley Construction Cost	
Total Henderson Alley Construction Cost	
Total Wilkinson Alley Construction Cost	
Total Combined Construction Cost	

TECHNICAL SPECIFICATIONS

FOR THE

DOWNTOWN ALLEY IMPROVEMENTS PROJECT

CITY PROJECT No. 2TRST2110

CITY OF WILMINGTON

PROJECT DIRECTOR: AARON BECKNER. P.E.

PROJECT ENGINEER: ZACH ROMAN, P.E.

PREPARED BY:
CITY OF WILMINGTON PUBLIC WORKS DEPARTMENT
STORMWATER & STREETS MANAGEMENT DIVISION
209 COLEMAN DR., WILMINGTON, NC 28412

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APPENDIX A – MISCELLANOUS UTILITY IMPROVEMENTS DOCUMENTATION

APPENDIX B – PUBLIC OUTREACH MEETING COMMENT FORMS

TECHNICAL SPECIFICATIONS
SECTION 1: EXCAVATING, GRADING & BACKFILLING 10/26/2017

T-1.01 **SCOPE**:

The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, supplies and materials, and in performing all operations in connection with the excavations, grading and backfilling, including borrow, drainage structures, curb and gutter, sidewalks, driveways, pavements, slopes, storm drains, water and sanitary sewer lines, including all hauling, wetting, rolling and other operations pertaining thereto within the project or work limits, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract. Prior to any work, the Contractor shall comply with the provisions of the General Conditions Section G-1.52. Precautions prior to and during excavation of any street.

T-1.02 **EXCAVATION, UNDERCUTTING, BORROW, EMBANKMENT**:

T-1.02.1 **EXCAVATION**:

All excavation shall be performed in accordance with the grades and lines as established by the Engineer and as required by the work to be performed. Excavation, unless otherwise indicated in the Special Conditions, shall include the removal of all concrete, curb, rock, earth, fences, trees, shrubs, and other materials, excepting trees having a diameter of 6" or more, measured four feet above the ground, which shall be paid for as outlined in the proposal or shall be included in the cost of clearing and grubbing where indicated on the plans and in the proposal. Care will be exercised by the Contractor to prevent undercut lower than the required subgrades. In the event such undercutting takes place, the areas so cut will be backfilled as provided for in Paragraph T-1.02.2 on Embankment. All excavation, unless otherwise indicated, shall be performed on an unclassified basis. All excavation shall be performed in compliance with OSHA Safety and Health Standards Applicable to Construction, 29 CFR Part 1926, as amended.

All materials from excavation that are considered suitable by the Engineer shall be used as embankment, wherever required, and the Contractor shall arrange his work so that this usage of excavated material will be possible.

T-1.02.2 **EMBANKMENT, FILL**:

Where existing grades require the use of embankment or fill to reach the required section elevation, the Contractor shall deposit suitable spoil or borrow material from excavated areas. Such spoil material shall be free from debris, roots, trash, stones, or other deleterious materials, and shall be placed in successive layers of loose material not more than 12 inches in depth.

Each layer shall be spread uniformly by the use of a road machine or other approved device and rolled with an approved tamping or power roller until thoroughly compacted to 95 percent of maximum density obtained at optimum moisture content, as determined by the ASTM D 698 Standard Proctor Test Method.

When any portion of the embankment is constructed on an old road bed, the existing surface shall be scarified and manipulated as directed by the Engineer in order that, when compacted, it shall have a uniform density, as specified above.

Embankments or fills shall be maintained at all times during their construction, so as to prevent an accumulation of standing water in the event of rain.

T-1.02.3 **UNDERCUTTING**:
Any undercutting, unless authorized by the Engineer, shall be replaced and compacted, as specified for embankment, at the Contractor's expense. If the material, after excavation to subgrade is found to be soft, spongy or unfit for use as subgrade, such unsuitable materials shall be removed to a depth as directed by the Engineer and the subgrade shall be brought to proper elevation by filling with suitable spoil from excavation elsewhere.

T-1.02.4 **BORROW**:
The contractor shall use suitable excavation from the project. If suitable excavation is not available then the Contractor will supply the site for all borrow necessary in this work. The Contractor will provide all labor and equipment necessary to dig and haul such borrow material. All borrow or material sources supplied by the contractor and used on this job shall have the limits of the borrow source identified, and be excavated from a permitted borrow site. The contractor have Standard Proctor Test Method, ASTM D-698, test performed and submitted to the Engineer for approval, prior to beginning borrow operations. The placing of borrow shall be as provided for in the paragraph of Embankment. No overhaul will be allowed. Borrow shall be a natural sand material with not more than 15% passing the No. 200 sieve, and shall be furnished as directed for use to replace excavated soils found to be unsuitable for trench backfill (if any) and/or to supplement excavated soil supply if needed to complete backfilling operations to suitable grade. Digging, hauling and placing of borrow will be paid for as specified under Payment.

T-1.02.5 **GRADING & SLOPING BANKS**:
Where it is necessary to terrace or slope banks, either in the street right-of-way or behind the property line, the Contractor is hereby notified that this work will be considered **common excavation and paid for as such**. In grading these banks, a slope of 3 horizontal to 1 vertical will generally be held except in cases where it is necessary to build retaining walls or otherwise change this slope in order to protect property or meet other conditions. In these cases, the slope shall be as designated by the Engineer.

In the event that fill is required at the property line, this fill will be extended level with the top of the sidewalk (or level with the final grade at the property line where sidewalk is not installed) at least one foot behind the property line and then carried on a 3 horizontal to 1 vertical slope back on the property until it intersects the property grade.

Sloping in either cut or fill section shall be accomplished on straight grades as near as possible and fine grading and cleaning shall be done with a hand rake. This surface shall be prepared in such a manner that it is ready for fertilizing and seeding when completed.

T-1.03 **EXCAVATION & BACKFILLING FOR WATER MAINS, SANITARY SEWER & STORM DRAINS**:
Pipes shall be laid true to the lines and grades shown on the plans. The grade shown on the profile is the invert to which the work must conform. Work not conforming to the grade shall be corrected by the Contractor at his own expense.

The grade and alignment of the pipe may be done in one of the following ways:

1. By String Line

a. The string line shall be parallel with the grade line and vertically above the center line of the pipe. This line shall be established on level batter boards at intervals of not more than fifty (50) feet. Batter boards shall span the trench and be rigidly anchored to substantial posts driven into the ground on each side of the trench.

b. Three (3) adjacent batter boards must be set before laying pipe to provide a check on the grades and line. Elevation and position of the string line shall be determined from the elevation and position of offset points or stakes located along the pipe route. Pipe shall not be laid using side lines for line and grade.

2. By Laser Beams

a. Laser beams may be used in lieu of string lines when operated by trained personnel

b. The pipe shall be checked with a level between 50 and 100 feet out of the manhole to assure that the laser beam is on the correct grade. An additional check will be made at 100-foot intervals.

The Contractor is responsible for maintaining the line and grade. The pipe shall be checked at each manhole to assure that it is on the correct line and grade.

The locations and depths of the proposed lines are shown on the plans. The Engineer reserves the right to make changes in lines and grades of pipe lines and in locations of pipes and manholes when such changes may be necessary.

T-1.03.1 **BACKFILLING MATERIALS**:

SUITABLE MATERIALS:
Suitable material, when used as backfill in paved areas, shall be capable of being compacted as specified in paragraph "Compaction and Testing in Paved Areas" of this section of these specifications.

TYPE 1 MATERIAL:
Excavated material from the trench or materials from other sources, which are free from large clods, roots or stones larger than 1 inch.

TYPE 2 MATERIAL:
Excavated material from the trench or materials from other sources, which are free from large clods, roots or stones larger than 8 inches.

CRUSHED STONE:
Crushed stone shall be size number 57, with fines present to stabilize it in the trench. If amount of fines is insufficient, then stone screenings shall be added to extent required to stabilize it in the trench.

CONCRETE:
Concrete used for cradles, thrust blocks, or encasement shall be Class A concrete as specified in Section on CONCRETE. **Test of concrete for this usage are waived**.

T-1.03.2 **EXCAVATION**:
Perform all excavation of every description and of whatever substances encountered to the depth shown on the plans.

All excavated materials not required for fill or backfill shall be removed from the site of the work by the Contractor, but none shall be deposited on private property until written consent of the property owner has been filed with the Engineer.

All excavation, unless otherwise authorized by the Engineer, shall be made by open cut. Side walls of trenches shall be kept vertical and shall be properly sheathed and braced.

T-1.03.3 E**XISTING FACILITIES**:

Contractor is responsible for the location of existing utilities as required by North Carolina Statute, Chapter 87. Attention is directed to the fact that there may be water pipes, storm drains, catch basins, and other utilities in certain locations. Some of these have been indicated on the plans, but no attempt has been made to show all of the services, and the completeness of accuracy of the information given is not guaranteed.

All water or other utility lines shall be located on the ground with pipe locating equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. Such locations shall be established at least 500 feet in advance of all trench excavation. All such location work shall be provided by the contractor at no extra cost.

As the excavation approaches pipes, conduits or other underground structures, digging by conventional trenching machine methods shall be done with extreme care. No extra compensation will be given if manual excavation is required to locate utilities and/or underground structures, and/or to install the proposed work.

When excavating within 2 feet (vertical or horizontal) of a gas, water, sewer, or oil line, the contractor shall use the manual method of excavation. At no time will conventional trenching equipment be permitted under these conditions. No extra compensation will be given for this manual excavation.

Excavation near structures will not be allowed closer to the structure than the depth of the excavation below the bottom of the foundation without shoring the excavation with sheathing.

Contractor shall carefully protect from disturbance and damage all land monuments and property markers until an authorized agent has witnessed or otherwise referenced their locations. These monuments and/or markers shall then only be removed when authorized by the agent or Owner.

T-1.03.4 **PROTECTION OF EXISTING STRUCTURES**:

All existing pipes, poles, wires, fences, curbing, catch basins, valves, property line markers and other structures which must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor and in accordance with the utility owners standards and specifications.

In case of damage to any structure, the Contractor shall notify the appropriate party so that proper steps may be taken to repair any and all damage done. If the owner of the structure wishes to make his own repairs, the Contractor shall reimburse the owner of the structure for all the time and materials required to make the repairs.

When the owners of the damaged structures do not wish to make the repairs themselves, the Contractor shall repair all damage, or, if not promptly done by him, the Owner may have the repairs made at the expense of the Contractor.

T-1-03.5 **CARE AND RESTORATION OF PROPERTY**:

Excavating machinery and cranes shall be operated with care to prevent damage to existing structures, paving and/or wires.

On paved surfaces, the Contractor shall not use or operate tractors, bulldozers or other power-operated equipment, the treads or wheels of which will cut or otherwise damage such surfaces.

The Contractor must exercise care not to damage paving, curb, inlets, sidewalk, etc. Any damages shall be replaced in kind by the Contractor at his own expense, to the satisfaction of the owner.

The restoration of existing property or structures shall be done as work progresses and shall not be left until the end of the construction period.

T-1.03.6 **TRENCHING**:
Trenches shall be dug to the depth required by the contract documents adding, however, to such depths the thickness of the pipe and the required bedding. A recess sufficiently large enough to receive the couplings, where applicable, and to permit making the joints, shall be cut out of the bottom of the trench. Where the bottom of the trench is or appears to be soft or spongy, the excavation shall be made deeper as described under this section to permit a bedding being laid.

T-1.03.7 **TUNNELING UNDER TREES, CURBS, ETC.**:
In areas where specific trees, curbs, etc., are designated to be saved, excavation may be made by alternate sections of open cut and wedge tunnel.

Backfilling of the tunnel section shall be by the use of mechanical tampers, starting at the wedge and working progressively away from the wedge.

If the wedge tunnel method is not deemed feasible, an alternate method of tunneling shall be designed and submitted by the Contractor's engineer.

T-1.03.8 **SHEETING AND SHORING**:
Where sheeting, shoring, bracing or trench boxes are used, they must be designed and sealed by a professional engineer licensed to practice in the State in which the construction work is being accomplished.

Trenches shall, at all times, be properly and adequately sheeted and braced to prevent accidents, caving of the sides of the trench or breaking of the ground outside of the lines of the trenches proper or damage to buildings or other structures along the line of construction. Underground structures of all types shall be protected by the Contractor, who shall use all necessary shoring, bracing or other appliances for the protection of same. Care must be taken not to damage in any way water mains, water service pipes, drain pipes, sanitary or stormwater sewers, gas mains, oil mains, electric conduits or other structures encountered on the lines of the work.

No sheeting or shoring shall be left in place unless so authorized by the Engineer.

T-1.03.9 **QUICKSAND EXCAVATION**:
Where quicksand excavation is encountered, the Contractor shall drive either tight tongue and groove wooden sheet piling or steel sheet piling to a depth, which will effectually cut off the flow of sand. Well points and other methods shall then be used to dewater the trench. Excavation and construction shall follow as rapidly as possible thereafter. A satisfactory foundation must, however, be secured.

T-1.03.10 **TRENCHING IN ADVANCE OF PIPE LAYING**:

The trench for the pipe lines shall not be opened for a distance of more than one hundred (100) feet at any one time. At no time will the Contractor be permitted to leave the trench open at the end of a working day.

T-1.03.11 **KEEPING TRENCH DRY**:

All ground water which may be found in the trenches and any water which may get into them from any cause whatsoever shall be pumped or bailed out so that the trench shall be dry during pipe laying period. No water shall be permitted to reach concrete until it has set sufficiently. All water pumped from the trenches shall be disposed of in compliance with the applicable local regulations of the appropriate governing body. The Contractor hall provide a minimum of two pumps for each trench opened in wet ground, one operating and one standby. The standby pump shall be of a size that will replace the largest operating pump. The Contractor shall be required to well point, pump, or provide other measures necessary to keep the trench dry, at no additional cost to the owner.

The Contractor shall provide and place all necessary flumes or other channels of adequate size to carry temporarily all streams, brooks, stormwater or other water which may flow along or across the lines of the pipe line. All flumes or channels thus utilized shall be tight so as to prevent leakage into the trenches.

T-1.03.12 **PIPE BEDDING**:

ORDINARY BEDDING (DIP PIPE):

Ductile iron pipe (DIP) in ordinary bedding shall be supported by the following method. The trench shall be mechanically excavated to a point not less than 0.3 times the diameter above the final pipe invert leaving the bottom in a substantially undisturbed condition. The final excavation shall be performed by pick and shovel to form a shaped excavation fitting the bottom quadrant (90 deg.) of the pipe barrel and providing uniform support along the length of the pipe section at the required line and grade. Suitable recesses shall be provided in the undisturbed bedding to permit adequate clearance for bells, couplings or similar projections so that no part of the load is supported by the bells. The full load should rest on the barrel of the pipe.

CRUSHED STONE BEDDING (PVC, DIP, RCP, AND CMP IN UNSTABLE OR WET CONDITIONS):

Crushed stone bedding shall be used for all PVC, DIP, RCP, and CMP pipe in unstable or wet conditions, or as otherwise directed by the Engineer. Wet conditions are defined as standing water, running water, or water that requires removal from trench by pumping, well point, etc. This bedding shall be constructed in accordance with the Construction Details. The crushed stone shall be placed in the trench 6" below the bottom of the pipe and for its full width to uniformly support the pipe at the required line and grade. The bedding shall extend upward around the pipe barrel until the crushed stone reaches one (1) foot above the top of the pipe. Suitable recesses shall be provided to permit adequate clearance for bells, couplings or similar projections. Material shall be spread in four-inch layers, and each layer shall be compacted with twenty-pound hand tampers or pneumatic tampers of the proper size, to operate between trench wall and pipe without damaging the pipe until the required total depth of bedding has been built up.

CONCRETE ENCASEMENT:

Where specified or required in the field, the pipe shall be supported by Concrete Encasement. The trench shall be excavated to a minimum depth of six (6) inches below

the bottom of the pipe or as shown on the construction details. The excavated space shall then be completely filled with and the entire pipe encased in concrete such that the concrete encasement measures a minimum six (6) inches deep above the barrel of the pipe. The total minimum width of the concrete encasement shall equal the width of trench excavation. Unless otherwise shown on the plans or specified herein, concrete shall be Class A in accordance with the requirements of Section 6, CONCRETE. Freshly poured concrete shall be maintained free from ground water for at least the first four hours. No backfilling of the trench shall begin until a minimum time period of 24 hours has elapsed after the encasement has been poured. Steel reinforcing, if required, shall be as shown on the plans or construction details.

CONCRETE CRADLE:
Where specified or required in the field, the pipe shall be supported on Concrete Cradle. Concrete Cradle shall be installed in unstable soil conditions where crushed stone encasement is determined to be insufficient support by the Engineer. The Concrete Cradle shall be furnished and installed equal to the "Concrete Encasement", except that only that portion of the encasement at and below the horizontal diameter of the pipe shall be poured, forming a true cradle under the bottom half of the pipe.

CRUSHED STONE FOUNDATION:
When bedding occurs in unstable soil conditions, or when suitable supporting soil or rock stratum occurs at a depth greater than 6 inches below the bottom of the required pipe invert, or where the trench is excavated below the specified depth, the foundation shall be modified as follows:

Except in the case of over-excavation where no extra excavation would have been required, the trench shall be excavated to the depth necessary to reach the suitable supporting stratum. Crushed stone shall be spread in four-inch layers, and each layer shall be compacted with twenty-pound hand or pneumatic tampers. The foundation shall carry vertically from the supporting stratum up to the required level. The determination as to the suitability of the supporting soil or rock stratum will be made by the Engineer. Extra payment for additional crushed stone foundation required as a result of unsuitable soil conditions will be made at the contract unit price. The amount of payment will be determined by the Engineer. Extra bedding as a result of over-excavation will be at the Contractor's expense.

T-1.03.13 **BACKFILLING**:
No backfilling shall be done before the Engineer gives permission. After pipes have been checked for alignment and bedding, the backfilling may be started. Backfill material may be deposited in trench either by hand or machine. Sufficient number of men shall be available to spread the backfill in uniform layers.

BACKFILLING IN NON-TRAFFIC AREAS (GRASS AND EARTH PLOTS):

1. Initial Backfilling of Pipe (Ordinary Bedding Material for DIP Pipe)

a. After preparing the trench for ordinary soil bedding as described under Paragraph T-1.03.12 of this section, this portion the pipe trench shall be backfilled with suitable materials (Type 1) under and around the pipe carefully deposited in uniform layers on both sides of pipe, and compacted by hand or pneumatic tampers until backfill reaches one (1) foot above top of pipe. The depth of backfill layers shall be six (6) inches maximum. Each layer of material shall be compacted to a dry density 90 percent of the maximum determined by the Standard Proctor Compaction Test.

b. When crushed stone or concrete encasement is used, the initial backfill of suitable materials will not be required.

c. The tampers shall be of the proper size to operate between trench wall and pipe without damaging the pipe.

2. Initial Backfilling of Pipe (Crushed Stone Bedding for PVC pipe, DIP in unstable or wet conditions, or Crushed Stone foundation):

a. This portion of the pipe trench shall be backfilled with crushed stone to provide crushed stone encasement.

b. When concrete cradle is used, the initial backfill will start at the top of the concrete and then continue as specified above.

c. When concrete encasement is used, the initial backfill of crushed stone will not be required.

3. Backfilling Trench to Subgrade After Initial Backfilling.

a. After initial backfilling has been compacted as specified above, the remainder of the trench shall be backfilled with suitable material (Type 2). When the material excavated from the trench is deemed unsuitable for backfilling, the Contractor shall supply and install either suitable material (Type 2) from outside sources or, at his option, "Select Backfill" at no change in contract price.

b. Final backfilling material may be dumped into trench by front end loader, then compacted using the following method:

Compact backfill in layers, 6 inches minimum with hand or pneumatic tampers, to a dry density 95 percent of the maximum determined by the Standard Proctor Compaction Test.

4. Settlement

a. If settlement occurs within warranty period, additional backfill shall be deposited and mechanically compacted to the required elevation with 90 percent compaction.

BACKFILLING IN TRAFFIC AREAS (STATE HIGHWAYS, PAVED STREETS, PAVED PARKING LOTS, ALLEYS, DRIVEWAYS, HIGHWAY AND STREET SHOULDERS):

1. Initial Backfilling of Pipe (Ordinary Bedding for DIP Pipe)

a. After preparing the trench for ordinary bedding as described under Paragraph 1-3.12 of this section, this portion of the pipe trench shall be backfilled with suitable materials (Type 1) under and around the pipe, carefully deposited in uniform layers on both sides of pipe and compacted by hand or pneumatic tampers until backfill reaches one (1) foot above top of pipe. The depth of backfill layers shall be six (6) inches maximum. Each layer of material shall be compacted to a dry density 95 percent of the maximum determined by the Standard Proctor Compaction Test.

b. When crushed stone or concrete encasement is used, the initial backfill of suitable materials will not be required.

c. The tampers shall be of the proper size to operate between trench wall and pipe without damaging the pipe.

2. Initial Backfilling of Pipe (Crushed Stone Encasement for PVC pipe, DIP in unstable or wet conditions, or crushed stone encasement)

a. This portion of the pipe trench shall be backfilled with crushed stone to provide crushed stone encasement.

b. When concrete cradle is used, the initial backfill will start at the top of the concrete and then continue as specified above.

c. When concrete encasement is used, the initial backfill of crushed stone will not be required.

3. Backfilling Trench to Subgrade After Initial Backfilling (Suitable Materials)

a. After initial backfilling has been compacted as specified above, backfill the remainder of the trench in compacted layers not to exceed twelve (12) inches using a mechanical tamper up to the bottom elevation of the pavement structure with suitable materials (Type 2) to be a dry density 95 percent of the maximum determined by the Modified Proctor Compaction Test.

T-1.03.14 **COMPACTION AND TESTING**:

The backfill shall be thoroughly compacted over and around the pipe by use of vibratory tamping pads, or where these cannot be used, by mechanical or hand tamping. Backfilling shall be compacted to at least the levels outlined above.

The optimum moisture content and the maximum density of each type of material used for trench backfill shall be determined by "Tests for Moisture-Density Relations of Soils, using 10-pound Rammer and 18-inch Drop" (ASTM D698 or AASHTO T-180).

The field moisture content of materials being compacted shall be determined by "Laboratory determination of Moisture Content of Soil" (ASTM D2216). The field density of compacted material shall be determined by "a nuclear Density Gauge test (ASTMD6938-17)

An independent soils engineering and testing laboratory shall perform sufficient tests and inspection procedures, to the satisfaction of the Engineer, both in the field and lab to ensure that the provisions of this specification are met. The testing shall be paid by the Contractor. The testing lab shall be approved by the Engineer.

After testing is completed and reports are provided, all subgrades below the paving will be examined by the Engineer before any paving is authorized.

The responsibility of the soils engineering and testing laboratory is to the Engineer, to whom that firm must promptly, faithfully and accurately report the results of its tests and inspections. The firm must, in addition, work in coordination with the Contractor, making all tests required. The reports must state whether or not the reported results comply with contract requirements. The testing and control firm shall promptly type and deliver all its reports to the Engineer with a copy to the Contractor.

T-1.03.15 **DISPOSAL OF MATERIAL**:

Excavated material shall be so placed as not to unreasonably interfere with travel. All asphalt and other street surfacing, surface loam and sod shall be kept separate from the remainder of the excavated material.

Upon completion of the backfilling, the property shall be cleaned, all surplus material removed, and the surface restored to the condition in which it was before ground was broken.

Unless otherwise specified, all materials left over shall become property of the Contractor. Also, underground structures removed, such as brick, concrete and sewer pipe, shall become the property of the Contractor, unless otherwise noted on the plans. If the Contractor shall fail to promptly remove surplus material, the owner may have the material removed and charge the cost thereof as money paid to the Contractor. All surplus excavation shall be removed from the site of the work by the Contractor, but none shall be deposited on private property until written consent of the property owner has been filed with the Engineer. Contractor's disposal shall comply with all Federal, State and local laws and regulations.

T-1.03.16 **CUT-BACK OF PAVEMENT REQUIRED**:

When pipe lines are placed under existing pavements, a cut-back of the pavement of 12" will be required on each side of the trench, see Standard Detail 1-05. After the pipe line has been laid and backfilled in City streets, a minimum 6-inch compacted base of marl-type rock shall be placed over the total width of the pavement cut. After manipulation and the compaction, this base shall be 2 inches below the level of the adjacent pavement. A wearing surface of 2 inches (or equal to existing pavement thickness, whichever is greater) of bituminous concrete, Type I, shall then be applied over this base in such a manner as to, when rolled, match the grade of existing pavement. N.C. D.O.T. street base and pavement will be specified on plans.

T-1.04 **GRADING & PREPARATION OF SUBGRADES**:

T-1.04.1 **ASPHALT PAVEMENT**:

After all excavation, undercutting and backfilling have been completed, the subgrade shall be properly shaped and compacted. The area to be compacted shall include all areas beneath pavement and curb and gutter and shall extend at least one foot behind the back of the curb. The degree of compaction of the top six inches over this entire area shall be at least 95% of that obtained by compacting a sample of the soil or materials with the equipment and in the manner prescribed by the Stardard Proctor method, so that it conforms to the lines and grades as shown and shall be brought to a firm, unyielding condition before any base course, surface course, or pavement is placed thereon. If the subgrade does not contain sufficient moisture for compaction, it shall be wetted as directed by the Engineer.

All soft and yielding material, boulders, loose stones, or any other unsuitable materials in the sub-grade, which will not readily compact, shall be removed and replaced with suitable material which shall then be thoroughly compacted. All roots, stumps, and other perishable matter encountered in the preparation of the subgrade shall be removed to a depth of not less than two feet below the surface of the pavement, unless otherwise directed by the Engineer. Any portion of the subgrade inaccessible to the roller shall be thoroughly compacted with hand or mechanical tampers.

T-1.04.2 **CURB & GUTTER**:
The subgrade shall be constructed true to grade and cross-sections as required. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent roadway or street and shall be placed and compacted to conform to applicable requirements of T-1.04.1 above. All roots, stumps, and other perishable matter encountered at the subgrade shall be removed to a depth of not less than 12 inches below the subgrade and undercut filled and compacted with select material.

Excavation to an elevation slightly above finished subgrade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is in place. The subgrade shall be wet down sufficiently in advance of the placing of the concrete to ensure a firm and moist condition. In cold weather, the subgrade shall be so treated, protected, and prepared as to produce a satisfactory subgrade entirely free from frost when the concrete is deposited.

T-1.04.3 **SIDEWALKS & DRIVEWAYS**:
The subgrade shall be constructed true to grade and cross-section as required. In areas where sidewalks or driveways are to be poured, the following conditions will be observed relating to compaction of the subgrade.

Where good firm material (original material, not fill) has been carefully graded, so that no undercutting has occurred, this material shall be considered acceptable subgrade, upon approval by the Engineer.

Where fill material has been placed, where undercutting has occurred, or where loose or unsuitable material is encountered, such fill or loose material shall be compacted to 95% as specified above for Embankments.

Where roots, stumps or other perishable matter is encountered at the subgrade, they shall be removed to a depth of 4 inches below the subgrade.

In cold weather, the subgrade shall be so treated, protected, and prepared as to produce and provide a satisfactory subgrade entirely free from frost when the concrete is deposited.

All subgrades shall be graded and protected so as to prevent an accumulation of standing water, and consequent subgrade saturation, in the event of rain.

T-1.05 **BACKFILLING FOR DRAINAGE STRUCTURES**:
Backfilling around and adjacent to all drainage structures shall be as specified in paragraph T-1.03.1.

T-1.06 **BACKFILL OF CURB & GUTTER & SIDEWALKS**:
Immediately after the removal of forms for curb and gutter, sidewalks and driveways, the space between the back of the curb and sidewalks shall be backfilled, smoothed off and maintained so as to prevent the accumulation of standing water in the event of rain.

T-1.07 **SALVAGE OF USABLE MATERIALS**:
All materials such as granite curbing, paving blocks, brick pavers, castings, pipe, etc., removed during excavation, shall be delivered to the City Street Division lot in the vicinity of Tenth and Fanning Streets. Care shall be taken that granite curb, when encountered, shall not be broken into short lengths, but shall be delivered in the same

lengths found in place when encountered. Loss or unnecessary damage to any such items shall be considered the Contractor's responsibility, and the City shall take credit for such loss or damage when deemed advisable by the Engineer.

T-1.08 **FINISHING SLOPES AND SURFACES**:
The surface of all areas of earth and other materials shall be finished to a reasonably smooth and compact surface substantially in accordance with the surface lines, cross-sections and elevation indicated on the drawings, or as established by the Engineer.

T-1.09 **PROTECTION OF TREES**:
Only where it is found to be absolutely necessary shall trees be removed. These trees to be removed will be designated by the Engineer. The Contractor shall take all possible precautions to ensure that all other trees are not damaged.

T-1.10 **AREAS TO BE CLEARED AND GRUBBED**:

T-1.10.1 Unless clearing limits are otherwise designated, the street right-of-way lines or easement lines shall normally constitute the clearing and grubbing limits.
Special conditions may require that areas other than street rights-of-way be included within clearing and grubbing limits; in this case, the limits will be clearly designated on the plans.

The areas designated to be cleared and grubbed under this item shall be staked on the ground in advance by the Contractor and approved by the Engineer.

T-1.10.2 **CLEARING**:
Clearing shall consist of felling, cutting, and satisfactory disposal of trees and other vegetation designated for removal.

T-1.10.3 **GRUBBING**:
Grubbing shall consist of the removal of all stumps and roots having a diameter of three inches or larger, to a depth of at least three feet below the subgrade, and the disposal thereof.

T-1.10.4 **DISPOSAL OF CLEARED AND GRUBBED MATERIAL**:
All timber, logs, roots, brush, etc., from the clearing and grubbing operation shall be removed from the site and disposed of by the Contractor at a permitted disposal site.

T-1.11 **METHODS OF MEASUREMENT:**

T-1.11.1 **EXCAVATION:**
The unit of measurement for excavation shall be cubic yards, which will be computed by the average end-area method from the cross sections taken before and after the excavation operations. The yardage to be paid for under this section of the specifications shall be the number of cubic yards of material, measured in its original position and removed from the excavation areas. The measurement will include the excavation below grade, where ordered, and allowance made on the same basis for suitable excavation as replacement. The measurement will not include the yardage excavated without authorization beyond the normal slope lines nor the yardage of any material which is used for proposes other than those directed.

Borrow shall be measured by the cubic yard, compacted in-place, by the width, length, and depth of placement. The contractor shall also provide tickets for each load used on

the project, which shows the amount per truck. The contractor and the inspector shall agree as to borrow quantity before submittal for payment.

The salvage of usable material, removal of excess material, the finishing of slopes and surfaces and the forming of fill, embankments and subgrade will be considered as a subsidiary obligation of the Contractor and will be covered under the contract unit price for excavation.

T-1.11.2 **EXCAVATION AND BACKFILL:**
All excavation and backfill in connection with drainage structures, water mains, sanitary sewers, storm drains, curb and gutter, sidewalk and driveways shall be considered a subsidiary obligation of the Contractor, for which payment shall be included in the unit price for the basic item.

T-1.11.3 **CLEARING AND GRUBBING:**
Measurement, if allowed, shall be as specified under the Special Condition. If not specified, then this work shall be considered incidental to the contract and included in the unit price of excavation.

T-1.12 **PAYMENT:**

T-1.12.1 **EXCAVATION:**
The yardage of excavation and borrow measured as specified herein, will be paid for at the contract prices per cubic yard for excavation and borrow respectively, which payment shall constitute full compensation for all labor, equipment, tools, supplies, and incidentals necessary to complete all items of work, including all hauling, construction of fills, and embankments, spreading, rolling, wetting, and compacting of subgrades, and disposal of all surplus and unsuitable materials, as indicated on the drawings and specified herein.

T-1.12.2 **CLEARING AND GRUBBING:**
Payment shall be made according to the Special Conditions and at the price shown in the proposal, and should include all labor, equipment, tools, and incidentals necessary to complete the work specified above.

T-2.01 **SCOPE**:

The work covered by this section of the specifications consists of furnishing all labor, materials, plant, and equipment necessary to construct all storm drain lines, structures, and appurtenances where shown on the plans or as directed by the Engineer. The Contractor is cautioned to review the General Specifications pertaining to precautions for excavation of streets.

T-2.02 **GENERAL**:

Storm drain lines, structures, etc. shall be constructed to line and grade as established by the Engineer. It shall be the Contractor's responsibility to protect and maintain any grade alignment stakes. All pipe lines and structures shall be constructed by the use of competent workmen under the supervision of an experienced foreman. Proper materials and equipment shall be used and shall be subject to the approval of the Engineer. Great care shall be taken to obtain well-aligned and tight pipelines so as to assure good flow and the exclusion of ground water and foreign substances.

T-2.03 **MATERIALS**:

T-2.03.1 **PIPE**:

All storm drain pipe shall be reinforced concrete pipe unless otherwise indicated on the plans, specifications, and proposal or unless otherwise directed by the Engineer. Only sound, undamaged pipe shall be used. The Contractor or his suppliers shall be responsible for the delivery, storage, and handling of the pipe. The Contractor shall, at his own expense, replace any damaged or otherwise unacceptable sections of pipe.

REINFORCED CONCRETE PIPE:

Reinforced concrete pipe (RCP) shall be manufactured in accordance with ASTM Specification C-76, Class III and shall be clearly marked as such on each joint. RCP shall be required to be furnished in eight (8) foot joints for sizes twelve (12) inches through twenty-four (24) inches except where shorter joints are needed for tie-ins. The City prefers that ALL sizes of RCP be furnished in the eight (8) foot lengths when the Contractor has the proper equipment and sufficient working area. Permission may be granted for use of other length joints by the Engineer on a case-by-case basis.

REINFORCED CONCRETE ARCHED AND ELLIPTICAL PIPE:

Reinforced concrete arched and elliptical pipe shall be manufactured in accordance with ASTM C 506 latest revision.

REINFORCED CONCRETE ELLIPTICAL PIPE:

Reinforced concrete elliptical pipe shall be manufactured in accordance with ASTM C 507 and AASHTO M-207.

REINFORCED CONCRETE BOX CULVERTS:

Reinforced concrete box culverts shall be manufactured in accordance with the latest edition of the AASHTO Specifications and shall be designed for H-20 loading in the longitudinal and transverse directions. Shop drawings and specifications shall be submitted to the Engineer for review and approval prior to installation. The Engineer

may request design calculations sealed by a Licensed Professional Engineer registered in North Carolina on a case-by-case basis.

ALUMINUM CORRUGATED PIPE:
Aluminum corrugated pipe shall be used primarily for risers and barrels for water quality and retention/detention basins. Aluminum corrugated pipe can be used within street rights-of-ways or public easements on a case by case basis when approved by the Engineering Department. Specifications for aluminum corrugated pipe shall be included in Special Conditions when called for on the plans and specifications.

HIGH DENSITY POLYETHYLENE PIPE (HDPE):
HDPE shall not be permitted within rights-of-ways or public easements.

CORRUGATED POLYPROPYLENE PIPE:
Corrugated polypropylene (PP) pipe shall be manufactured in accordance with ASTM F2881 or AASHTO M330. PP shall have a smooth interior and annular exterior corrugations. PP shall be required to be furnished in eight (8) foot joints for sizes twelve (12) inches through twenty-four (24) inches except where shorter joints are needed for tie-ins. The City prefers that ALL sizes of PP be furnished in the eight (8) foot lengths when the Contractor has the proper equipment and sufficient working area. Permission may be granted for use of other length joints by the Engineer on a case-by-case basis. Pipe shall have double-gasket connections and shall be installed in accordance ASTM D2321 and manufacturer's recommended installation guidelines.

T-2.03.2 **FLARED END SECTIONS**:
Flared end sections (FES) shall be installed at locations shown on the plans or as directed by the Engineer. FES's shall be manufactured of the same material as the pipe to which it is being connected and shall be manufactured and installed with the same type of joint as the pipe.

REINFORCED CONCRETE FLARED END SECTIONS:
Reinforced concrete flared end sections shall be manufactured in accordance with plans that have been approved by the North Carolina Department of Transportation. The concrete used in FES's shall attain a strength of 3500 psi when tested in accordance with AASHTO T22. Where grates are to be installed on FES's, provisions for mounting the grate shall be provided.

T-2.03.3 **BRICK**:
Bricks shall conform to AASHTO M-91-90, Grade MS, and shall be WHOLE solid brick of standard size, with straight and parallel edges and square corners. They shall be of compact texture, full weight, entirely true, free from injurious cracks and flaws, tough, strong, and shall have a clear ring when struck together.

T-2.03.4 **CASTINGS**:
All castings for storm drain structures shall be Gray Iron castings manufactured in accordance with ASTM A-48, latest revision and shall be fabricated in accordance with the City of Wilmington Standard Details for each casting. Storm drain manholes shall have the words "STORM DRAIN" or "STORM SEWER" cast in the lids.

T-2.03.5 **FILTER FABRIC**:

Filter fabric shall be Supac Style 5-NP, Trevira Spunbound Type S-1115, Amoco Style 4545, or an approved equal. The Contractor shall furnish the Engineer sufficient data to evaluate the adequacy of any substitute non-woven filter fabric. No installation of substitute fabric shall be permitted until written approval has been furnished by the Engineer.

T-2.04 **STRUCTURES**:

T-2.04.1 **MANHOLES**:

Where shown on the plans or otherwise directed by the Engineer, storm drain manholes shall be constructed in accordance with these specifications and in accordance with City of Wilmington Standard Details unless otherwise directed by the Engineer. All inverts in storm drain manholes shall be shaped to provide smooth flow through the manhole and to prevent ponding of water and settlement of sediment and debris.

BRICK MANHOLES:

Brick manholes shall be constructed in accordance with City of Wilmington Standard Details 2-03. Where the depth of the manhole exceeds eight (8) feet, the inside diameter of the manhole shall be increased to five (5) feet and the wall thickness shall be increased to twelve (12) inches for the portion of the manhole greater than eight (8) feet deep. Where the plans or the Engineer specify, the manhole shall be constructed at the specified diameter and corbelled in accordance with SD 2-03.

PRECAST MANHOLES:

Precast manholes shall be permitted unless specifically stated otherwise on the plans, Special Conditions, or Proposal. Precast manholes shall be constructed in accordance ASTM Specification C-478 and shall have an inside diameter of four (4) feet unless specified otherwise on the plans, Special Conditions, Proposal, or directed by the Engineer. A six (6) inch extended footing shall be required on all four-foot diameter precast manholes. (See T-14.23)

CORRUGATED METAL PIPE MANHOLES:

Corrugated metal manholes shall not be permitted unless specified in the Special Conditions.

INTERFERENCE MANHOLE:

Interference manholes shall be constructed in accordance with City of Wilmington Standard Detail 2-05 and in accordance with the other specifications for manholes as specified in this Section. Interference manholes shall be constructed where shown on the plans or where directed by the Engineer to eliminate a conflict with the storm drain system.

T-2.04.2 **JUNCTION BOXES**:

REINFORCED CONCRETE JUNCTION BOXES:

Reinforced concrete junction boxes shall be constructed at locations shown on the plans or where directed by the Engineer. The reinforced concrete junction boxes shall be constructed in accordance with the details on the plans and in accordance with applicable sections of the ACI Manual of Concrete Practices and NCDOT Standards. All tops for

junction boxes shall be cast to provide for a City of Wilmington approved manhole ring and cover.

PRECAST REINFORCED CONCRETE JUNCTION BOXES:
Precast reinforced concrete junction boxes shall be manufactured to the inside dimensions shown on the plans or as directed by the Engineer. The manufacturer of the precast boxes shall provide detailed shop drawings and design calculations that have been sealed by Professional Engineer registered in the State of North Carolina. All boxes shall be designed for a minimum of H-20 loading with appropriate safety factors indicated. All tops for junction boxes shall be cast to provide for a City of Wilmington approved manhole ring and cover.

T-2.04.3 **CATCH BASINS AND INLETS**:

BRICK CATCH BASINS:
All catch basins, unless directed otherwise by the Engineer or specifically noted on the plans, shall be open throat basins constructed of brick and in accordance with City of Wilmington Standard Detail 2-01.

PRECAST CATCH BASINS:
Precast catch basins shall be permitted unless specifically stated otherwise on the plans, Special Conditions, or Proposal. Precast catch basins shall be constructed in accordance NCDOT standards and shall have an inside diameter of four (4) feet unless specified otherwise on the plans, Special Conditions, Proposal, or directed by the Engineer. A six (6) inch extended footing shall be required on all four-foot diameter catch basins manholes. (See T-14.23)

DROP INLETS:
All drop inlets, unless specifically noted otherwise on the plans or directed by the Engineer, shall be constructed of brick and in accordance with City of Wilmington Standard Detail 2-02.

T-2.04.4 **REINFORCED CONCRETE HEADWALLS**:
Reinforced concrete headwalls shall be constructed at locations shown on the plans or where directed by the Engineer. All reinforced concrete headwalls shall be constructed in accordance with the details and specifications included with the project and in accordance with applicable sections of the ACI Manual of Concrete Practices.

T-2.05 **CHANNEL LININGS**:

RIP RAP:
Rip rap shall consist of field stone or rough unhewn quarry stone. The stone shall be sound, tough, dense, resistant to the action of air and water, and suitable in all other respects for the purposes intended. The stone shall be graded to meet the following requirements:

Class I - Stone shall vary in weight from 5 to 200 pounds with at least 30 percent of the total weight of rip rap weighing a minimum of 60 lbs. and not more than 10 percent weighing less than 15 lbs.

Class II - Stone shall vary in weight from 25 to 250 lbs. with at least 60 percent of the total weight of the rip rap shall weigh a minimum of 100 lbs. and no more than 5 percent shall weigh less than 50 lbs.

Class A - Stone shall vary in size from 2-inches to 6-inches and while no specific gradation is specified, the stone shall be equally distributed within the range. The size shall be determined by measuring its long dimensions.

Class B - Stone shall vary in size from 5-inches to 15-inches and while no specific gradation is specified, the stone shall be equally distributed within the range. The size shall be determined by measuring its long dimensions.

Rip rap shall be grouted into place with flowable fill concrete if shown on the plans.

T-2.06 **SUBDRAINS**:

SUBDRAIN PIPE:
Subdrain pipe shall be six (6) inch perforated pipe with the perforations on the bottom of the pipe. Metal subdrain pipe shall be galvanized corrugated steel pipe meeting ASTM A-760 and AASHTO M-36. PVC subdrain pipe shall be Schedule 40 meeting the requirements of ASTM Specification D-1785.

T-2.07 **INSTALLATION**:

T-2.07.1 **PIPE INSTALLATION**:
All pipe and related structures shall be installed to the line and grade as shown on the plans or as established by the Engineer. The Contractor shall adhere to any and all construction techniques established by the pipe manufacturer unless directed otherwise by the Engineer. The Contractor shall be responsible for and correct any and all defects due to settlement, poor workmanship, improper handling, or lack of maintenance. It shall be the Contractor's responsibility to maintain the new and existing pipe system as well as existing utilities on the job site for the duration of the project. This is to include, but not be limited to, the infiltration of sand and debris into the new and existing storm drainage system and into the other utility lines. Should sand or debris collect in any portion of the new or existing systems as a result of construction, the Contractor shall be required to remove said sand and debris at his own expense.

T-2.07.2 **PIPE JOINTS:**

JOINTS:

All pipe joints, regardless of pipe material, shall be wrapped with filter fabric along the exterior of the pipe. The filter fabric shall be secured to the exterior of the pipe with a bituminous adhesive. The filter fabric shall cover the circumference of the joint completely and extend at least twelve inches beyond the center of the joint in both directions.

REINFORCED CONCRETE PIPE:
Joints for reinforced concrete pipe shall be tongue and groove with flexible watertight joints unless specified otherwise on the plans, specifications, or proposal or unless directed otherwise by the Engineer. The joint material shall be as recommended by the reinforced concrete pipe manufacturer and shall provide water tight seals at all joints,

meeting the requirements of Section T-14.10.2. Joint materials specifications shall be submitted to the Engineer for review and approval prior to installation.

REINFORCED CONCRETE ARCHED AND ELLIPTICAL PIPE:
Joints for reinforced concrete arched and elliptical pipe shall conform to the specifications for joints for reinforced concrete pipe.

REINFORCED CONCRETE BOX CULVERTS:
Joints for reinforced concrete box culverts shall conform to the specifications for joints for reinforced concrete pipe.

ALUMINUM CORRUGATED PIPE:
Aluminum corrugated pipe joints shall be in accordance with the manufacturer's recommendation and shall provide a watertight seal at all joints. Specifications for joints and fittings for aluminum corrugated pipe shall be submitted to the Engineer for review and approval prior to installation.

CORRUGATED POLYETHYLENE PIPE:
Corrugated polyethylene pipe joints shall be in accordance with the manufacturer's recommendations and shall provide a watertight seal or shall be installed such as to prevent any infiltration of sand or soil.

CORRUGATED POLYPROPYLENE PIPE:
Corrugated polypropylene pipe joints shall be in accordance with the manufacturer's recommendations and shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477.

T-2.07.3 **FLARED END SECTIONS**:
All flared end sections shall be manufactured of the same material as the pipe to which it is being connected, with the exception of aluminum. No aluminum flared end sections shall be permitted. The contractor shall use a concrete headwall when using aluminum pipes. The flared end section shall be installed such as to minimize and prevent undermining of the flared end section and to minimize erosion of the receiving channel. The Contractor shall use extreme care not to undercut the soil under the flared end section. Where the soil is undercut, the Contractor shall be required to replace the material and to place the material in six (6) inch lifts achieving 100 percent of the maximum density at optimum moisture, as determined by ASTM D-1557 Standard Test Method.

T-2.07.4 **STRUCTURES**:
All structures shall be constructed on firm, undisturbed soil at locations shown on the plans or as directed by the Engineer, provided that all precast structures shall have a minimum of six (6) inches of washed stone (#57) bedding and the cost of the stone bedding shall be considered incidental to the precast structure. Additional stone bedding thickness may be required as directed by the engineer for structures deeper than six feet. Where the Contractor undercuts the soil for the footing, the Contractor shall be required to use washed stone (#57) to bring the subgrade back to proper elevation. Should the contractor encounter unsuitable material at the subgrade elevation for the manhole footing, he shall immediately notify the Engineer and assist the Engineer in determining the severity of the problem and work with the Engineer in resolving the situation.

The inverts of all structures shall be constructed and shaped to provide free flow of water without ponding and to eliminate and prevent accumulation of sediment and debris. All connections to structures shall be watertight and shall be grouted from both the exterior and interior of the structure, fully encapsulate bricks, if used, with grout. All connections to structures shall be wrapped with filter fabric along the exterior of the pipe and the structure. The filter fabric shall be secured to the exterior of the pipe and the structure with a bituminous adhesive.

MANHOLES:

BRICK MANHOLES:
Brick manholes shall be constructed on concrete footing a minimum of six (6) inches thick and having a diameter a minimum of twelve (12) inches larger than the outside diameter of the structure. Brick manholes shall be plastered with ¾ inch cement on both the exterior and interior of the structure. All brick shall be whole, solid, uniform brick made of cement or hard burned clay. The brick shall be fully soaked in water prior to being set in cement mortar. All pipes entering or leaving the manhole shall be set prior to the setting of bricks. Bricks and mortar shall be placed around the pipes in a manner to ensure a neat watertight seal. Steps shall be installed one (1) foot on center directly below the access opening.

PRECAST MANHOLES:
The Contractor shall use extreme care in handling, setting, and connecting to the precast manhole to prevent any structural damage. The City reserves the right to reject any structure that has been damaged and could result in a loss of structural strength or integrity. All connections to precast manholes shall be watertight and shall be grouted from both the exterior and interior of the structure. Steps shall be installed one (1) foot on center directly below the access opening.

INTERFERENCE MANHOLES:
Installation of interference manholes shall be in accordance with the specifications for the type of manhole being installed. The carrier pipe through the interference manhole shall always be metal (steel or ductile iron). When the carrier pipe is an existing pipe to be replaced, the carrier pipe shall be a separate bid item unless specifically stated otherwise on the plans or special conditions. A minimum of twenty-four (24) inches clearance shall be provided between the outside bottom of the carrier pipe and the bottom of the manhole invert, said clearance may have to be a "sumped" area in some cases. Steps shall be installed one (1) foot on center directly below the access opening.

REINFORCED CONCRETE JUNCTION BOXES:
Reinforced concrete junction boxes shall be constructed in accordance with the details on the plans, specifications, and in accordance with the applicable sections of the latest edition of the ACI Manual of Concrete Practices. All pipes entering or leaving the junction box shall be set prior to the placing of the concrete for the walls. Steps shall be installed one (1) foot on center directly below the access opening.

PRECAST REINFORCED CONCRETE JUNCTION BOXES:
All connections to the precast junction boxes shall be watertight and shall be sealed from both the interior and exterior of the structure. Care shall be taken in handling, setting, and connecting to the structure to prevent any structural damage. The City reserves the right to reject any structure that has been damaged and could result in a loss of structural strength or integrity. Steps shall be installed one (1) foot on center directly below the access opening.

BRICK CATCH BASINS:

Brick catch basins shall be constructed on concrete footing a minimum of six (6) inches thick and extending a minimum of four (4) inches past the outside face of the structure. Brick catch basins shall be plastered with ¾ inch cement on both the exterior and interior of the structure. All brick shall be whole, solid, uniform brick made of cement or hard burned clay. The brick shall be fully soaked in water prior to being set in cement mortar. All pipes entering or leaving the catch basin shall be set prior to the setting of bricks. Bricks and mortar shall be placed around the pipes in a manner to ensure a neat watertight seal.

DROP INLETS:

Drop inlets shall be constructed on concrete footing a minimum of six (6) inches thick and extending a minimum of four (4) inches past the outside face of the structure. Brick drop inlets shall be plastered with ¾ inch cement on both the exterior and interior of the structure. All brick shall be whole, solid, uniform brick made of cement or hard burned clay. The brick shall be fully soaked in water prior to being set in cement mortar. All pipes entering or leaving the drop inlet shall be set prior to the setting of bricks. Bricks and mortar shall be placed around the pipes in a manner to ensure a neat watertight seal.

REINFORCED CONCRETE HEADWALLS:

Reinforced concrete headwalls shall be constructed of Class A concrete as specified in T-6.09 of the concrete section of the specifications. All concrete shall comply with the requirements in Section 6 of the specifications and with the applicable sections of the ACI Manual on Concrete Practices. Reinforcing steel shall be Grade 60 Deformed bars complying with ASTM A - 615 and shall be of the size and quantity specified in the details and/or specifications. Steel shall be placed in accordance with the details and specifications and shall be placed such that a minimum of two (2) inches of concrete covers the steel.

T-2.07.5 **CHANNEL LININGS**:

RIP RAP:

Rip rap shall be installed at the locations shown on the plans or as directed by the Engineer. All rip rap shall be installed in accordance with City of Wilmington Standard Detail 2-15 and shall be installed with non-woven filter fabric resistant to ultraviolet rays between the ground and the rip rap unless noted otherwise on the plans. The Contractor shall use caution to prevent any tears or holes in the filter fabric when placing the rip rap. All tears or holes in the filter fabric shall be repaired as directed by the Engineer. As a minimum, the damaged area shall have an undamaged section of filter fabric which extends a minimum of two (2) feet in all directions past the damaged area, placed over the damaged filter fabric.

T-2.07.6 **SUBDRAINS**:

Sub drains shall be installed at locations shown on the plans or as directed by the Engineer. The sub-drain shall be installed in accordance with SD 2-04. A minimum of six (6) inches of washed stone shall be placed around the perforated pipe. The washed stone shall be wrapped in an approved non-woven filter fabric. Unless directed otherwise, all subdrains shall be connected to the storm drain system at structures and the invert of the subdrain shall be a minimum of six (6) inches above the invert of the structure.

T-2.08 **EXCAVATION AND BACKFILL**:

T-2.08.1 **EXCAVATION FOR PIPE LINES**:

Excavation of all trenches for pipe lines shall be done to line and grade as established by the Engineer. The width of the trench shall not be greater than necessary to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. The bedding surface shall provide a firm foundation of uniform density through the entire length of the pipe. Recesses shall be excavated to accommodate bells and joints. The bottom of the trench shall be carefully shaped and rounded to the shape of the lowest 1/4 of the outside of the pipe for its entire length.

T-2.08.2 **EXCAVATION FOR STRUCTURES**:

Excavation for all structures shall be done such that the structure can be set to line and grade as established by the Engineer. The width and depth of the trench shall not be greater than that necessary to properly set and seal the structure in accordance with the plans and specifications.

T-2.08.3 **UNDERCUTTING**:

Any undercutting in good soil shall be replaced at the Contractor's expense, and the replacement material shall be compacted to 95 percent of the maximum density obtained at optimum moisture content as determined by ASTM D-1557 Standard Test Method. In the event that the material encountered at grade is found to be soft, spongy, or in any other way unsuitable, the Contractor shall notify the Engineer immediately. If instructed to remove the unsuitable material to a specified depth, the contractor shall do so and replace the same with borrow material acceptable to the Engineer. This material shall be placed in layers not to exceed six (6) inches in thickness and compacted to 95% of the maximum density by the method described above.

T-2.08.4 **SHORING, SHEETING, AND WELL-POINTING**:

Shoring, sheeting, and/or well-pointing shall be used where and as necessary, in order to prevent damage to existing facilities or structures, or as a matter of safety, or as directed by the Engineer. The cost of shoring, sheeting, and/or well-pointing as required are to be included in the unit prices as bid for storm drains (pipes and structures) and there shall be no additional payment allowed for these items.

T-2.08.5 **BACKFILL**:

Before backfilling is commenced over pipes and installations, fine earth, sand, or rock dust shall be solidly tamped around and above the pipe to a depth of one (1) foot above the top of the pipe. Care shall be taken to prevent any disturbance to the pipe, structures, or newly made joints. The filling of the trench shall be carried on simultaneously on both sides of the pipes and structures in such a manner that injurious side pressures do not occur. NO SEPARATE PAYMENT SHALL BE ALLOWED FOR BACKFILLING OF STORM DRAINS.

Sheeting and shoring generally should be removed only when the trench below it has become substantially filled, and every precaution shall be taken to prevent any slides of material from the sides of the trench onto or against the pipe and/or structures.

The material for backfilling, unless specified otherwise, shall be earth, loam, gravel, or quarry spoil from trenches and shall be free from stones larger than two (2) inches in diameter. It shall be free from all perishable and objectionable materials. Before placing

any backfill, all rubbish, forms, blocks, wires, or other unsuitable material shall be removed from the excavation. The backfilling shall be placed in layers not to exceed twelve (12) inches thick and compacted to a minimum density of 95 percent as determined by ASTM D 1557 Standard Test Method.

Material for backfill shall generally be material excavated from the trench or excess material from the project site created as a result of required grading. When there is not sufficient suitable material available at the site, the Contractor shall immediately notify the Engineer and request directions on how to proceed. Should the Engineer direct that borrow be used, the Contractor shall provide fill material. Fill material, if directed to be supplied by the Engineer, shall be paid for on a cubic yard basis as bid in the proposal, or at a unit price negotiated by the Engineer and Contractor.

The unit price of fill material, if used, should include all the cost of providing the fill material to the site and disposal of the objectionable material. The cost of placing and compacting the material shall be included in the cost of the pipe and structures.

T-2.08.6 **CUT-BACK OF PAVEMENT**:

When pipe lines and/or structures are placed under existing pavements, a cut-back of the pavement of twelve (12) inches shall be required on each side of the ditch line, per Standard Detail SD 1-05. After the pipe has been laid and backfilled in accordance with the plans and specifications, a six (6) inch, or as specified on the plans or in the Special Conditions Section, a compacted base of marl-type rock shall be placed over the total width of the pavement cut. After manipulation and compaction, this base shall be two (2) inches below the level of the adjacent pavement. A wearing surface of two (2) inches of bituminous concrete, Type I-2, shall then be placed over this base in such a manner as to, when rolled, match the grade of the existing pavement.

This type of pavement repair shall be permitted by the City for all types of bituminous-surfaced streets, regardless of the existing type of base, unless specified otherwise on the plans or in the Special Conditions Section.

T-2.09 **EXISTING PIPES AND STRUCTURES**:

T-2.09.1 **TAPPING EXISTING STRUCTURES**:

Where shown on the plans or directed by the Engineer, the Contractor shall connect new pipe, install new structures, etc. or otherwise make connection to the existing storm drain systems. This connection (tap) shall be accomplished with minimal damage to the existing structure. All gaps, cracks, etc. shall be mortared so as to prevent any ground-water infiltration. This shall be accomplished with the type brick and mortar used in construction of new manholes unless otherwise specified or directed by the Engineer. NO EXTRA PAYMENT SHALL BE ALLOWED FOR THIS WORK.

T-2.09.2 **REPLACEMENT OF EXISTING STRUCTURES**:

Where shown on the plans or directed by the Engineer, the Contractor shall replace an existing structure with a new structure. Unless noted otherwise, the Contractor shall completely remove the old structure, including the footing and shall build the new structure in accordance with the appropriate standards and specifications or as directed by the Engineer.

T-2.09.3 **REMOVAL OF EXISTING PIPE AND/OR STRUCTURES**:

Unless noted otherwise in the Special Conditions section or on the plans, the Contractor shall remove ALL abandoned pipe and/or structures. Unless noted otherwise in the proposal, NO EXTRA PAYMENT SHALL BE ALLOWED FOR THIS WORK.

T-2.09.4 **SALVAGING EXISTING PIPE, CASTINGS, ETC.**:

All pipes, castings, etc. deemed salvageable by the Engineer shall be removed from the construction site by the Contractor and shall be delivered to the City Operations Center at River Road. Upon such delivery, the Contractor shall receive a receipt for said salvaged material. The Contractor shall be required to replace all material directed to be salvaged which he cannot account for.

T-2.09.5 **PLUGGING EXISTING LINES**:

The Contractor shall install a masonry plug where shown on the plans or directed by the Engineer. Unless otherwise stated in the Special Conditions section or in the proposal, NO EXTRA PAYMENT SHALL BE ALLOWED FOR THIS WORK.

T-2.09.6 **GROUT FILLING ABANDONED LINES AND/OR STRUCTURES**:

Where shown on the plans, specified in the Special Conditions section, or directed by the Engineer, the Contractor shall fill existing pipes and/or structures as required with concrete or grout. This concrete or grout shall be a minimum 2000 psi. For pipe, this grout shall be pumped under pressure into the section being filled in such a manner to ensure that the line completely fills with the concrete or grout.

T-2.09.7 **REPLACEMENT OF EXISTING IMPROVEMENTS**:

Where the storm drain crosses existing improvements, i.e., asphalt, base, curb, driveways, sidewalks, brick pavers, water/sewer services, other utilities, etc., it shall be the Contractor's responsibility to protect and/or to replace these improvements. The cost of protecting and/or replacing these improvements shall be included in the unit prices for new storm drain pipes and structures and NO EXTRA PAYMENT SHALL BE ALLOWED unless otherwise specified in the Special Conditions section. The Engineer shall be the judge as to the extent of replacement required. In the instance of asphalt replacement, it shall be done in accordance with Section T-2.08.6 and Standard Detail SD 1-05.

T-2.10 **MEASUREMENT AND PAYMENT**:

T-2.10.1 **PIPE**:

Payment for pipe shall be for the actual linear footage installed for each size and cut range specified in the proposal. The actual amount of pipe in a given cut range shall be determined by the initial grade at the point of installation and the installed pipe invert unless otherwise specified in the Special Conditions section. No payment through structures will be allowed.

T-2.10.2 **BOX CULVERTS**:

Box culverts shall be measured in the same method as pipe and as described in Section T-2.10.1.

T-2.10.3 **FLARED END SECTIONS**:

Flared end sections shall be paid on a “per each” basis for the specific sizes used as bid in the proposal.

T-2.10.4 **CATCH BASINS AND MANHOLES**:
Catch basins and manholes shall be paid for as specified in the proposal for the actual quantity installed for the various diameters and ranges of cut. The appropriate cut for a given structure shall be determined in the field and shall be measured in feet from the lowest invert of the manhole or basin to the rim.

T-2.10.5 **JUNCTION BOXES**:
Junction boxes shall be measured on a "per each" basis using the inside dimensions and as bid in the proposal. The unit price for junction boxes shall include all costs associated with constructing and/or installing the box including steps, castings, etc.

T-2.10.6 **HEADWALLS**:
Headwalls shall be measured on a "per each" basis for the headwall actually installed for the various ranges of pipe(s) in the headwall and as bid in the proposal unless otherwise specified in the Special Conditions section and/or in the proposal.

T-2.10.7 **CHANNEL LININGS AND OUTLET STABILIZATION**:

RIP RAP:
Rip rap shall be measured on a square yard basis for the actual quantity installed as determined by final field measurements for the various thickness(es) and type(s) specified in the Special Conditions section and/or the proposal.

T-2.10.8 **SUBDRAINS**:
Subdrains shall be measured on a linear foot basis for the actual quantity installed.

T-2.10.9 **EXCAVATION AND BACKFILL**:
No extra payment will be allowed for excavation and/or backfill required for the installation of storm drain pipes and/or structures, except that mucking required below the bedding of the pipe shall be paid for as common excavation. Where undercutting is required for the placement of stone bedding (specified by the Engineer), the cost of the undercutting shall be included in the cost of the stone bedding.

BORROW OR SELECT FILL:
When the Engineer has directed the Contractor to provide select fill (borrow) for the backfilling of pipes and structures, the borrow will be measured on a per cubic yard basis. The method of measurement shall be computed by measuring the trench to be backfilled and subtracting the volume of the pipe and structures, or at the direction of the Engineer by using truck counts and allowing a shrinkage of 20% for the voids.

TECHNICAL SPECIFICATIONS
SECTION 6: CONCRETE: PROPORTIONING, MIXING, TESTING, PLACING AND CURING **4/04/2001**

T-6.1 **GENERAL**:
Concrete shall consist of a mixture of Portland cement, aggregates and water, proportioned in accordance with the requirements of this specification. Admixtures shall be included with these primary ingredients only when specifically authorized.

T-6.02 **SPECIAL PRECAUTIONS IN FREEZING WEATHER**:

T-6.02.1 **FROZEN AGGREGATES**:
Frozen aggregates or aggregates containing lumps of frozen material shall be thawed before using.

T-6.02.2 **WORK IN FREEZING WEATHER**:
All concrete work during cold weather shall be in conformance with ACI-306R. In general, no concrete shall be placed when the ambient temperature is 40 degrees F. or below without the consent of the Engineer.

T-6.03 **PROPORTIONS AND CONSISTENCY**:
In proportioning concrete materials one (1) bag (sack) of cement shall be considered as being one (1) cubic foot volume and ninety-four (94) pounds weight.

T-6.03.1 **AGGREGATES**:
The weight per unit volume of the aggregates shall be based on dry and rodded weights determined in accordance with ASTM C-29 latest revision.

T-6.03.2 **WATER**:
Total or maximum water shall be considered as all added water, including absorbed (surface) water in the aggregates.

Water shall be measured by volume or weight. The device for the measurement of water shall be readily adjustable under all operating conditions and shall be accurate to one-half (1/2) percent or less.

T-6.03.3 **CEMENT**:
Cement shall be measured by weight when bulk cement is used and where batching it is necessary to use a portion of a bag, otherwise for bag cement, the bag weight of ninety-four (94) pounds may be used. Cement shall not be weighed in the same batch box as the aggregates, but a separate scale shall be used.

T-6.03.4 **ADMIXTURES**:
Powdered admixtures shall be measured by weight and liquid admixtures by weight or volume.

T-6.03.5 **WEIGHING HOPPERS & SCALES**:
Scales utilized in proportioning shall be either springless dial, multiple beam type, or solid-state digital strain gage transducer type. Scale gradations shall be no greater than the following:

Aggregate Scales	30 lbs
Cement Scales	6 lbs
Water Scales	6 lbs

All scale indicators shall be enclosed against moisture and dust.

Weighing equipment shall be insulated against vibration and movement of other operating equipment in the plant. When the entire plant is running, the scale reading at cut-off shall not vary more than 1 percent for cement, 1 percent for water, 1-1/2 percent for any size of aggregate, nor 1 percent for the total aggregate in any batch.

T-6.03.6 **CONSISTENCY**:
The consistency of the concrete shall be determined by the slump test, hereinafter referred to, and said mixes shall be of the consistency required by the Engineer; but the ratio of the aggregate to total aggregate shall be maintained as shown in Table 1, T-6.08.

T-6.04 **MIXING AND DELIVERY**:
All concrete under this specification shall be machine mixed in accordance with ACI 304R. Hand mixing may be allowed where the volume to be placed is less than one (1) cubic yard.

The mixing equipment shall be capable of mixing the aggregates, cement, and water within the specified time into a thoroughly mixed and homogenous mass that can be discharged without segregation.

T-6.04.1 **HAND MIXING**:
Hand mixing shall be permitted when the amount of concrete required for any job is less than one (1) cubic yard. Hand mixed concrete shall be mixed on a watertight platform or in a mortar box in batches not to exceed 1/3 cubic yards each. The aggregate shall first be spread in a uniform layer over which the required quantity of cement shall be evenly distributed. The entire batch shall be turned with shovels until the ingredients are thoroughly blended before adding the water. After adding the proper amount of water, the batch shall again be turned with shovels until a uniform consistency is obtained. Methods of hand mixing which allow the loss of mixing water will not be permitted.

T-6.05 **HANDLING AND PLACING CONCRETE**:
No concrete shall be used which does not reach its final position in the forms within one (1) hour after water is first added to the mix, except when concrete is continually agitated, when the time may be extended to one and one-half (1-1/2) hours.

T-6.06 **INSPECTION**:
Proper facilities shall be provided for the inspection and sampling of concrete at the mixing plant, loading plant and point of delivery.

T-6.06.1 **FACILITIES**:
The manufacturer shall afford the inspector, without charge to the City, all reasonable facilities for securing samples to determine if the concrete is being furnished in accordance with the requirements of this specification. All inspection and sampling shall be so conducted as not to interfere unnecessarily with the manufacture and delivery of the concrete.

6.06.2 **PLACING CONCRETE**:
Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. The use of long chutes for conveying concrete from the mixer will be permitted only on written authority of the Engineer. In case an inferior quality of

concrete is produced by the use of chutes, the Engineer may order discontinuance of their use and the substitution of a satisfactory method of placing.

Open troughs and chutes shall be of metal or metal lined; where steep slopes are required, the chutes shall be equipped with baffle boards or be in short lengths that reverse the direction of movement.

Concrete shall not be dropped more than six feet into the forms so as to avoid the segregation of aggregate and mortar.

All chutes, troughs and pipes shall be kept free from coatings of hardened concrete by thoroughly flushing with water after each run; water used for flushing shall be discharged clear of the concrete already in place.

T-6.06.3 **CONSOLIDATION OF CONCRETE (ACI 309R)**:

Concrete shall be compacted by continuous working with a suitable tool or by vibrating the forms in a manner acceptable to the Engineer; the mortar shall be flushed to the surface by the use of a suitable spading tool. If puddling cannot be done because of the obstruction of reinforcement or other cause, compacting shall be accomplished by vibrating the form in a manner satisfactory to the Engineer.

Concrete shall be placed in horizontal layers not more than twenty-four (24) inches thick except as hereinafter provided. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding batch has taken initial set to prevent injury to the green concrete and avoid surfaces of separation between the batches.

Construction joints shall be placed across regions of low shearing stress, in locations that will be hidden from view to the greatest possible extent, and at only the locations shown on the plans or as directed by the Engineer.

Re-tempering of mortar or concrete that has partially hardened with or without additional materials or water is prohibited.

All concrete shall be placed so as to be properly finished and curing begun during the daylight hours. At no time shall concrete be placed which will require the finishing, etc., to be performed by artificial light. Paving operations shall be as scheduled by the Engineer.

T-6.07 **FINISHING AND CURING OF CONCRETE**:

T-6.07.1 **FINISHING**:

BROOMED FINISH:

Concrete for curb, curb and gutter, sidewalk and driveways shall have a broomed finish. This finish shall be accomplished as follows: The surface shall be screeded and tamped with a special tool to force the coarse aggregate away from the surface, floated to bring the surface to the required finish level, steel-troweling to an even smooth surface and brooming with a fiber-bristle brush. The surface shall be of uniform texture.

SCRATCHED FINISH:

Surfaces intended to receive bonded applied cementations applications shall have a scratched finish. After the concrete has been placed, struck off, consolidated and leveled, the surface shall be roughened with stiff brushes or rakes before final set.

FLOATED FINISH:

Surfaces intended to receive roofing, weatherproofing, membranes, or sand bed terrazzo shall have a floated finish. After the concrete has been placed, struck off, consolidated, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared, and/or when the mix has stiffened sufficiently to permit the proper operation of a power-driven float.

The surface shall then be consolidated with power driven floats of the impact type except in thin sections such as pan slabs. Hand floating with wood or cork-faced floats shall be used in locations inaccessible to the power driven machine. Trueness of surface shall be rechecked at this stage with a 10-foot straightedge applied at not less than two different angles. All high spots shall be cut down and all low spots filled during this procedure to produce planes checking true under the straightedge in any direction with tolerances not exceeding 1/8-inch in ten (10) feet. The slab shall then be refloated immediately to a uniform, smooth, granular texture.

TROWELED FINISH:

Floors intended as walking surfaces or to receive floor covering shall have a troweled finish. Where a troweled finish is specified, the surface shall be finished first with impact power floats, as specified above where applicable, then with power trowels, and finally, with hand trowels. The first troweling after power floating shall be done by a power trowel and shall produce a smooth surface that is relatively free of defects that may still contain some trowel marks. Additional troweling shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be free of any trowel marks and shall be uniform in texture and appearance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.

FORMED SURFACES (RUBBED FINISH) - EXPOSED SURFACES:

Unless otherwise specified herein or noted on the contract drawings, all exposed surfaces of concrete walls, columns, beams, underside of slabs, etc., shall have a uniform rubbed finish, free from form marks, irregularities and blemishes, obtained by hand or machine rubbing employing an abrasive material such as carborundum. The finished surface shall have a smooth, even, uniform surface, color and texture. Cement washes will not be acceptable.

UNEXPOSED SURFACES:

Surfaces of walls that are three feet or more below water level and/or finished grade, and other surfaces not exposed to view, shall have fins and other projections removed.

T-6.07.2 **CURING**:

Curing shall be accomplished by preventing loss of moisture, rapid temperature change, and mechanical injury or injury from rain or flowing water for a period of seven (7) days when normal Portland cement has been used and three (3) days when high-early-strength Portland cement has been used. Curing shall be started as soon after placing and finishing as free water has disappeared from the surface of the concrete. Curing may be accomplished by any of the following methods or combination thereof, as approved. All curing shall be in conformance with ACI 308.

MOIST CURING:

Unformed surfaces shall be covered with burlap, cotton, or other approved fabric mats, or with sand and shall be kept continually wet. Forms shall be kept continually wet and if removed before the end of the curing period, curing shall be continued as on unformed surfaces, using suitable materials. Burlap shall be used only on surfaces that will be unexposed in the finished work and shall be in two layers.

WATERPROOF PAPER CURING:

Surfaces shall be covered with waterproof paper lapped four (4) inches at edges and ends and sealed with mastic or pressure-sensitive tape not less than one and one-half (1-1/2) inches wide. Paper shall be weighted to prevent displacement, and tears and holes appearing during the curing period shall be immediately repaired by patching.

MEMBRANE-CURING METHOD:

The entire exposed surface shall be covered with a pigmented membrane-forming curing compound approved by the Engineer. The curing compound shall be applied in two coats by hand operated pressure sprayers at a coverage of approximately 200 square feet per gallon for both coats. The second coat shall be applied in a direction approximately at right angles to the direction of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Concrete surfaces that are subjected to heavy rainfall within three (3) hours after the curing compound has been applied shall be resprayed by the method and at the coverage above, at no additional cost to the City.

Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for seven (7) days from pedestrian and vehicular traffic and from any other action that might disrupt the continuity of the membrane. Any area covered with curing compound and damaged by subsequent construction operations within the seven-day curing period shall be re-sprayed at no additional expense to the City.

T-6.08 **TABLE I - RECOMMENDED PROPORTIONS OF AGGREGATES**

Maximum Size of Course Aggregate – Inches	Ratio of Fine (*) to Total Aggregate on Basis of Dry, Compacted Columns, Measured Separately	
	Minimum	Maximum
3/8	0.55	0.70
3/4	0.40	0.60
1 and over	0.30	0.50

(*) NOTE: The finer the sand, the lower will be the percentage required.

T-6.09 **TABLE II - CONCRETE PROPORTIONS AND STRENGTH REQUIREMENTS**

Concrete Classification	Type of Construction	Max. Water Gal. Per Bag Cement	Min. Cement Bags per 1 Cu Yd Concrete	Min. Comp Strength Lbs Per Sq In at Age 28 Days
AA	Reinforced Piles, Thin Wall Light Structural Members Max slump - 3 1/2"	5-1/2	6-3/4	4000
A	Reinforced Retaining Walls, Sidewalks, Driveways, Curbs, Retaining Walls not Reinforced and Cradles for Sewers Max slump - 3 1/2"	6-3/4	5-3/4	3000

T-6.10 **SAMPLING AND TESTING**:
All sampling, curing and testing of Portland cement concrete shall be in accordance with the current A.S.T.M. and ACI Standards. Not less than three cylinders shall be taken for testing at any one time. Unless otherwise directed by the Engineer, a minimum of one cylinder shall be taken for breaking at seven days and two cylinders taken for breaking at twenty-eight (28) days from each batch to be tested. The cost of concrete for samples is to be considered incidental to the project.

TECHNICAL SPECIFICATIONS
SECTION 7: CONCRETE CURBING AND CONCRETE CURB AND GUTTER

10/19/2001

T-7.01 **SCOPE**:
The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the construction of concrete. Curbing is to include combination curbing, gutters, driveway gutters, curb returns, slope face curb, vertical curb, header curb, and other related structures shown on the drawings and as required by the Engineers in accordance with these specifications. Prior to any work, the Contractor shall comply with the provisions of Paragraph G-1.52.

T-7.02 **GENERAL**:
Concrete for curbing and other related structures shall be Class "A" concrete, proportioned, mixed, tested and placed as specified, in Section 6, "Concrete, Proportioning, Mixing, Testing and Placing."

The alignment and grade of the curbing will be established by means of off-set stakes by the Engineer, and the completed work shall accordingly conform thereto. The Contractor's foreman or form-setter shall carefully watch all alignment and grades to detect any errors in grade or alignment. In the event any of the curbing is damaged from any cause or proves defective in any way, or is out of alignment or grade, the Contractor shall remove such sections and replace at his own expense.

Concrete **shall not** be placed in the forms for curbing until the forms and subgrade have been tested, inspected, and approved by the Engineer.

T-7.02.1 **JOINTS**:
Construction joints shall be spaced at ten (10) foot intervals, except that a fifteen (15) foot spacing may be used when a curbing machine is used. Construction joints may be installed by the use of templates or formed by other approved methods. Where such joints are not formed by template, a minimum depth of one and one-half (1-1/2) inches shall be obtained.

Expansion joints filler shall be spaced at thirty (30) foot intervals, except that a ninety (90) foot spacing may be used where a machine is used. Expansion joint filler shall be one half (1/2) inch thick and have same dimensions as the curb section and conform to Materials Section T-14.20.1

Expansion joints filler shall be adjacent to all rigid objects.

T-7.03 **EXCAVATION AND SUBGRADE PREPARATION**:
Excavation and subgrade preparation for concrete curbing shall be in strict compliance with Technical Specifications Section I, Excavation, Grading and Backfilling.

T-7.04 **FORMS**:
Wooden or steel forms, satisfactory to the Engineer, shall be used for the construction of curbing. They shall be set true to alignment and grade as established by the Engineer, and substantially braced. Metal templates, not more than three-sixteenth (3/16) inch in thickness and manufactured in accordance with the curbing section, shall be set in the

places provided in the forms not more than ten (10) feet apart, as directed by the Engineer. The forms and templates shall be thoroughly cleaned and oiled after each operation. Templates shall be adjusted under the supervision of the Engineer so as to prevent short sections (less than 5 feet).

When back and front forms have been set to exact grade and secured, the dividing plates shall be inserted and trued up. With these forms as templates, fine grading to exact subgrade elevation shall be completed by hand. Face forms shall then be set. The Contractor shall at all times have at least one hundred (10') feet of forms set and grade tested and approved by the Engineer, ahead of pouring operations. He shall use every effort to observe any possible misalignments in grades and shall call such to the attention of the Engineer promptly.

T-7.05 **SECTIONS**:

Combination curbing shall be of the vertical curb type, conforming to the dimensions shown in the Standard Details of these specifications.

Slope-face curb shall conform to the dimensions shown in the Standard Details of these specifications.

The minimum thickness for curbing shall be six (6) inches in the cross-sections.

T-7.06 **CONSTRUCTION**:

Concrete curbing shall be constructed of Class "A" concrete. All materials incorporated shall conform to the provisions as set out hereinbefore and shall be mixed and deposited in accordance with the requirements of these specifications and the Engineer. The forms for combination curbing shall be placed in accordance with the proper alignment and grade as established by the Engineer, and all attachments, templates, stakes, bracings, etc., shall be securely set in place prior to depositing of concrete. Careful check will be made of all forms prior to pouring and the Contractor shall obtain a visual inspection and approval of all forms prior to depositing concrete therein. Such approval, however, shall not be grounds for claims by the Contractor for additional work in replacing any faulty work poured in forms approved by the Engineer or his authorized assistants.

When sufficient concrete has been placed in the forms, it shall be well spaded along areas in contact with the forms in order to eliminate all honeycombing and floating the proper alignment and grade, after which it shall be toweled smooth and very lightly brushed. Templates shall be removed by stages, but not entirely until the concrete has become thoroughly hard. After removal of the templates, there must be a clear division throughout between these sections. Edging tools will be used to form an edge along the back and front form and at each template.

All concrete pours shall terminate at a template. If pouring is to be resumed within one hour or less, any excess concrete that exists after the template has been reached may be spread in the bottom two (2) inches of the gutter form adjoining the completed curb or disposed of, as directed by the Engineer.

At catch basins, there will be a short section of gutter only, the curbing being replaced by the casting. The catch basin casting shall be parallel with, and on the grade of the back form of the curbing section. The gutter area shall be so shaped and sloped as to increase in slope toward the curbing to an extent that when opposite the catch basin casting, it will provide an eight (8) inch clear opening below the casting top. This warped section at, and adjacent to, each catch basin shall have the exact same finish texture as

that of the other curbing present and shall be poured at the same time where possible. A double ply of 30-pound building felt shall be inserted on all sides of catch basin casting covers that come in contact with any concrete. No felt shall be placed against catch basin leg castings.

The use of excessive grout (mud) continuously along the curbing section will not be tolerated. The use of "mules" shall be limited to obtaining the desired finish--they should not be allowed to alter the section of the curb. No floating and little or no troweling should be necessary against the curb face in order to obtain a true and proper section.

Such section should be obtained with the curb face form board, the alignment of which must be extremely good. (1/8 inch for every 6 feet) (1/4 inch for every 10 feet)

T-7.07 **CURBING AT STREET AND DRIVEWAY CORNERS**:
The curbing at street corners shall be constructed on a thirty-five (35) foot radius unless otherwise instructed. At driveways the curb and gutter shall be constructed on a three foot radius unless otherwise directed by the Engineer.

T-7.08 **CONCRETE CURBING, CURING AND FINISHING**:
Concrete curbing will be finished in strict compliance with these specifications as stated in Section 6, “Concrete, Proportioning, Mixing, Testing, and Placing.”

T-7.09 **BACKFILLING OF CURBING**:
Backfilling of curbing shall be in strict compliance with the specifications as stated in Section 1, “Excavation.”

T-7.10 **MEASUREMENT**:
Measurement of combination curbing shall be by actual linear feet of curbing measured at the bottom of the face of the curb, including that area across catch basins. Where driveways occur, the curbing measurement shall continue across driveways, and that area from a line drawn one foot behind the face of the curb extended, or the gutter line shall be paid for as curbing. The remaining driveway between this line and the property line shall be paid for as six (6) inch concrete driveway at the price bid in the proposal. That portion of the driveway return behind the line drawn one foot from the face of the curb shall be converted to equivalent flat area (0.4 sq yd for 4-1/2 ft. radius-0.3 sq yd for 3 ft. radius) and paid for as six (6) inch concrete driveway.

T-7.11 **PAYMENT**:
The quantity of combination curbing, measured as hereinbefore specified, will be paid for at the contract unit price for the cross section shown on the drawings or standard detail. The price paid per linear foot for curbing shall include full compensation for furnishing all labor, materials, tools, and equipment, and doing all the work involved in preparing the subgrade for these structures and constructing the curbing complete-in-place, as hereinbefore specified, including furnishing and placing all expansion joint filler.

T-7.12 **TREE PROTECTION PROCEDURES (AP 88-1)**:

T-7.12.1 **PURPOSE**:
The purpose of this policy is to outline the procedures to be used in determining how to accomplish concrete repair work when there is a conflict with trees located in the public right-of-way.

T-7.12.2 **PROCEDURES FOR SIDEWALK REPAIR WORK**:

If a problem with a tree is encountered when trying to accomplish sidewalk repair the first course of action will be to determine if there is enough room in the public right-of-way between the property line and the tree roots to cobble the sidewalk around the tree roots and still provide a sidewalk that is at least three (3) feet wide. If there is not enough room in the public right-of-way to do this, the next course of action will be to use asphalt for the sidewalk material instead of concrete and lay the asphalt over the tree roots. The installation of the asphalt sidewalk should be done in such a way that a safe sidewalk results in terms of smoothness and slope. When asphalt is used it should be sprinkled with dried cement or a similar material to lighten the appearance so it blends in as well as possible with the concrete sidewalk adjacent to it. The final course of action will be to remove the tree if conditions warrant such removal.

The Street Division will contact the Parks Division to determine if conditions exist that warrant tree removal. Examples of such conditions could be: the tree is already dead or dying and poses a threat to public safety, the tree roots are too large for the plaza area afforded and are causing severe sidewalk and/or curb damage.

It is understood that under this procedure tree roots will **NOT** be cut in order to repair damaged sidewalks unless both the Parks Division and the Streets Division agree that this is a viable course of action due to the circumstances of the situation.

T-7.12.2 **PROCEDURES FOR OTHER CONCRETE REPAIR WORK**:

The Streets Division will contact the Parks Division when curb and gutter repair or any other type of concrete repair work is needed due to damage caused by tree roots. Together the Divisions will determine the course of action to be followed in addressing the situation. Possible courses of action may include: doing nothing, repairing the concrete material with another material such as asphalt, or removing the tree.

TECHNICAL SPECIFICATIONS
SECTION 8: CONCRETE SIDEWALKS & DRIVEWAYS **10/19/2001**

T-8.01 **SCOPE**:
The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the construction of Portland cement concrete sidewalks and driveways, complete, in strict accordance with this section of the specifications, and the applicable drawings. IMPORTANT: SEE PARAGRAPH G-1.52.

T-8.02 **GENERAL**:
Concrete for sidewalks and driveways shall be Class A Concrete proportioned, mixed, tested and placed, in strict accordance with the specifications given in Section 6, "Concrete Proportioning, Mixing, Testing and Placing," and Section 14, "Materials."

The alignment and grade of sidewalks will be established as directed by the Engineer. The normal cross-section, as shown on the drawings, will be followed. Generally, the alignment and grade of the sidewalks will be determined from the previously placed concrete curb and gutter. Typical sections will be deviated from only where directed by the Engineer. Driveways shall connect the openings in the curb and gutter and extend across to the back edge of the sidewalks as shown on the drawings. In the event any of the sidewalks or driveways are damaged from any cause, or prove defective in any way, or are out of alignment or proper grade, the contractor shall remove such sections and replace at his own expense. No driveways shall be less than twelve (12) feet wide, clear width, except where specifically designated by the Engineer.

Concrete shall not be placed in the forms for sidewalks and driveways until the forms and subgrade have been tested, inspected and approved by the Engineer.

T-8.03 **EXCAVATION AND SUBGRADE PREPARATION**:
Excavation and subgrade preparation for concrete sidewalk and driveways shall be in strict compliance with the specifications as stated in Section 1, Paragraph T-1.04.3.

T-8.04 **FORMS**:
Forms shall be of wood or metal, straight and free from warp, and of sufficient strength to resist springing during the process of depositing and consolidation of the concrete. The width of the forms for sidewalk and driveways shall be equal to the full depth of the sidewalk or driveway. Forms shall be securely staked and braced true to the line and grade set by the Engineer. Suitable metal or wooden division plates shall be provided to completely separate adjacent slab during construction. Forms shall be cleaned and well oiled before being set.

T-8.05 **WIDTH AND THICKNESS**:
The width and thickness of walks and driveways, and the specific size of slabs, shall be as shown on the drawings or as directed by the Engineer. Sidewalks shall be marked in sections with a proper lining tool so as to form squares the size of which will depend upon the width of the walks. The edges of driveways will be worked with an edging tool and will be sectioned into squares or marked as shown on the plans and details, or as directed by the Engineer.

All sidewalks shall be constructed to the uniform thickness of four (4) inches. Driveways shall have a uniform thickness of six (6) inches, including that section which crosses the sidewalk area.

T-8.06 **CONSTRUCTION OF SIDEWALKS AND DRIVEWAYS**:

After the forms have been set, the Engineer shall inspect the form for proper line and grade and shall check the subgrade for proper compaction before allowing any concrete to be placed. Concrete for sidewalks and driveways shall be Class "A" concrete. All materials incorporated in this concrete shall conform to the provisions as set out hereinbefore and shall be mixed and deposited in accordance with the requirements of these specifications. When sufficient concrete has been deposited in the forms, it shall be well "spaded" along all areas in contact with the forms in order to eliminate all "honeycombing." Sidewalks shall be "scored" (1 inch deep) in sections equal to the width or as directed by the Engineer. If a sidewalk is greater than six (6) feet in width, scoring shall be as directed by the Engineer. All "scores" shall be straight and rounded at the surface with the proper edging tool, or as directed by the Engineer. Expansion joint shall be installed for every thirty (30) linear feet of sidewalk, against all structures, pavement and curbs, and at such other places as shown on the plans and details, or as directed by the Engineer.

All concrete pours shall terminate at a template. If pouring is to be resumed within one hour or less, any excess concrete that exists after the template has been reached may be spread in the bottom two (2) inches of the adjoining sidewalk section, or disposed of if directed by the Engineer.

The Engineer shall require any concrete that fails to meet the required compressive strength for Class "A" concrete after 28 days to be removed from any portion of a sidewalk or driveway and be replaced at the Contractor's own expense.

T-8.07 **CONCRETE CURING AND FINISHING**:

The curing and finishing of concrete sidewalks and driveways shall be in strict compliance with the specifications as stated in Section 6, "Concrete Proportioning, Mixing, Testing and Placing."

T-8.08 **MEASUREMENT**:

Concrete sidewalk and driveways shall be measured by area in square yards. The measurement of four (4) inch concrete sidewalk shall be by actual field measurement and shall not include that portion of six (6) inch concrete where driveways cut across the sidewalk area. This area shall be measured as six (6) inch concrete driveway. Driveway measurement shall include all six (6) inch concrete between the property line and a line drawn one foot behind the face of curb or gutter line for types "A" and "B" curb returns, that portion of the radii falling within this area shall be converted to equivalent six (6) inch concrete (0.4 sq. yd. for each 4-1/2-ft. radius and 0.3 sq. yd. for each 3-ft. radius) and paid for as six (6) inch concrete driveway.

Where type "D" curb is used and driveway returns (2-ft. radii) are installed, the six (6) inch concrete driveway shall be measured from the back of curb to the property line (or where directed to end by the Engineer).

T-8.09 **PAYMENT**:

The quantity of four (4) inch sidewalk and six (6) inch driveways measured as hereinbefore specified, will be paid for at the applicable contract unit price. The price per square yard shall include full compensation for furnishing all labor, materials, tools and equipment and doing all work involved in excavating, backfill and preparation of the subgrade for sidewalks and driveways, and constructing sidewalks and driveways complete-in-place, as hereinbefore specified.

T-8.10 **TREE PROTECTION PROCEDURES (AP 88-1)**:

T-8.10.1 **PURPOSE**:

The purpose of this policy is to outline the procedures to be used in determining how to accomplish concrete repair work when there is a conflict with trees located in the public right-of-way.

T-8.10.2 **PROCEDURES FOR SIDEWALK REPAIR WORK**:

If a problem with a tree is encountered when trying to accomplish sidewalk repair the first course of action will be to determine if there is enough room in the public right-of-way between the property line and the tree roots to cobble the sidewalk around the tree roots and still provide a sidewalk that is at least three (3) feet wide. If there is not enough room in the public right-of-way to do this, the next course of action will be to use asphalt for the sidewalk material instead of concrete and lay the asphalt over the tree roots. The installation of the asphalt sidewalk should be done in such a way that a safe sidewalk results in terms of smoothness and slope. When asphalt is used it should be sprinkled with dried cement or a similar material to lighten the appearance so it blends in as well as possible with the concrete sidewalk adjacent to it. The final course of action will be to remove the tree if conditions warrant such removal.

The Street Division will contact the Parks Division to determine if conditions exist that warrant tree removal. Examples of such conditions could be: the tree is already dead or dying and poses a threat to public safety, the tree roots are too large for the plaza area afforded and are causing severe sidewalk and/or curb damage.

It is understood that under this procedure tree roots will **NOT** be cut in order to repair damaged sidewalks unless both the Parks Division and the Streets Division agree that this is a viable course of action due to the circumstances of the situation.

T-8.10.2 **PROCEDURES FOR OTHER CONCRETE REPAIR WORK**:

The Streets Division will contact the Parks Division when curb and gutter repair or any other type of concrete repair work is needed due to damage caused by tree roots. Together the Divisions will determine the course of action to be followed in addressing the situation. Possible courses of action may include: doing nothing; repairing the concrete material with another material such as asphalt; or removing the tree.

TECHNICAL SPECIFICATIONS
SECTION 10: FINE & COARSE AGGREGATE BASE COURSE 1/20/2000

T-10.01 **SCOPE**:

BASE COURSE:
The Contractor for this section shall furnish all materials, labor, equipment and plant necessary for, and to complete in place as shown on the drawings or in the specifications and as directed by the Engineer, the pavement base course of the thickness specified on the plans and in the Project Specifications. Placing, shaping, compacting and reworking of the base course is included in this section. Excavating and grading shall be in conformity with the Section of these specifications entitled, "Excavation, Grading and Backfill."

T-10.02 **BASE COURSE MATERIALS**:
Base course for bituminous concrete pavement shall be fine aggregate, coarse aggregate, or soil cement as shown herein or as shown on the Contract Plans.

T-10.02.1 **FINE AGGREGATE BASE COURSE MATERIAL**:
Fine aggregate base course material shall consist of a mixture of clay, silt, fine and coarse sand and gravel so proportioned as to meet the requirements of these specifications.

The fine aggregate mixture shall be free from vegetative matter and lumps or balls of clay, and shall meet the requirements for Type "A" grading given below, using A.A.S.H.T.O. Method T-88.

TYPE "A": This fine aggregate type shall not contain more than 35 percent of aggregate passing the two (2) inch and retained on the No. 10 sieve, and its soil mortar (material passing the No. 10 sieve) shall conform to the following grading requirements:

SIEVE DESIGNATION	PERCENTAGE BY WEIGHT PASSING
No. 10	100
No. 40	40-75
No. 200	12 - 35

The fraction passing the No. 200 sieve shall be less than two-thirds the fraction passing the No. 40 sieve. The material passing the No. 40 sieve shall have a plasticity index not greater than six and a liquid limit not greater than twenty-five, when tested in accordance with A.A.S.H.T.O. Methods T-89, T-90 and T-91.

T-10.02.2 **COARSE AGGREGATE BASE COURSE MATERIAL**:
Coarse aggregate base material shall consist of crushed stone, crushed or uncrushed gravel, crushed or uncrushed shell rock or other inert materials having similar characteristics, so proportioned as to meet the grading requirements as specified below, using A.A.S.H.T.O. Method T-88:

SIEVE DESIGNATION	PERCENTAGE BY WEIGHT PASSING
1-1/2 inch	100
1 inch	80 - 95

1/2 inch	60 - 75
No. 4	40 - 55
No. 10	28 - 43
No. 40	15 - 27
No. 200	5 - 12

The material passing the No. 200 sieve shall be not more than two-thirds the percentage passing the No. 40 sieve.

The fraction retained on the No. 4 sieve prior to spreading on the road shall meet the following requirements:

1. When tested in accordance with the A.A.S.H.T.O. method T-96, test grading A, it shall show a loss of not greater than 55 percent.

2. The material passing the No. 40 sieve obtained from the above test shall have plasticity index not greater than 6, and liquid limit not greater than 30, when tested with A.A.S.H.T.O. Method T-89, T-90, T-91 and modification of the Liquid Limit Test.

3. When subjected to five alternations of the soundness test, A.A.S.H.T.O. Method T-104, using sodium Sulphate, the weighted average loss shall not be more than 15 percent.

The material passing the No. 4 sieve prior to spreading on the road shall meet the following requirements:

1. The material passing the No. 10 sieve shall meet the following grading requirements:

SIEVE DESIGNATION	**PERCENTAGE BY WEIGHT PASSING**
No. 10	100
No. 40	40 - 85
No. 200	12 - 35

2. The fraction passing the No. 40 sieve shall have a plasticity index of not greater than 6, and a liquid limit not greater than 30, when tested in accordance with A.A.S.H.T.O. Methods T-89, T-90, T-91 and modification of the Liquid Limit Test.

3. The materials passing the No. 200 sieve shall not be more than two-thirds the percentage passing the No. 40 sieve.

4. The fraction passing the No. 10 sieve shall consist of a mixture of screenings or sand, silt, and clay, and it may occur as topsoil meeting the requirements without mixture; or it may be deficient in one or more of the ingredients, coarse or fine sand or screenings, silt, or clay, in which case the required ingredients must be incorporated; or it may consist of crushed decomposed rock which shall meet the requirements stipulated in 1, 2, and 3 above.

After the base course has been completed, that portion of the material which passes the No. 40 sieve shall have a plasticity index of not greater than 6, and a liquid limit of not greater than 30, when tested in accordance with A.A.S.H.T.O. Methods T-89, T-90, T-91 and the modification of the Liquid Limit Test.

T-10.02.3 **SOIL CEMENT BASE COURSE MATERIAL**:

Soil cement base material shall consist of Portland cement and soil in accordance with Section 541, Standard specifications for roads and structures of the N.C. Department of Transportation.

Portland cement shall conform to the requirements of ASTM designation C 150 Type I. Soil for the soil cement mixture shall be existing in place material, except that any rubble or lumps existing or uncovered during mixing which is larger than 3 inches in diameter shall be removed from the site and the maximum allowable volume of these lumps for any square foot of base surface shall not be greater than 50 percent of the base volume. If additional soil is required to bring the base course to grade, the material shall be provided by the Contractor at no additional cost to the owner and shall be clean, sandy soil-free of organic matter with allowable clay content of 0 to 5 percent. The entire soil mixture shall be classified generally as cohesionless soil.

Cement shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Any material that has deteriorated or has become lumpy from water intrusion shall not be used.

The soil cement mixture shall be proportioned with cement volume being 14 percent of soil volume.

Before applying cement remove all vegetation and foreign material and blade finish to a fairly level surface so that cement application may be uniformly distributed.

T-10.02.4 **SOURCE OF MATERIALS**:

Material for the base course shall be obtained from sources selected by the Contractor, subject to the approval of the Engineer.

T-10.02.5 **SAMPLING AND TESTING**:

All test samples shall be taken by the Engineer and all tests will be made by the City at no cost to the Contractor.

T-10.02.6 **WATER**:

Water, if used in construction, shall be free from oil and other deleterious matter and shall be subject to the approval of the Engineer.

T-10.03 **EQUIPMENT**:

All plant, equipment, tools, and machines used in the performance of the work covered by this section shall be subject to the approval of the Engineer, and shall be maintained in satisfactory working condition at all times.

T-10.03.1 **POWER ROLLERS**:

The rollers shall be self-propelled, three-wheel type, weighing not less than ten (10) tons, and having a minimum weight of 300 pounds per inch width of rear wheel. The wheels shall be equipped with adjustable scrapers.

T-10.03.2 **TAMPING ROLLERS**: (sheepsfoot type)

Tamping rollers shall consist of one or more units. Each unit shall consist of a watertight cylindrical drum not less than forth-eight (48) inches in length, surmounted by metal studs with tamping feet projecting not less than seven (7) inches from the surface of the drum, and spaced not less than six (6) nor more than ten (10) inches, measured diagonally from center to center. The tamping feet shall be an approved type suitable for compacting stabilized aggregate base courses. Each unit shall be equipped with a suitable device for cleaning the tamping foot. The rolling units of multiple type tamping rollers shall be pivoted on the main frame in a manner which will permit the units to adapt themselves to uneven ground surfaces and to rotate independently. When fully loaded, the roller shall produce at least 300 pounds per square inch on the combined areas of the tamping feet in contact with the ground.

T-10.03.3 **VIBRATING WHEEL ROLLERS**:

Vibrating wheel rollers shall consist of a self-propelled or trailer-type drum wheel roller having a weight of not less than 300 lbs. per inch of wheel width and having a vibrator motor unit capable of causing an effective vibration of soils being compacted.

T-10.03.4 **BLADE GRADERS**:

Blade graders shall have a wheel base of not less than 15 feet, a blade of not less than 10 feet, and shall be self-propelled.

T-10.03.5 **RUBBER-TIRED ROLLERS**:

The rubber-tired rollers shall consist of two axles on which are mounted not less than nine (9) pneumatic-tired wheels in such a manner that a rear group of tires will not follow in the tracks of the forward group. The axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. The tires shall be uniformly inflated. The rollers shall be weighted as directed by the Engineer. The tractor or other towing equipment shall also be pneumatic-tired.

T-10.03.6 **TRAVELING MIXED PLANTS**:

Traveling mixing plants shall be so designed and constructed that they will pick up the windrowed aggregate without damaging the subgrade or leaving any portion of the windrow on the subgrade. Machines shall be mounted on pneumatic-tired wheels or smooth-tread crawler type tracks of such width that, when the plant is fully loaded, they will not cut or damage the subgrade. The equipment for proportioning the aggregates and water shall accurately measure the specified amounts of the materials while the machine is in operation. Each plant shall be capable of producing a uniform mixture without loss of the aggregate and shall have capacity of not less than 100 tons of mixed material per hour.

T-10.03.7 **SPRINKLING EQUIPMENT**:
The sprinkling equipment shall consist of tank trucks, pressure distributors, or other equipment designed to apply water uniformly and at controlled quantities to variable widths of surface.

T-10.03.8 **DISKS**:
Disks shall be of the tandem type, and shall be constructed so as to prevent any cutting of the subgrade during mixing operations.

T-10.03.9 **PLOWS**:
Plows shall be of the multiple-furrow type, and shall be so designed that the depth of furrow can be accurately controlled.

T-10.03.10 **HAULING EQUIPMENT**:
Hauling equipment shall consist of pneumatic-tired vehicles having dump bodies suitable for dumping materials in windrows or in layers on the subgrade of select-material base course.

T-10.03.11 **TAMPERS**:
Hand tampers shall weigh not less than fifth (50) pounds and shall have a face area of not more than one-hundred (100) square inches. Mechanical tampers shall be of an approved type.

T-10.03.12 **MISCELLANEOUS EQUIPMENT**:
Scarifiers, tractors, spring-tooth or spike-tooth harrows, windrow equalizers, spreaders, and other equipment shall be of approved type, suitable for constructing stabilized aggregate base courses.

T-10.04 **OPERATION OF PITS**:
All work involved in the clearing, stripping and excavating, in addition to the processing and blending, in the opening and operation of new pits, or in the operation of approved existing pits, shall be performed by the Contractor. The methods of operating the pits and the processing and blending of the material may be changed or modified by the Engineer without adjustments in the contract unit prices, when such action is necessary in order to obtain material conforming to the specified requirements.

T-10.05 **STOCKPILING MATERIAL**:
Approved material available from the excavation and grading operations shall be stockpiled in the manner and at the locations designated by the Engineer. Prior to stockpiling of material, the storage sites shall be cleared and leveled by the Contractor. When aggregate or binder material obtained from other sources is to be stockpiled, such materials shall be separately stockpiled in a similar manner on the cleared and leveled areas designated by the Engineer.

T-10.06 **WEATHER LIMITATIONS**:
Stabilized aggregate base courses shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees F., it

shall be the responsibility of the Contractor to protect all areas of completed base course against any detrimental effects, by methods approved by the Engineer. Any areas of completed base course that are damaged by freezing, shall be reconditioned, reshaped and recompacted by the Con-tractor in conformance with the requirements of this specification without additional cost to the City.

T-10.07 **PREPARATION OF SUBGRADE**:

Prior to constructing the base course, curb and gutter shall have been constructed and cured; the previously constructed subgrade shall be dry and cleaned of all foreign substances. The surface of the subgrade will be inspected by the Engineer for adequate compaction and surface tolerances. Any ruts or soft-yielding spots that may appear in the subgrade, any areas having inadequate compaction, and any deviations of the surface from the requirements set forth therein shall be corrected by loosening, removing, and adding approved material, reshaping, and recompacting the affected areas to line and grade, and to the specified density requirements at the Contractor's expense.

T-10.08 **PLACING AND MIXING OF MATERIAL**:

The base material shall not be dumped directly onto the subgrade from trucks. Dumping shall be either on old pavement or on material already dumped and spread, and material shall be spread by means of bulldozers or graders of a size suitable for such spreading. Spreading will begin at the point nearest the source of supply and all hauling shall be over the material dumped and spread. Constant machining shall accompany the traffic in order to prevent rutting and to provide for even compaction. Hauling shall be distributed over the entire width of the street. Any portions of the layer spread that become segregated shall be remixed by scarifying and the addition of new material to produce a satisfactory blend of materials.

T-10.09 **MANIPULATION AND COMPACTION**:

After sufficient material has been placed on the sub-grade to obtain the specified thickness of base, it shall be well rolled and machined until thoroughly compacted. Frequent template checks shall be made to ensure that a minimum amount of patching is necessary after complete compaction is secured. If patching is required, the base material in place shall be scarified to ensure adequate bonding together of previously placed base and new material. The base course shall be compacted its full depth to at least 95 percent of the density at optimum moisture, as determined by ASTM D 698, latest revision.

T-10.10 **EDGES OF BASE COURSE WHEN CURB OR SIDE ARE NOT USED**:

Earth or other approved material shall be placed along the edges of the base course in such quantity as will compact to the thickness of the course being constructed, or, when the course is being constructed in two or more layers, to the thickness of each layer of the course, allowing in each operation at least a one (1) foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the base course, as approved by the Engineer.

T-10.11 **SMOOTHNESS TEST**:

The surface shall not show any deviations in excess of 3/8 inch when tested with a 10-foot straight-edge applied parallel with and at right angles to the centerline of the paved area. Any deviation in excess of this amount shall be corrected by the Contractor by loosening, adding or removing material, reshaping, watering, and compacting as directed by the Engineer. When the base course is to be constructed in more than one layer, the smoothness requirements specified above shall apply only to the top layer. The surface of the underlying layers shall be finished as directed by the Engineer.

T-10.12 **THICKNESS**:

Compacted thickness of base course shall be shown on the plans and as specified in the Project Specifications. The Contractor will be responsible for securing this final compacted thickness in all cases.

T-10.13 **MAINTENANCE**:

Areas of roadway where base material has been placed will be kept constantly in a moist condition by wetting until final grading and surfacing to prevent dust. No means but wetting shall be used for such dust control. Traffic shall be kept off the base after final compaction and cross-section has been attained, just before surfacing.

T-10.14 **METHOD OF MEASUREMENT**:

T-10.14.1 **SQUARE YARDAGE**:

The square yardage of base course shall be the number of square yards of completed and accepted base course determined by the Engineer.

T-10.14.2 **TONNAGE**:

When called for in the Proposal, some coarse aggregate base may be used for "tie-ins" at intersections and at other points where a standard thickness base cannot be used. Where this item is called for and used, it will be measured by tons actually placed.

T-10.15 **BASIS OF PAYMENT**:

Base course shall be paid for at the contract price per square yard or ton, which payment shall constitute full compensation for the construction and completion of the base course, including: the preparation of sub-grade; furnishing all materials, supplies, equipment and tools; the handling, mixing, manipulation, placing, shaping, compacting, rolling, finishing, and the correcting of unsatisfactory areas and mixtures; the furnishing and application of water; the placing and compacting of portions of the shoulders at edges of base course; and the furnishing of all other labor and incidentals necessary for and incidental to the work required by this section of the specifications.

T-13.01 **GENERAL**:

The Contractor shall maintain all work areas within and outside the project boundaries free from environmental pollution that would be in violation of any Federal, State or local regulations.

T-13.02 **STORM WATER CONTROL AND PERMIT**:

All construction activities disturbing one than 1 acre of land are subject to stormwater permitting as required by the U.S. Environmental Protection Agency and North Carolina Division of Water Quality (DWQ) for a NPDES permit (National Pollution Elimination Discharge System). Contractor shall comply with the applicable conditions of the Stormwater Permit including, where necessary, implementation of the Erosion and Sedimentation Control (E&SC) plan, maintenance of control facilities and preventing pollution.

In addition to the E&SC plan, stormwater protection includes prevention of contamination from equipment and debris used during construction. This includes preventing spills of oil, fuels, coolants, and fluids, following proper and legal use of herbicides, pesticides and fertilizers and disposing of construction debris, materials, litter and sanitary waste.

T-13.03 **EROSION AND SEDIMENT CONTROL**:

All work shall comply with the regulations of the North Carolina Sedimentation Control Act of 1973, and all subsequent amendments. An erosion and sedimentation control (E&SC) plan must be submitted at least 30 days before land disturbance activities begin on any site 1 acre or larger. The E&SC is a component of the Stormwater Permit and the intent of the law requires installation and maintenance of sufficient erosion control facilities to retain sediment within the boundaries of the site. Primary requirements include: a sufficient buffer zone along any natural watercourse or lake where sediment is captured within the first 25% of the zone; groundcover of disturbed areas must be provided within 15 working days or 90 calendars, whichever is shorter; graded slopes must be vegetated or stabilized within 21 calendar days. The contractor shall implement and install all control facilities included on the approved E&SC plan for this project and conduct appropriate monitoring and inspection of the BMP's and outfalls.

Contractor shall keep on-site the following: Copy of E&SC plan and amendments; a rain gauge; records of rainfall amounts and dates; records of inspections for E&SC control facilities; and records of observations of streams and stormwater outfalls.

Contractor is required to complete and submit a Stormwater Inspection Report through the duration of the project where land disturbing activities have taken place. Inspection of E&SC control facilities shall take place a minimum of once per week and after any storm event one-half inch or greater (during 24-hr period). Contractor must observe the condition of the streams and run-off at stormwater outfalls for the characteristics included in the permit and listed on the sample form 'Stormwater Inspections for General Permit NCG010000 – Land Disturbing Activities

Contractor is required to notify project manager and or inspector whenever any deficiencies in the E&SC plan are noted as inadequate or when large amounts of sediment in the stream are observed. Contractor is required to immediately prioritize and address any damage or deficiencies to the BMP's in regards to managing sedimentation; such activities include addressing findings from inspections and periodic maintenance of facilities including construction entrances.

The contractor shall perform operation & maintenance activities for E&SC facilities as necessary. Such activities may include: regular cleaning of sedimentation basins; stabilizing eroded banks or spillway structures; repairing or cleaning of inlet and outlets; repairing of piping or equipment as necessary; and repairing of damage to silt fencing.

T-13.04 **AREAS UNDER ACTIVE CONSTRUCTION**:

No disturbed area shall be left bare for more than fifteen (15) working days or ninety (90) calendar days, whichever is shorter, unless it is under active construction, at which point it may be necessary to install silt fences or other temporary erosion and sedimentation control facilities to prevent off-site sedimentation damage.

T-13.05 **EROSION & SEDIMENTATION CONTROL BMP'S**:

When construction activities necessitate a modification or addition of an erosion control facility to prevent off-site sedimentation, the contractor shall utilize available BMP's. Such facilities may consist of vegetative cover, inlet protection and sediment traps such as sod, straw bales, seeding, fiber mats or tubes, woven plastic filter cloths, mulches, bituminous spray, rip rap or stone, silt fence, sediment basins and other erosion control facilities as approved by the Engineer prior to installation.

T-13.06.1 **SEEDING AND GROUND COVER**:

Contractor shall be aware of surface and soil conditions necessary for proper application prior to installation.

1. Materials:

(a) Seed: All seed used shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act currently in effect. All seed shall be furnished in scaled standard containers, unless exception is granted by the Engineer. Seed that has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable.

SCHEDULE OF SEED MIX

Kind of Seed	Percent of Mix
Bermuda Grass	35%
Centipede Grass	10%
Creeping Red Fescue	30%
Winter Rye (Grain)	25%
Guaranteed Germination	not less than 85%
Guaranteed Purity	not less than 96%

Note: The total percentage by weight of material other than grass seed in the above mixes shall not exceed 5 percent. This material shall include all non-viable seed, chaff, hulls, live matter, and weed seed.

(b) Fertilizer shall be 8-8-8 Commercial grade uniform in composition, free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled; conforming to the fertilizer laws of the State of North Carolina and bearing the name, trade name, or trade mark and warranty of the producer.

(c) Lime shall be ground limestone, not less than 85 percent of total carbonates, and shall be ground that at least 50 percent will pass through a 100 mesh sieve, and at least 90 percent will pass through a 20 mesh sieve.

2. Application

(a) Application of Fertilizer: Fertilizer shall be distributed uniformly at the rate of 4 pounds per 100 square feet over the areas to be seeded, and shall be incorporated into the soil to a depth of at least two (2) inches.

(b) Application of lime: Lime shall be distributed uniformly at a rate of 10 pounds per 100 square feet over the areas to be seeded, and incorporate into the soil along with the fertilizer to a depth of two (2) inches.

(c) Broadcast Seeding: Seed, if broadcast, shall be distributed by use of mechanical hand-operated sowing equipment at the rate of five (5) pounds of specified seed mix per 1,000 square feet. The seed shall be uniformly distributed over the designated areas. Broadcast seeding shall not be done during windy weather. Seed shall be covered to a depth not to exceed one-eighth (1/8) inch.

3. Maintenance and Growth: The Contractor will maintain, repair, replace where washouts occur, and water until a uniform growth of two (2) inches or higher is generally uniform on planted areas.

T-13.06.2 **SODDING:**

1. General: In order to establish vegetation in critical areas, such as slopes, drainage-ways, and channels, sodding may be required as shown on the plans or required in the Special Conditions.

2. Materials:

a) Sod type shall be Bermuda grass unless specified otherwise in the Special Conditions. The sod shall be of know origin, free of weeds, disease, and insects. The sod should be machine-cut at a uniform depth to a standard size as established by the supplier. Harvest, delivery and installation shall occur within a time period of six (6) hours.

b) Fertilizer and lime shall be furnished and applied as specified above in Paragraph T-13.02.3.

3. Preparation:

a) The surface area established to receive sod shall be cleared of trash, debris, roots, branches and stones. Fill and level low spots to prevent ponding.

b) Rake or harrow the sod area to incorporate the fertilizer and lime into the soil and to smooth and level the surface to final grade.

c) Final preparation will be to roll or cultipack the surface to firm the soil. However, care must be taken to avoid excessive compaction.

4. Installation:

a) After the sod is unrolled it should be moistened and stored in the shade.

b) Moisten the surface area prior to laying out the sod.

c) Lay the first layer in a straight line with the longest dimension perpendicular to the slope and/or channel flow.

d) Install the subsequent rows, parallel to and butted against each other. Stagger the joints in a brick pattern and butt together tightly to prevent voids.

e) Roll the sod after installation to establish firm contact with the roots and soil.

f) On slopes 3:1 or greater and channel ways anchor sod with pegs and or wire staples, six (6) to ten (10) inches long.

g) Irrigate sod until a depth of four (4) inches is wet. Maintain irrigation until the sod takes root.

T-13.06.3 **GOOD STAND OF GRASS**:

The Contractor is hereby advised that the City will hold the normal five percent (5%) retainage of the contract amount until such time as a good stand of grass as approved by the engineer is obtained. In this regard, the Contractor is encouraged to fertilize and seed the plazas as each street nears completion. A good stand of grass shall be defined uniform growth of grass at least two (2) inches in height.

T-13-06.4 **AREAS TO BE MULCHED**:

Where directed by the Engineer, the Contractor shall mulch the plaza areas. Where mulching has been directed, the Contractor shall double the rate of application of seed specified in Section T-13.02.03. The mulch shall be hay mulch tacked lightly with asphalt cement to prevent displacement. All cost associated with the mulching, including the additional seeding, hay, asphalt cement, etc., shall be included in the price bid per square yard for mulching in the proposal.

T-13.06.5 **BIODEGRADABLE EROSION CONTROL BLANKETS**:

The erosion control blanket shall consist of a machine-produced mat of curled wood excelsior of 80% six-inch or longer fiber length, with consistent thickness and the fiber

evenly distributed over the entire area of the blanket. The wood fibers shall be held in place by extruded plastic mesh on both sides. The staples shall be made of wire, No. 11 gauge or greater, "U" shaped with legs six (6) inches in length and a one (1) inch crown. Size and gauge of staples used will vary with soil conditions. The excelsior matting shall be used for channel stabilization when specified in the Special Conditions or shown on the plans.

Channel stabilization of side slopes from top of bank to toe of slope of all grass-lined channel side slopes shall include fine grading so that the channel side slopes are ready for seeding, fertilizer, lime, the erosion control matting, and required staples to ensure the matting is held firmly in place.

T-13.06.6 **NON-BIOGRADABLE EROSION CONTROL MATTING**:

Non-biodegradable erosion control matting shall be used as drainage channel liners where high stormwater velocities are anticipated. The erosion control matting shall be either nylon fiber with UV resistant netting on each side, or a flexible mat of PVC monofilaments bonded together on a three-dimensional web. The erosion control matting shall be installed over prepared channel areas, seeded and mulched per paragraphs T-13.02.3 and T-13.02.6. The erosion control matting shall be anchored with wire staples or pins as per manufactures recommendations.

Erosion control matting shall be installed when shown on the plans and/or specified under Special Conditions.

T-13.06.7 **RIPRAP**:

Riprap should be a well-graded mixture of hard angular stone of such quality that it will not break down on exposure to water or weathering. Riprap shall be Class I as specified by the North Carolina Department of Transportation for slope stabilization and outlet protection.

T-13.06.8 **FILTER BLANKET**:

A filter blanket shall be placed between the riprap and the underlying soil to prevent soil movement into or through the riprap. A suitable filter shall consist of a synthetic filter fabric manufactured for this express purpose. No filter fabric should have less than 4 percent open area or an equivalent opening size (EOS) less than U.S. Standard Sieve No. 100 (0.15mm). The permeability of the fabric must be greater than that of the soil. The fabric shall be of non-woven monofilament yarns and should meet the following minimum requirements:

Thickness 20-60 mils
Grab strength 90-120 lbs
Conform to ASTMD-1682 or ASTM D-177
Placement of a synthetic filter blanket shall be by the manufacturers' recommendations.

T-13.07 **SILT FENCE**:

Silt fence shall be used as a permeable barrier that retains sediment on the construction site. Use a synthetic filter fabric that is certified by the manufacturer or supplier conforming to the following requirements:

Filtering efficiency - 85% minimum
Tensile Strength of 20% maximum elongation 30 lbs/lin in (min)
Slurry Flow Rate - 0.3 gal/sq ft/min

Installation and maintenance shall be by the manufacturers' recommendations. Materials shall meet the requirements of the North Carolina Department of Transportation.

T-13.08 **AIR AND WATER QUALITY PROTECTION:**

T-13.08.1 **PROTECTION OF AIR QUALITY**:
The air pollution likely to occur due to construction operations shall be minimized by wetting down bare soils during windy periods, requiring the use of properly operating combustion emission control devices on construction vehicles and equipment used by contractors, and by encouraging the shutdown of motorized equipment not actually in use. Trash burning will not be permitted on the construction site. Steps to protect air quality shall be taken at all times, including non-working hours, weekends, and holidays.

T-13.08.2 **PROTECTION OF WATER QUALITY**:
The Contractor shall observe the rules and regulations of the State of North Carolina and agencies of the United States Government prohibiting the pollution of stream or river waters by the dumping of any refuse, rubbish or debris therein.

T-13.08.3 **PROTECTION OF FACILITIES**:
The Contractor shall take adequate measures to prevent the impairment of the operation of the existing facilities and prevent construction materials, pavement, concrete, earth, or other debris from entering these facilities.

T-13.09 **NOISE CONTROL**:
The Contractor shall conduct all his work and use appropriate construction methods and equipment to prevent exceeding legal noise levels.

T-13.09.1 **NOISE CONTROL ORDINANCE**:
Section 6-9, “Noises,” of the Wilmington City Code shall apply to the Contractor.

TECHNICAL SPECIFICATIONS
SECTION 14: MATERIALS **04/08/2005**

T-14.01 **SCOPE:**
This section includes all materials that may be used in the work as set out herein but does not intend in any way to suggest that all materials listed are included. The intention of the section is to denote the quality and type of materials desired and required. The name of a certain brand, make, manufacturer or definite specification is to denote the quality of material desired, but does not restrict bidders to the specific brand, make, manufacturer or specifications named; it is to set forth and convey to prospective bidders the general style, type, character and quality of the article desired.

T-14.02 **AGGREGATES**:

T-14.02.1 **CONCRETE AGGREGATES**:
Fine concrete aggregates shall conform to either A.S.T.M. C-33 or AASHTO M 6-87. Coarse concrete aggregates shall conform to AASHTO M 80-87.

T-14.02.2 **MORTAR AGGREGATES**:
Mortar aggregates shall conform to A.S.T.M.-C-144-84/ AASHTO M-45-89.

T-14.02.3 **ASPHALT AGGREGATES**:
Fine aggregates used in asphaltic concrete shall be graded from coarse to fine to meet the graduation, as provided under Section 9, "Paving," and shall be composed of sand, stone screenings or a blend of both, which shall be of grains of quartz or other hard, durable rock, rough surfaced and angular grains, clean and free from any injurious materials. Stone screenings shall be produced from stone that shall have a percent of wear not more than 65, as determined by AASHTO Test T-96. In all cases, sand samples shall be submitted to the City and shall be subject to the approval of the Engineer.

Coarse aggregates shall consist of clear, tough, durable fragments, free from an excess of flat, elongated, soft or disintegrated pieces and shall not contain clay, silt or other objectionable matter. Coarse aggregates shall be of crushed stone retaining on a number 10 sieve. Test for quality shall be according to the AASHTO Test T-96, and shall have a loss of not more than 55 percent. In all cases, coarse aggregate samples shall be submitted to the City and shall be subject to the approval of the Engineer.

Mineral filler shall consist of thoroughly dry limestone dust, Portland Cement, or other materials approved by the Engineer. It shall meet the following requirements:

PERCENT OF TOTAL

Passing 30 mesh sieve	100
Passing 100 mesh sieve	85-100
Passing 200 mesh sieve	65-100

T-14.03 **CEMENT**:

T-14.03.1 **PORTLAND**:
Portland cement shall conform to ASTM C-150-latest edition, Type I or III / ASSHTO M 85-89, Type I or III.

T-14.03.2 **MASONRY**:
Masonry cement shall conform to ASTM C 150-86/ASSHTO M 85-89. Type I shall be used on aboveground structures. Type II shall be used on underground drainageand sanitary sewer structures.

T-14.03.3 **ASPHALTIC**:
Shall be 85-100 penetration petroleum asphalt to meet AASHTO M-20-42, subject to the approval of the Engineer.

T-14.04 **WATER**:
All water used for mixing mortar or concrete shall be clean, free from acid, strong alkali, or matter in suspension, and will be obtained from the City water supply system unless otherwise permitted by the Engineer.

T-14.05 **MORTAR**:
Mortar shall be prepared from cement, sand and water that fulfill the requirements as stated for each. The mortar shall consist of one (1) part by volume of Portland Cement and three (3) parts by volume of sand. A maximum of ten (10) percent of lime putty or dry hydrated lime to each volume of cement may be used to attain workability, if desired, or if so instructed by the Engineer. Prepared types of mortar cement may be used only with the written permission of the engineer. The mortar shall be mixed in boxes prepared for that purpose, and must be cleaned after each batch is removed. No mortar may be used that shows signs of setting, or that has been allowed to stand for a period of thirty (30) minutes after mixing.

T-14.06 **BRICK**:
Bricks shall conform to AASHTO, M114, Grade MW, and shall be whole solid brick of standard size, with straight and parallel edges and square corners. They shall be of compact texture, full weight and entirely true, free from injurious cracks and flaws, tough, strong, and shall have a clear ring when struck together.

T-14.07 **BRICK FOR SANITARY SEWER, DRAINAGE, AND WATER MAIN MANHOLES**:
None but whole, solid, sound, hard, straight, thoroughly burned brick, uniform in structure, with true and even faces shall be used. The brick shall be entirely free from injurious defects, and shall ring clear when two are struck together. All brick shall meet ASTM Standard Specifications for Sewer Brick ASTM Designation C-32, Grade MS, latest revision, according to the various classification according to use as given therein.

CONCRETE BRICK:
Concrete brick shall be sized 4"X4"X8", and conform to ASTM C 139-79 / AASHTO C 145-75.

T-14.08 **GRAY IRON CASTINGS**:

T-14.08.1 **REQUIREMENTS AND METHODS OF TESTING**:
All iron castings for manhole and well hole frames and covers, inlet frames, covers and traps, and for other sewer appurtenances, unless otherwise specified in the plans, shall conform to the requirements for Gray Iron Castings of the American Society for Testing Materials.

T-14.08.2 **CLASSIFICATION**:
All castings shall conform to ASTM A 48-83, Class 30 “Gray Iron Castings” unless specified otherwise on the plans or in the Special Conditions.

T.14.08.3 **WORKMANSHIP AND FINISH**:
The castings shall be true to pattern and free from cracks, gas holes, flaws and excessive shrinkage. Surfaces of the castings shall be free from burnt-on sand and shall be reasonably smooth. Runners, risers, fins, and other cast-on pieces shall be removed. In other respects, the castings shall conform to whatever points may be specified in the plans. All covers for manholes, wall holes, inlets, etc., must have a continuous and even bearing on the frames. Castings tolerances shall be plus or minus 1/16 inch per foot.

T-14.08.4 **INSPECTION**:
The Engineer shall have free entry at all times while work on the material to be used in this contract is being performed, to all parts of the manufacturer's work which concern the manufacture of the castings ordered. The manufacturer shall afford the Engineer all reasonable facilities to satisfy him that the castings are being furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture prior to shipment, unless otherwise specified on the plans, and shall be so conducted as not to interfere unnecessarily with the operation of the work. When offered for inspection, the castings shall not be painted or covered with any material that will hide defects.

T-14.08.5 **CERTIFICATION**:
Upon request of the Engineer, the manufacturer shall certify that his product conforms to the requirements of these specifications.

The weights of all castings shall be certified by the founder furnishing them and shall not be less than those called for on the plans.

T-14.08.6 **MANHOLE CASTINGS**:
Manhole castings shall conform to ASTM "Gray Iron Casting" and be marked “SANITARY SEWERS” or “STORM SEWER” as required, and shall be East Jordan Iron Works, No. V-1384, Ennis Enterprises No. MH-GRE-24, Vulcan Foundry No.V-2384, or equal. Watertight or lockable manhole castings shall be specified under “Special Conditions.”

T-14.08.7 **MANHOLE STEPS:**

STORM DRAIN MANHOLE STEPS:
Manhole steps for masonry structures shall be East Jordan Iron Works, Inc., No. 8500, Neehah Foundry Co. No. R-1980-1, Vulcan Foundry No.1999-6, or equal. Manhole steps for precast manholes shall be fabricated from ½-inch steel rod encapsulated in polypropylene plastic. The step shall be twelve–inches wide with serrated tread and lugs to prevent feet from off the step and shall be spaced on 16-inch centers.

SANITARY SEWER MANHOLE STEPS:
Sanitary sewer manholes shall not be furnished with manhole steps unless specified in the Special Conditions.

T-14.09 **SANITARY SEWER PIPE AND FITTINGS:**

T-14.09.1 **DUCTILE IRON PIPE AND FITTINGS**:
Ductile iron pipe shall meet the requirements of Section T-14.11.1 of these specifications except that the interior coatings shall be ceramic epoxy coating, 40 mils thick, equal to Protecto 401. Fittings shall meet the requirements of Section T-14.11.4 of these specifications except that “push-on-joints” may be used in lieu of mechanical joint

fittings and the interior coating shall be a ceramic epoxy coating, 40 mils thick, equal to Protecto 401.

T-14.09.2 **POLYVINYL CHLORIDE (PVC) PIPE**:

PVC pipe and fittings for sanitary sewer shall meet the following requirements:

A. PVC pipe shall have integral wall bell and spigot push-on joints and shall meet the requirements of ASTM D 3034, Type PSM, SDR 35 or SDR 26 conforming to ASTM 2241 and NSF for 8-inch to 15-inch pipe. When pressure pipe is required or specified, the PVC pipe shall meet the requirements of ASTM D-2241. Fittings shall be push-on-joint PVC furnished by the pipe manufacturer.

B. PVC pipe, with push-on joints and elastomeric gaskets, conforming to the standards of AWWA C900, Class 150 or AWWA C905, Class 150 for pipes larger than 14-inches, shall be required when the depth of main, measured from the invert of the pipe to finished grade, equals or exceeds ten (10) feet. All PVC mains shall be fully encased in stone bedding when the depth equals or exceeds eight feet.

T-14.09.3 **SANITARY SEWER SERVICE PIPE**:

Pipe for sanitary sewer service lines and stacks (4 and 6-inch diameter) shall be either polyvinyl chloride (PVC) or cast iron pipe. PVC pipe shall be SDR 26, with integral bell and spigot and push-on joints conforming to ASTM D-3034, type PSM Fittings shall also conform to ASTM D-3034. Solvent welded joints shall not be acceptable. Cast iron pipe shall be used where directed and shall be heavy-duty cast iron soil pipe conforming to ASTM A-74-latest edition with push-on joints with rubber gaskets conforming to ASTM C-564-latest edition.

T-14.09.4 **TRANSITION FITTINGS:**

Transition fittings for connection between pipes of dissimilar material shall be as follows:

A. 4-inch to 6-inch couplings: Adjustable repair couplings meeting ASTM C 564, with rigid wide non-shear band stainless steel as manufactured by Mission Rubber Company, Inc., Fernco, Romac, or equal.

B. 8-inch and larger couplings: Mechanical joint ductile iron sleeve or adapter conforming to Section T-14-11.4

T-14.10 **REINFORCED CONCRETE PIPE AND JOINT MATERIAL**:

T-14.10.1 Concrete pipe used for storm drain pipe shall conform to the requirements of ASTM-C-76 latest revision, Class III.

T-14.10.2 Concrete pipe for use as casement pipe shall conform to the requirements of ASTM C-76, latest revision, Class IV.

T-14.10.3 Concrete pipe joint material shall meet ASSHTO M-198, ASTM C-990, and Fed. Spec. SS-S-210A.

T-14.11 **WATER PIPE AND FITTINGS**:

T-14.11.1 **PUSH JOINT DUCTILE IRON PIPE**:

Push joint ductile cast iron pipe shall be Class 51. The pipe shall be centrifugally cast and shall be made of ductile cast iron 60-42-10 grade in accordance with ANSI/AWWA C150/A21.51 and ANSI/AWWA C151/A21.51 under Special Thickness Class. The pipe shall be furnished in nominal 16-foot to 20-foot laying lengths. All pipe shall be cement mortar lined and seal coated inside, and bituminous coated outside in accordance with

ANSI/AWWA C104/A21.4. Pipe shall be furnished complete with gaskets and lubricant**,** per ANSI/AWWA C104/A21.4.

T-14.11.2 **POLYVINYL CHLORIDE (PVC) PIPE FOR 4 THROUGH 12 INCHES**:
PVC pipe for water pipe shall conform to AWWA C900, Class 150, with push-on joints. Elastomeric gaskets shall conform to ASTM F477. Pipe shall be furnished complete with gaskets and lubricant.

T-14.11.3 **POLYVINYL CHLORIDE (PVC) PIPE FOR 2 AND 3 INCHES**:
PVC pipe for water pipe, 2 through 3 inches in diameter shall be 200 PSI, SDR 21 conforming to ANSI/ASTM D-2241, NSF approved, with push-on-joints meeting ANSI/ASTM D-3139. The pipe compound shall be PVC 1120.

T-14.11.4 **DUCTILE IRON FITTINGS**:
The fittings shall be standard mechanical joint fittings made of ductile iron in accordance with ANSI/AWWA C110/A21.10. Compact ductile iron fittings meeting ANSI/AWWA C153/A21.53-94 shall also be acceptable. Standard mechanical accessories shall be furnished for each bell opening consisting of HSCI bolts, cast iron glands, and plain rubber gaskets in accordance with ANSI/AWWA A21.11-90. Fittings shall be cement mortar lined and seal coated inside per ANSI/AWWA C104/A21.4-90. Where flanges are indicated on fittings they shall be F and D 125 pound per ASME/ANSI B16.42-87. Fusion bonded epoxy coated ductile iron fittings meeting C116/A21.16-98, NSF 61 with a normal coating thickness of 6-8 mils are acceptable.

T-14.11.5 **PVC FITTINGS**:
PVC fittings for PVC pipe, 4 inches and larger shall be mechanical joint ductile iron fittings as specified under Section T-14.11.4 above. Fittings for PVC pipe, 2 through 3 inches shall be molded PVC, Class 200 conforming to SDR 21 in accordance to ANSI/ASTM D-2241, NSF approved, with push-on-joints meeting ANSI/ASTM D-3139 with gaskets conforming to ASTM F-477.

T-14.12 **WATER SERVICE LATERALS**:

T-14.12.1 **COPPER PIPE SERVICE LATERALS**:
Copper pipe water services shall be installed only where shown on the plans and/or directed by the Engineer. Copper pipe for water services shall be Type K soft, complying with Federal Specifications WW-T-799 and ASTM-B-88.

T-14.12.2 **POLYETHYENE PIPE SERVICE LATERALS**:
Polyethylene pipe for water services shall be polyethylene tubing, CTS, SDR 9, 200 PSI, conforming to AWWA C901, PE 3408. Each service shall be either 1" or 2" size. A pipe marking wire, 10-gauge, insulated solid core, shall be attached at 10-foot intervals with duct tape to each service lateral.

T-14.13 **PIPE MARKING TAPE and WIRE REQUIRED FOR PVC AND POLYETHYLENE PIPE**:
Tape shall be a minimum 3-inches wide, blue in color, bearing continuous message "CAUTION WATER LINE BURIED BELOW". Tape shall be made of plastic or other permanent material with metallized foil core. Tape shall also be used for buried force mains bearing the same type of caution message.
Wire - #10 INSULATED COPPER WIRE shall be installed along the top of the PVC pipe. PVC pipe shall be marked by installing the #10 insulated copper wire along the top along the entire length and strapping the wire to the main with duct tape at intervals of twice per joint. The insulated wire shall be stripped to bare wire at the contact points with

fittings and valves. The insulation shall be resistant to petroleum products. Each valve and fitting shall be wrapped around twice with the copper wire.

T-14.14 **VALVE BOXES AND EXTENSIONS**:
Valve boxes and extensions furnished shall be Wilmington Standard Telescoping valve box and extension.

T-14.15 **WATER SERVICE FITTINGS**:

T-14.15.1 **COPPER SERVICE FITTINGS: (USE ONLY AS DIRECTED BY ENGINEER)**:
Service saddle shall have double stainless (ss) straps and factory coated corrosion resistant body. Service saddle shall be Smith-Blair 317, Romac 202S, JCM 406, Mueller DR2S or equal. Curb stops shall be Mueller H 15174, Ford B21, McDonald 6100 series, or equal. Corporation stops shall be Mueller H 15000, Ford F600, McDonald 4701 series, or equal. City will allow compression fittings for copper pipe service of 1-inch diameter. Each curb stop shall be furnished with a IMP brass bushing, 1" x 3/4", and brass meter coupling equal to McDonald 4620, Ford C38-23-2.25, or Mueller H 10890. The brass meter yoke shall be as specified in T-14.15.2. The meter box shall be as shown on Standard Details SD 4-12 or SD 4-13.

T-14.15.2 **POLYETHYLENE SERVICE FITTINGS:**
Service saddles shall be as specified in T-14.15.1. Corporation stop shall be 1-inch or 2-inch, CC x CTS, equal to Mueller P15013 w/ss stiffener, Ford FB 1000 w/ss stiffener or McDonald 4701-22 w/ ss stiffener. Curb stops shall be equal to Ford B61-444 w/ss stiffener, Mueller P-25172 w/ss stiffener, or McDonald 6102W-22 w/ss stiffener. Each curb stop shall be furnished with an IMP brass bushing, 1" x 3/4", and brass meter coupling equal to McDonald 4620, Ford C38-23-2.25, or Mueller H 10890. Each service shall be furnished with a brass meter yoke with lock stop, 7-inch riser, 5/8" x ¾" size unless directed otherwise, equal to Mueller B 24118, McDonald 18-207WX, or Ford V42-7. The meter yoke shall be furnished with a brass meter coupling as specified above. The meter box shall be as shown on Standard Details SD 4-12 or SD 4-13.

T-14.16 **VALVES**:
All valves shall conform to AWWA Specification C500, latest revision, gate valves or ordinary water works service except as hereinafter stated and shall have mechanical joint ends. All valves shall be resilient wedge gate valves, open right and shall have a 2-inch square head nut upon the end of the stem, with the direction arrow clearly and plainly cast thereon. Valves shall be as manufactured by Clow Corporation, Darling Valve Manufacturing, Mueller Company, Henry Pratt Company, American AVK Company's Series 25; or equal. The City will accept interior and exterior coating of fusion bonded epoxy, normal coating of 6-8 mils, meeting the requirements of AWWA/ANSI C550-01.

T-14.16.1 **VERTICAL GATE VALVES**:
Shall be used on all lines 12 inches and under and shall be non-rising stem type, 175 psi working pressure and 300 psi test pressure with "O" ring stem seal. Valves shall be Resilient Wedge Gate or double disc type with cast iron body and bronze disc seats, stem and wedges. In the open position, the area of the opening shall be equal or greater than the area of the same nominal size pipe.

T-14.16.2 **HORIZONTAL GATE VALVES OR BUTTERFLY VALVES**:
Shall be used on all lines 16 inches and larger. Horizontal valves shall be 150 psi working pressure. 16-inch valves and larger shall be 150 psi working pressure and 300 psi test pressure. All valves shall have conventional packing. Valves shall be equipped with a bevel gear, non-rising type, with grease case of the totally enclosed type and shall be

provided with suitable rollers, track, scrapers, and a guide for a disc mechanism through its entire travel length. Valves 16 inches and larger shall have a by-pass with non-rising type valve. Valves shall be double disc, with cast iron body and bronze disc seats, tracks, stem, and wedges. Area of opening in the open position shall be equal to or greater than the nominal pipe diameter.

Butterfly valves shall meet the full requirements of AWWA Standard C504-70 for Class 150B. The manufacturer shall have manufactured tight-closing, rubber-seat butterfly valves for buried service for a period of at least five years. All butterfly valves shall be Henry Pratt Company's "Groundhog," Mueller "Lineseal III," American-Darling "AFC Butterfly valve" or equal.

T-14.16.3 **TAPPING SLEEVE AND VALVES**:
Sleeve shall be DI or SS 150 psi working pressure, mechanical joint. Valve shall be vertical type with "O" ring seals, mechanical joint outlet end, and flange end for connection to tapping sleeve. Flange end shall have machined projections to ensure correct alignment. Seat opening of valve shall be slightly larger than nominal size to provide for full diameter cut to be made. Sleeve shall be furnished by valve manufacturer. (SS Tapping sleeve- heavy duty, fully gasketed and SS MJ or flange) Testing of TS&V shall be as recommended by manufacturer.

T-14.17 **HYDRANT**:
Hydrants shall be improved type conforming to AWWA C-502, latest revision. Fire hydrant shall be for ordinary waterworks service, approved by American insurance association, with four and one half (4-1/2) inch valve opening; two (2) each, two and one half (2 ½) inch hose nozzles with City of Wilmington, North Carolina, standard thread; and four and one half (4-1/2) inch pumper connection. Hydrant shall have breakable barrel and operating stem with minimum barrel length of three (3) foot, six (6) inch bury and shall be equipped with six (6) inch mechanical joint bottom hub with strapping lugs and one and two-thirds (1-2/3) inch solid pentagonal operating nut and "O" ring seals. Hydrants shall open right and be rated at 150 psi working pressure and 300 psi test pressure. Hydrant shall have two (2) coats of aluminum paint. Hydrant shall be dry-barrel type and be provided with drain outlet for draining when valve is closed. Hydrant shall be Mueller Centurion, Kennedy Guardian, American Darling Mark 73, - American AVK Co. Model 27/80 Dry Barrel fire Hydrants (11/2001) or equal. New hydrants shall be furnished with proper bury depths so as not to require "riser kits."

T-14.17.1 **FIRE HYDRANT PAINT**:
Paint shall be applied using two (2) coats of the specified paint according to the manufacturer's recommendation. The final coat must be applied after final installation. All hydrant barrels shall be painted with **heavy-duty aluminum paint** for industrial or commercial-use, by Rustoleum, Glidden, Sherwin Williams, Tnemec, or equal.

Fire hydrants on 6-inch and 8-inch diameter mains shall have the nozzle caps and bonnet painted with industrial or commercial-use **alkyd paint,** safety yellow color by Rustoleum, Glidden, Sherwin Williams, Tnemec, or equal.

Fire hydrants on lines greater than 10-inch diameter shall have the nozzle caps and bonnet painted with industrial or commercial-use alkyd, safety green color by Rustoleum, Glidden, Sherwin Williams, Tnemec, or equal.

T-14.18 **REINFORCING STEEL**:
Reinforcing steel shall conform to ASTM A-615, Grade 60. The steel shall have the net sectional area shown on the plans and shall be of deformed bars unless otherwise specified. Welding of Reinforcing steel shall conform to AWS D12.1. Welded wire fabric shall conform to ASTM A-185.

T-14.19 **FORMS**:
Forming material shall be finished with tongue and grooved type, dressed on one side and of sufficient thickness as to prevent warping when the concrete is placed. Plywood may be used where applicable with proper bracing. Forms shall be so constructed as to ensure against misplacement and misalignment when filled. The cost of forms shall be included in the price for concrete unless otherwise shown in the proposal. Formwork shall conform to ACI 347, "Recommended Practice of Concrete-Formwork."

T-14.20 **CONCRETE MEMBRANE CURING COMPOUND (WHITE)**:
The membrane-curing compound used in concrete curing shall be as specified in AASHTO Specification M-148-49 for a white curing membrane.

T-14.20.1 **EXPANSION JOINT FILLER (FOR CONCRETE CONSTRUCTION)**:
Expansion joint filler for concrete construction shall be bituminous, preformed, non-extruding joint filler, as specified in AASHTO M-33-48.

T-14.21 **LUMBER**:
Lumber shall be straight and sound and free from shakes, racks, large or loose knots, and other defects impairing its strength or durability. It shall be squared to the desired dimensions when the work demands, or when requested by the Engineer. If plans or the Special Conditions section of the Specifications indicate the character of lumber to be used on specific structures, they are hereby made a part of this paragraph. Such lumber as is required in sheeting, shoring, bridging, etc. shall be included in the bid price for furnishing and installing the proposed improvements.

T-14.22 **GALVANIZING**:

T-14.22.1 **REQUIREMENTS AND METHODS OF TESTING**:
Galvanizing of structural shapes used in structures shall conform to the requirements of, and shall be tested in accordance with ASTM A-123-84/AASHTO M-111-87. Galvanizing of fasteners and hardware shall conform to, and shall be tested in accordance with ASTM A-153-87/AASHTO M-227-90.

T-14.22.2 **WORKMANSHIP AND FINISH**:
The zinc coating shall be adherent, smooth, continuous and thorough. It shall be free from such imperfections as lumps, blisters, gritty areas, uncoated spots, acid and black spots, dross and flux. The coating shall not be so loosely adhering as to be removable by any reasonable process of handling and erection. Light blows with a one-half (1/2) pound hammer shall not cause peeling of the coating adjacent to the area deformed by the hammer blow. The coating shall not interfere with the intended use of material.

After immersion in molten zinc, the structural shapes, plates or bars shall not be subjected to any process of scraping or wiping which will reduce the uniformity or the specified weight of the zinc coating.

T-14.23 **MANHOLES PRECAST**:
Precast manholes shall have shaped invert with 4-foot minimum diameter, unless specified different on the plans. Unless shown different on the plans the wall, base, and top shall be constructed of 4000 psi concrete in accordance with ASTM C-478.

The other material requirements are as follows:

a) H-20 Highway Loading.
b) One pour monolithic base section base extends 6 inches beyond outside wall for manholes smaller than 5 feet I.D., and all manholes deeper than 8 feet.
c) Reinforced steel - ASTM A-185.
d) Steel reinforced Copolymer Polypropylene Plastic steps for storm drain manholes only. Sanitary sewer manholes shall not be furnished with manhole steps unless directed by the Engineer.
e) Flexible boot connector ASTM C-928 with cast iron or stainless steel hardware.
f) Section joint sealant - Butyl rubber sealant AASHTO M-198, ASTM C-990,and Fed. Spec. SS-S-210A.

T-14.24 **BEDDING MATERIAL**:
Material for pipe bedding where required by the Engineer shall be well-graded crushed stone or crushed gravel meeting the requirements of ASTM designation C-33, gradation 57 (3/4-in. to No. 4**).**

T-14.25 **RESTRAINT GLAND for DIP**:
The mechanical joint gland style restraint for mechanical joint fittings used on ductile iron pipe may be used for fire hydrant installations and any other location required by the Engineer to be restraint joint fittings. This type of restraint system can be used in lieu the restraint system using tie bolts and restraining rods as shown on the standard detail SD 4-02. The gland style restraint shall be a follower gland, which uses a series of individual actuated gripping wedges to positively engage the pipe surface while allowing joint deflection both before and after installation. This wedging action offers high pressure restraint capacity for mechanical joint fittings, valves, hydrant and pipe with 3-inch through 16-inch being rated at 350 psi and larger size rated at 250 psi. All sizes are tested to a minimum of 2:1 safety factor. The mechanical joint restraint glands shall be equal to Megalug, Series 1100 manufactured by Ebaa Iron, Inc., Stargrip Series 3000 manufactured by Star Pipe Products, or RomaGrip by Romac Industries, Inc.

T-14.26 **RESTRAINT GLAND FOR PVC:**
The mechanical joint gland style restraint for mechanical joint fittings used on PVC pipe can be used at locations required by the Engineer to be restraint joint fittings. This type of restraint system may be used in lieu of the restraint system using tie bolts and restraining rods as shown on Standard Detail SD 4-02. The gland style restraint shall be a follower gland, which uses a series of individual actuated gripping wedges to positively engage the PVC pipe surface while allowing joint deflection both before and after installation. This wedging action offers high pressure restraint capacity for mechanical joint fittings, valves, and pipe with 3-inch through 16-inch being rated at 350 psi and larger size rated at 250 psi. All sizes are tested to a minimum of 2:1 safety factor. The mechanical joint restraint glands shall be equal to Megalug, Series 2000PV manufactured by Ebaa Iron, Inc., PVC Stargrip Series 4000 manufactured by Star Pipe Products, or PVC-RomaGrip by Romac Industries, Inc.

T-14.27 **BLOCKING TAPPING TEES on PVC or AC PIPE for fire hydrant installation**:
Bags of concrete mix may be used for blocking from the tee to undisturbed soil. Care shall be taken so as not to obstruct access to the nuts and bolts on the mechanical joints.

T-14.28 **GENERAL**:

Any material required, but not listed in this section or not specified elsewhere in the specifications, shall be subject to the approval of the Engineer.

SECTION TS-15: SPECIAL CONDITIONS

GENERAL

This section of specifications describes provisions unique to this project. The specifications, the plans, the special and general provisions, and all supplementary documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. In case of discrepancy or conflict, annotated dimensions shall govern over scaled dimensions; plans shall govern over technical specifications except for Section 15 of the Technical Specifications, Special Conditions. The Special Conditions, TS-15, always take precedence over plans and all other technical specifications. Technical specifications take precedence over general provisions.

TS-15.01 PROJECT DESCRIPTION:

The project generally consists of constructing storm drain collector pipe with attachments to existing roof leaders and air conditioning condensate lines, electrical conduit, and water/sewer improvements at multiple City of Wilmington alleys. The demolition of the existing alley pavement and replacement with brick pavers is also included in the project. The work shall include, but is not limited to: pavement demolition, utility demolition, pipe trenching, pipe installation, brick paver installation, and erosion control.

TS-15.02 DRAWINGS AND INSTRUCTIONS:

The owner shall provide the Contractor with four (4) sets of plans, drawings, and specifications after the execution of the contract. If additional plans, drawings and specifications are required, the Contractor shall compensate the owner for same. The Engineer shall provide the Contractor with such revised plans, drawings and specifications as may be required to show any authorized changes or extra work. These plans, drawings, and specifications are the property of the City of Wilmington, North Carolina, and are furnished to the Contractor for the construction of the project under this contract only.

T-15.03 PROJECT TIMEFRAME:

All work included in this contract is to be completed within the time limit as set forth in the proposal. The expected time to complete construction is 6 months; therefore, the project has been given a timeframe of 180 days from the beginning date of construction.

Extensions to the contract may be approved for various reasons, such as changes in scope, unknowns, or inclement weather. Requests for extensions can be brought forward by either the Engineer or the Contractor. The Contractor shall have 21 days from the time of occurrence to submit written requests for consideration of time extensions. The guidelines are defined in the Project Proposal and General Provisions, most specifically in Sections G-1.46 and G-1.47.

T-15.04 LIQUIDATED DAMAGES:

Failure to complete the work within the contract time will result in damages due to public inconvenience, obstruction and delay to traffic, safety, and other considerations. For each consecutive calendar day in excess of the contract time specified, the Contractor shall pay, or have withheld monies due, a sum in accordance with the following:

Days in Excess of Contract Time	Sum per Day
0-14 Days	$ 250
15-22 Days	$ 500
23 Days and Beyond	$ 1,000

Liquidated damages will be adjusted and assessed on a monthly basis at the time of each partial payment request based on the Contractor's progress in comparison with the approved progress schedule.

T-15.05 MOBILIZATION:

The Contractor shall be paid a mobilization cost as bid in the proposal. The mobilization item shall include, but not be limited to, the Contractor's startup expenses, cost of insurance, permits, bonds, etc. and will be paid per the lump sum bid price. Partial payment for the item of "Mobilization" will be made in the first and second partial pay estimates paid on the contract, and will be made at the rate of 50 percent of the lump sum price for mobilization on each of these partial pay estimates, less the retainage provided for in the General Provisions, provided the amount bid for mobilization does not exceed 5 percent of the total amount bid for the contract.

When the amount bid for mobilization exceeds 5 percent of the total amount of the contract, 2 1/2 percent of the total amount bid will be paid on each of the first two partial payment estimates and that portion exceeding 5 percent will be paid on the final pay estimate.

When there is more than one section with payment for mobilization, the term payment for mobilization shall be figured based on each individual section rather than the total contract amount.

T-15.06 SUPERINTENDENT AND CONTACTS:

The Contractor shall have a Superintendent present on the job site at all times. Upon start of construction, the Contractor shall provide the Engineer with names, e-mail addresses, and telephone numbers of Superintendent(s) and two other representatives to be contacted after hours in case of emergency.

T-15.07 PROGRESS SCHEDULE, MEETINGS, AND REPORTS:

At the preconstruction conference, the Contractor shall submit to the Engineer for review a graphic schedule of the proposed construction operations. The progress schedule shall indicate the sequence of the work including the time of starting and

the completion of each major task. The schedule should conform to the traffic control plan and address priorities of the City.

Monthly progress meetings are expected throughout the duration of the project and shall include:

A. Contractor's Project Manager
B. Contractor's Project Superintendent
C. City's designated Representatives(s)
D. Engineer's designated Representative(s)
E. Corresponding Subcontractors

The Engineer shall schedule monthly meetings at a minimum, for the most convenient time frame. The Engineer shall take meeting minutes, review previous minutes with participants at the meeting, and submit copies of meeting minutes to participants within 7 days. The Engineer shall have available at each meeting full chronological file of all previous meeting minutes.

The contractor shall provide and present monthly progress reports. Each progress report shall include:

A. Narrative that is sufficient to describe current and anticipated delaying factors, their effect on the progress schedule, and proposed corrective actions.
B. A copy of the accepted graphic schedule marked to indicate actual progress.

Any work reported complete, but which is not readily apparent to the Engineer, must be substantiated with satisfactory evidence. The Contractor may be requested to provide and present construction plan mark-ups for discussion.

If the work falls behind schedule, the Contractor shall submit additional progress reports at such intervals as the Engineer may request.

TS-15.08 MONTHLY QUANTITIES AND PAY REQUESTS:

No pay request (progress payments including mobilization) shall be processed by the City for payment to the Contractor until a corresponding progress meeting has occurred and sufficient documentation has been provided for the schedule and quantities of work completed for the preceding month and is reviewed by the Inspector(s), Engineer, and approved by the City.

Five (5) copies of each verified pay request shall be submitted for review by the engineering/project manager. Upon review and approval, three (3) copies will be processed by the City, one (1) copy will be returned to the contractor, and one (1) copy will be retained by the engineer. If the pay request submitted is found not to be accurate or out of compliance with the contract or lacking accurate supporting documentation (MBE-DBE/payroll/sub-contractor utilization/material tickets or reports, etc), the contractor will be notified and will be required to revise and resubmit the pay request. No separate measurement or payment will be made for this item.

TS-15.09 PUBLIC TRAFFIC:

Contractor shall notify all affected property owners two (2) weeks in advance of the need to adjust access during construction. The contractor may not prevent access to businesses during their operating hours under any circumstances. It is the responsibility of the contractor to coordinate access details with businesses in the project area. Access to all properties shall be maintained throughout the project.

TS-15.10 NOTIFYING UTILITY COMPANIES:

The contractor's attention is hereby called to **Section G-1.52** of these specifications **and North Carolina's Underground Utility Damage Prevention Act 87-100** and the **City of Wilmington Municipal Code, Chapter 11, Article V**. Notification of the utility companies and departments shall be made prior to any excavation under this project. The Contractor is reminded that utility companies usually require a 72-hour notice. All services need to be located.

The following numbers are an aid to the contractor:

NC ONE CALL CENTER 1-800-632-4949 (requires 72 hour notice).

The following numbers are provided as an aid to the Contractor and in no way relieve the Contractor of his responsibility to provide required notices:

Utility	Phone Number
*Cape Fear Public Utility Authority	(910) 332-6426
*Duke Progress Energy	(800) 452-2777
* Piedmont Natural Gas Co	(800) 752-7504
*AT&T	(800) 288-2020
*Spectrum Cable	(888) 772-8252
*City Wilmington Traffic	(910) 341-7888
*NCDOT	(910) 341-2000

Prior to road closures, call 910-343-4255. This is the 911 Center.

TS-15.11 PROTECTION OF EXISTING UTILITIES:

The Contractor shall use the necessary precautions to protect existing water, sewer, gas, telephone, and storm drainage lines, etc. and service lateral during the course of construction. The cost of protecting such lines and services shall be considered incidental to the project and no additional payment will be allowed.

TS 15.12 CONSTRUCTION SURVEYING:

The contractor shall be responsible for completing all necessary construction staking to complete the proposed work. In addition to staking, the contractor shall provide an as-built survey of the project which includes storm drain collector pipe location/elevations, storm drain structures locations/elevations, electrical conduit locations/elevations, and water/sewer line locations/elevations. The survey must be completed and sealed by a professional land surveyor and utilize the NAD83

horizontal datum and NAVD88 vertical datum. The cost of completing this work shall be included in the contractor's bid for the project.

TS-15.13 SHOP DRAWINGS

TS-15.13.1 GENERAL:

Engineering data covering all fabricated material that will become a permanent part of the work under this Contract shall be submitted to the Engineer for review. The data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials.

All submittals, regardless of origin, shall be stamped with the approval of the Contractor and identified with the name and number of this contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor's stamp of approval is a representation to the City and Engineer that Contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that he has reviewed and coordinated each submittal with the requirements of the work and the contract documents.

Contractor shall accept full responsibility for the completeness of each submission. When an item consists of components from several sources, Contractor shall submit a complete initial submittal including all components.

All deviations from the Contract Documents shall be identified on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by the Contractor (including modifications to other facilities that may be a result of the deviation).

Electronic, portable document format (PDF), submittals of the shop drawings and engineering data shall be submitted to Engineer for review and distribution. Engineer will not accept submittals from anyone but the Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

TS-15.13.2 ENGINEER'S REVIEW OF DRAWINGS AND DATA:

Engineer's review of drawings and data submitted by the Contractor will cover only general conformity to the Drawings and Specifications, external connections, and dimensions, which affect the layout. Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. Engineer's review of submittals shall not relieve the Contractor from responsibility for errors, omissions, or deviations, nor responsibility for compliance with the Contract Documents.

Engineer's submittal review period shall be 21 consecutive calendar days in length and shall commence on the first calendar day immediately following the date of arrival of the submittal or re-submittal in the Engineer's office. The time required to transmit the submittal or re-submittal back to the Contractor shall not be considered a part of the submittal review period.

When the drawings and data are returned marked "REJECTED" or "REVISE AND RESUBMIT", the corrections shall be made as noted thereon and as instructed by the Engineer and a revised PDF resubmitted.

When the drawings and data are returned marked "NO EXCEPTIONS TAKEN EXCEPT AS NOTED" or "NO EXCEPTIONS TAKEN", no additional copies need be furnished unless requested by the Engineer at time of review.

TS-15.13.3 RE-SUBMITTAL OF DRAWINGS AND DATA:

The Contractor shall accept full responsibility for the completeness of each re-submittal. The Contractor shall verify that all corrected data and additional information previously requested by the Engineer are provided on the re-submittal.

When corrected copies are re-submitted, the Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by the Engineer on previous submissions.

Requirements specified for initial submittals shall also apply to re-submittals. Re-submittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the re-submittal.

Re-submittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days the Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the re-submittal cannot be complete within that time.

Any need for more than one re-submission, or any other delay in obtaining the Engineer's review of submittals, will not entitle the Contractor or an extension of the Contract Times unless delay of the work is directly caused by a change in the work authorized by a change order or by failure of the Engineer to review any submittal

within the submittal review period specified herein and to return the submittal to the Contractor.

TS-15.14 ENCROACHMENT:

Where existing features are encroached on the City right-of-way and are to be removed, the contractor shall be required to coordinate the removal of said encroachments with the City and the affected property owners. The contractor shall remove the encroachments and place them on the property of the affected owner if the owner desires. If the owner has no preference, the contractor shall remove and dispose of such item. The cost of relocating or removing encroachment items will be considered incidental to the project and no additional payment will be allowed.

TS-15.15 CONSTRUCTION VIDEO:

The Contractor shall video the project site in its entirety prior to construction, with emphasis on the adjoining properties, drives, trees, drainage, ditches, driveway pipes, cross pipes, shoulders, condition of roadway, and other distinguishing features. Appropriate narration will include location and description of property and physical features.

The Contractor shall provide one copies of the project video to the City at the preconstruction conference. No separate payment will be made for this work, and all associated cost will be considered incidental to other items in the contract.

TS-15.16 CONSTRUCTION ADMINISTRATION AND INSPECTIONS:

The Engineer shall provide construction administration services for the duration of the project. Inspection services will be provided by the City in conjunction with the Engineer. Contractor shall coordinate through Project Engineer and Inspector as required to facilitate the project. The key functions to be provided by the Engineer include, but are not limited to, the following:

A. Conduct weekly site inspections;
B. Conduct monthly progress meetings;
C. Direct communications with Contractor(s);
D. Provide lead role in communications between all parties;
E. Review and approve shop drawings;
F. Administer and develop change orders;
G. Review and certify pay applications;
H. Conduct substantial and final inspection walk-throughs and develop and track punch list items;
I. Assist and certify construction as-builts.

TS-15.17 DRAWINGS SHOWING CHANGES DURING CONSTRUCTION:

The Contractor shall maintain a set of plans and specifications marked “Construction Record Drawings”. The Contractor shall keep a complete and up-to-date record in red pencil of any and all changes made during construction. This set of contract documents shall be submitted to the Engineer and approved by him prior to the Engineer recommending final payment.

TS-15.18 TEMPORARY TRAFFIC CONTROL:

The Contractor shall be responsible for preparing a traffic control plan for the project and maintaining the approved plan during the work. The Contractor shall be required to furnish, place and maintain all signs, barricades, cones and other traffic handling devices necessary to implement the Traffic Control Plan.

The Traffic Control Plan shall be submitted at the pre-construction meeting and shall be approved by the City prior to beginning construction. All traffic control devices shall conform to the requirements of the current version of the Manual on Uniform Traffic Control Devices (MUTCD).

The Contractor is hereby advised that non-compliance with the approved Traffic Control Plan as described above could result in a "stop work" order, with no work continuing until necessary corrective measures have been performed. Work stoppages shall be at the expense of the Contractor. No additional payment shall be allowed.

The cost of the temporary traffic control system and its implementation shall be included in the Lump sum price bid in the proposal.

TS-15.19 EMERGENCY SERVICES NOTIFICATION:

Prior to any street being closed to traffic, the Contractor shall notify the Emergency Services Dispatchers. The Contractor may call the 911 system at (910) 341-4247 and request that the Police and EMT personnel be notified, or the Contractor may call each service individually 24 Hours in advance.

The Contractor will make provisions for access to all parts of the work for emergency vehicles (police, rescue, fire) and will assist in providing personnel to deliver sanitary pickup cans and other materials as required to a point where the City crew or City's Contractor can load their carrier. The Contractor should include all cost incurred for this item in the unit price bid for each item in the proposal.

TS-15.20 NON-CITY UTILITIES:

The removal, repair or relocation of electric, cable TV, telephone, communications, and gas utilities will be performed by others. However, the Contractor is responsible for coordination of such relocation or removal, schedule his work to coincide with such, and pay any associated cost. No extra payment will be made to the Contractor for this work.

NOTE: Utilities as shown on the plans are based on best available information and exact locations shall be the responsibility of the Contractor.

TS-15.21 CLEAN-UP AND RESTORATION:

The Contractor, during the course of this work shall maintain and clean up the streets, side yards, pavements, drainage structures, etc. and shall schedule at the end of each

day of work the removal of debris, grading of all disturbed areas and restoration to a usable state all means of access for the public and private property owners.

TS-15.22 USE OF A PORTION OF THE WORK:

Whenever, in the opinion of the Engineer, any portion of the work is completed, or is in an acceptable condition for use, it shall be used for the purpose intended. Such use shall not be held in any way as an acceptance of that portion of the work used, or as a waiver of any of the provisions of these specifications. Necessary repairs or renewals in any section of the work due to defective materials, defective workmanship, or natural causes, under the instructions of the Engineer shall be performed by the Contractor at no additional cost to the City.

TS-15.23 COMPLAINTS:

The City has a system of recording complaints that may be received from residents. The Engineers representative and representative of the Contractor will meet with the person registering a complaint as soon as possible after complaints are logged in. During this meeting, a reasonable course of action will be arrived at between the property owner and the City. It is not the intent of the City to require the Contractor accomplish unreasonable tasks. However, if the Contractor has not satisfactorily acted on resolving complaints by the end of the month, that month's payment request will not be processed. The payment request will be processed as soon as corrective action is taken. The City of Wilmington also reserves the right to issue stop work order as stated in paragraph G-1.59 of the General Specifications if the Contractor's actions or non-action so dictates.

TS-15.24 INCIDENTAL RESTORATION:

At locations shown on the plans or designated by the Engineer, the Contractor shall remove and reset existing signs, fencing, mailboxes, outside lighting, hedges or shrubbery, masonry or wooden flower boxes, and all miscellaneous yard/driveway ornamentation, etc., in accordance with the following provisions.

A. The existing items will be removed and replaced at the locations indicated on the plans or designated by the Engineer;
B. After resetting, all items shall be in a condition equal to or better than existed before being removed. The Contractor will be required to replace any components that have been unnecessarily damaged.

The quantity of items reset to be paid for shall not be measured separately. All items shall be included in the unit price for items in the proposal.

TS-15.25 NOTIFICATION OF PROPERTY OWNERS:

The Contractor shall be required to submit a plan for systematic notification of affected property owners. Such notices shall include, but not be limited to, the following items: schedule of work; access to streets during construction; removal of vegetation and above ground items; replacements of streets and driveways; parking; location of services. Plan shall be approved by the Engineer and the City. Upon

approval, the Contractor shall be required to provide all labor, materials, and other support in order to implement the plan.

TS-15.26 EROSION AND SEDIMENT CONTROLS:

The Contractor shall install the devices as required to comply with the erosion and sedimentation control measures shown on the plans and required by the NC Division of Energy, Mineral and Land Resources representatives. The devices shall be installed prior to any excavation or land disturbing activity and shall meet all design requirements. All measures shall be properly maintained until such time as they can be removed. In the event that the Engineer or a representative of the NC Division Energy, Mineral and Land Resources determines that adequate measures have not been provided and or maintained, the Engineer shall give a stop work order on the project until protective measures have been taken. No additional time will be given the Contractor when the stop work is a result of his failure to comply with the N.C. Sedimentation Control Act.

All work done for erosion and sedimentation shall be included in the lump-sum unit prices for the erosion and sedimentation items in the proposal. Said work may include, but not be limited to: silt fences; berms; dikes; catch basin protection; seeding; mulching; and all other erosion control devices or methods.

TS-15.27 SEEDING:

All temporary and permanent seeding shall follow the information in the latest version of the North Carolina Erosion and Sediment Control Planning and Design Manual.

TS-15.28 MATERIALS TESTING:

The City reserves the right to require certification or test any materials used, installed or stored on the project. The contractor is required to utilize approved materials and suppliers and shall facilitate the testing needs of the project through communication, coordination, and control of sub-contractors, during installation or delivery. Such efforts to provide assistance shall be deemed incidental to the project at no cost to the City.

Materials Testing, Inspection, and Quality Control protocol for the project will conform to the applicable NCDOT standards and guidelines. This plan shall be made available to personnel, sub-contractors, inspectors and technicians.

As needed, the City will engage the necessary resources to conduct on-site observation, record keeping, testing, sampling and laboratory analysis of construction methods and materials. The City will pay for quality control and materials testing services. However, the cost of any retests required because of failing tests will be the responsibility of the Contractor.

Sampling and Testing:
Materials testing will be conducted in accordance with the latest applicable methods and procedures such as ASTM, ACI, NCDOT, etc. Typical material testing procedures expected in this projects testing plan are:

Asphalt – cores for thickness, asphalt content and density (compaction), QC reports.

Concrete – cylinder molds with compressive strength breaks in 7 days, 14, or 28 days.

Soil – observation, proof roll, proctor tests and density tests for undercut, sub-base, trench, embankment, etc.

Stone – gradation, thickness, density testing for base.

Contractor is responsible to provide a "hot box" for on-site curing of concrete cylinders in a suitable and safe location.

Any materials or installations found out of compliance with the project specifications will require immediate suspension of construction and require contractor to submit and/or perform corrective action through repair, rework, or pay reduction factors using industry standards City specifications and NCDOT guidelines.

Materials Certification and Delivery:
Upon request of the Engineer the contractor shall make available to the City all documentation pertaining to the origin, manufacturing, job mix formula or delivery of materials to the job-site. All necessary documentation, whether original or signed must be provided in a legible and thorough manner to complete quantity verification and may include but not limited to shipping receipts, trucking delivery tickets, plant or quarry tickets, manufacturers certification, Buy America, shop drawings, etc. This may pertain to deliveries of asphalt (surface, intermediate, base, binder), cement, stone (ABC, #57, riprap), soils, mulch, castings (steel), pipe (RCP, PVC, ductile), fixtures, landscaping, seed, etc.

TS-15.29 SAWING EXISTING SIDEWALKS AND DRIVEWAYS:

Where it is necessary to remove existing sidewalks or driveways, the Contractor will be required to furnish a neat edge along the pavement retained by sawing a neat line approximately two inches deep, with a concrete saw, before breaking the adjacent pavement away.

TS-15.30 NOISE CONTROL:

The Contractor shall conduct all his work and use appropriate construction methods and equipment to prevent exceeding legal noise levels. The Contractor shall comply with Chapter 6, Article II -Noise Control of the Wilmington City Code. In addition, the Contractor shall provide baffles and/or enclosures on any dewatering pumps, by-

pass pumps, or generators that must be operated after normal working hours. The Contractor should also consider noise reduction when placing such equipment in the project work areas.

TS-15.31 CATCH BASIN, MANHOLE AND JUNCTION BOXES - MEASUREMENT AND PAYMENT:

Catch basins, manholes and junction boxes shall be paid for as specified in the proposal for the actual quantity installed for the various types. Each structure shall be placed on stone as specified in the project drawings. The cost of the stone shall be included in the unit price of the structure.

Payment for structure installation shall constitute full compensation for all labor, equipment, tools, supplies and incidentals necessary to complete all items of work, including excavation and backfill necessary to construct the structure, compaction of sub grade, hauling, construction of fills and embankments, spreading, rolling, wetting and disposal of all surplus and unsuitable materials, as indicated on the drawings and specified herein.

TS-15.32 FINAL CLEANUP:

The Contractor shall clear all streets, curbs, gutters, driveways and other contract items of all dirt and debris before final inspection will be made. The City will not inspect the improved areas until they are cleaned. Failure by the City to perform final inspection if the areas are not cleaned shall not relieve the Contractor of any liquidated damages. No extra payment will be allowed for this cleaning. The cost of the cleaning shall be included in each item bid in the proposal.

TS-15.33 RELEASE OF PERFORMANCE AND PAYMENT BOND:

The Contractor's performance and payment bond shall not be released until the City of Wilmington agrees that the work performed under this contract meets or exceeds standards and policies.

TS-15.34 PROJECT WORK TIMES:

Unless requested in writing and approved by the City in advance, the Contractor shall not be allowed to perform construction activities on weekends, City recognized holidays, or before 7:00 a.m. or after 6:00 p.m. on weekdays.

TS-15.35 MEASUREMENT AND PAYMENT – PROJECT COORDINATION:

This line item shall be paid for at the lump sum price listed on the bid schedule. The price shall include all labor, equipment, and material costs to work with business owners to maintain their services and coordinate the work of other contractors in the project area. The contractor shall at all times throughout the project's duration be solely responsible for planning, scheduling, coordinating, and monitoring the work of outside contractors working in the project area. Others planning to work in the project area may include Duke Energy Progress, Piedmont Natural Gas, Charter Communications, and AT&T. The contractor working with the owner (city) will not be responsible for the work proposed by others, but it will be the responsibility of the

contractor to manage the work done by others with the improvements proposed by the current project. This line item is intended for costs that may not be known at this time, but will occur as work in the alleys moves forward. The engineer must review and approve any expenses from this line item prior to payment being made; no payment will be made for items not approved.

TS-15.36 MEASUREMENT AND PAYMENT – 6" ROOF LEADER LATERAL AND 4" AIR CONDITIONING CONDENSATE LINE LATERAL:

The 6" Roof Leader Lateral and 4" Air Conditioning Condensate Line Lateral bid line items shall be measured on a per each unit installed, in accordance with the project plans and specifications, basis. The installed features must be reviewed and approved by the Engineer prior to being eligible for payment.

Payment for the line items shall be full compensation for all labor, equipment, tools, supplies, and incidentals necessary to complete all work, including, but not limited to, trenching, connection to existing roof leader/condensate line, and connection to proposed storm drain collector pipe, as indicated on the drawings and specified herein. It is the contractor's responsibility to include sufficient labor, equipment, and material costs in the unit cost for the bid items to connect the existing roof leaders and condensate lines to the proposed system, regardless of where the existing features presently terminate. For example, if one existing roof leader terminates 3' from the ground, and another existing roof leader terminates 15' from the ground, no additional compensation will be given for the differences required to make the connections; the contractor will be responsible for making a connection from the existing termination to the proposed system. The unit cost included in the bid must consider these differences.

TS-15.37 SUPPLY OF BRICK PAVERS:

The brick pavers needed for the project will be supplied by the City of Wilmington. The brick pavers will be available by appointment for pickup at the City of Wilmington Operations Center, located at 265 Operations Center Drive, Wilmington, NC 28412, between the hours of 8:00 AM to 3:30 PM, Monday through Friday, not including city observed holidays. Pickups must be scheduled by calling City of Wilmington staff 24 hours in advance to ensure personnel are available to load materials onto the contractor's equipment. Brick pavers must be stored and secured off-site by the contractor until they are installed. The cost of the disposal of pallets and other materials which brick pavers are delivered on shall be disposed of at the contractor's expense and will be incidental to the installation of the brick pavers.

TS-15.38 REQUIREMENT TO FOLLOW ALL REGUALTIONS:

The contractor shall comply with all city, state, and federal regulations per section G-1.29 in the general provisions included in this manual.

TS-15.39 SAWING EXISTING ASPHALT:

Where it is necessary to remove existing asphalt sidewalks, driveways, streets or curbs the contractor will be required to furnish a neat, straight, uniform edge along

the adjacent asphalt pavement retained by sawing a neat, straight, uniform line with a concrete saw, before breaking the adjacent surface away. The Contractor shall be responsible for ensuring that the saw cut is of sufficient depth to prevent damage beyond the limits of the saw cut. Once the saw cut has been made, no additional payment will be allowed, for asphalt removal and/or replacement and/or disposal and/or anything related to the concrete, beyond the limit of the saw cut. No direct payment will be made for the sawing as such work will be considered incidental to other work being paid for by the various items in the contract.

TS-15.40 DISPOSAL OF MATERIALS:

Excavated material shall be placed so as not to unreasonably interfere with travel. All asphalt and other street surfacing, surface loam and sod shall be kept separate from the remainder of the excavated material. Upon completion of the backfilling, the property shall be cleaned, all surplus material removed, and the surface restored to the condition in which it was before ground was broken. Unless otherwise specified, all materials left over shall become property of the contractor. Also, underground structures removed, such as brick, concrete, and sewer pipe, shall become the property of the contractor, unless otherwise noted on the plans. If the contractor fails to promptly remove surplus material, the owner may have the material removed and charge the cost thereof as money paid to the contractor. All surplus excavation shall be removed from the site of the work by the contractor, but none shall be deposited on private property until written consent of the property owner has been filed with the engineer. Contractor's disposal shall comply with all Federal, State, and local laws and regulations.

TS-15.41 DISPOSAL OF OBJECTIONABLE EXCAVATED MATERIAL:

The contractor is hereby notified that the disposal of objectionable common excavation material such as existing concrete curbing, asphalt, timber, concrete, tree limbs, brush, roots, stumps, muck, etc. shall be the responsibility of the contractor. The contractor will be required to obtain his own (State approved) disposal site for this material. No extra payment for this disposal will be allowed. The contractor should include all costs incurred for this item in the unit price bid for the appropriate bid line items in the proposal.

TS-15.42 POLYMERIC SAND FOR BRICK PAVERS INSTALLATION:

The contractor shall use polymeric sand for the filling in of joints of brick pavers as directed by COW personnel. The use of this material will allow the joints to expand and contract with weather conditions encountered, from summertime heat to the freeze/thaw conditions. This product will help prevent sand erosion of the paver joints caused by storm water runoff. The ambient temperature must be 35 degrees Fahrenheit at installation area and must be that temperature 4 hours prior and 8 hours after installation of this material. Recommended for joints up ¾" (max), or 1" when pavers intersect. The contractor should try not to install polymeric sand if rain is forecasted to begin with 5 hours of installation. Curing time may take up to 24 hours for this material to set up, dependent on current weather conditions at installation.

Contractor shall follow manufacture's recommendation for the installation of this product.

TS-15.43 UNDERCUT EXCAVATION:

When the engineer determines that the natural soil materials in areas where fills are to be placed are undesirable in their location or condition, the engineer may require the contractor to remove the undesirable material and backfill with approved, property compacted material. Use equipment in undercutting and backfilling operations of such weight, size and capability to efficiently remove and replace the material within the limits established. Use equipment of a size and weight that will not displace the underlying or adjacent material. All material removed in the work of undercut excavation will be classified by the engineer as either suitable for other use without excessive manipulation or used elsewhere in the work or unsuitable for further use and disposed of by the Contractor. Conduct undercut operations so that the Engineer can take the necessary measurements before any backfill is placed. Place backfill in undercut areas in a continuous operation concurrent with the undercutting operation. Do not place backfill material in water unless otherwise permitted by the engineer. Undercut excavation will be considered incidental to the cost of the bid line items that require it.

TS-15.44 FINAL PAYMENT:

The final pay request is due 15 days after all punch list items have been completed and accepted by the City of Wilmington.

APPENDIX A

MISCELLANOUS UTILITY IMPROVEMENTS DOCUMENTATION

SCHEMATIC UTILITY PLAN

PROPOSED UTILITY SCHEMATIC PLAN

DEVELOPMENT AT 10 SOUTH FRONT STREET LAYOUT PLAN

6" STORM STUBOUT
6" SEWER STUBOUT
6" STORM STUBOUT
6" STORM STUBOUT
QUINCE ALLEY
107.00'
87.02'
46.41'
+/- 55' TO DENSITY LINE
+/- 18' TO PROPERTY LINE
+/- 18' TO PROPERTY LINE
DOWNSPOUT LOCATION
S 84°51'46" W 159.93'
DOWNSPOUT LOCATION
CONDUCTOR HEAD
27.25'
CONDUCTOR HEAD
6" STORM
S. FRONT ST.
S 05°08'14" E 26.93'
QUINCE ROOM
GAS
ELECTRICAL
WOMEN
MEN
DISHWASHER
COMMERCIAL KITCHEN
095
ARCADE - COVERED
ARCADE - PARTIALLY COVERED
SEATING - COVERED
SEATING - UNCOVERED
S 84°51'46" W 7.73'
S 05°08'14" E 27.17'
HENDERSON ROOM
6" STORM STUBOUT
6" STORM
S 84°34'57" W 152.59'
110.60'
HENDERSON ALLEY
147.19'
6" STORM STUBOUT
16" ELM
LIGHT POLE
GARBAGE CAN
WATER METER
S. FRONT STREET
10 5 0 10 20 30
SCALE IN FEET: 1"= 10'

CHARTER COMMUNICATIONS IMPROVEMENTS PLAN

Market Street

Quince Alley

Henderson Alley

Dock Street

Potts Alley

Betten Court

South Front Street

S WATER ST

S FRONT ST

DOCK ST

2-2in conduits
Will run along with power

DUKE ENERGY PROPOSED CONDUIT LOCATIONS SKETCHES FOR FUTURE SERVICE CONVERSIONS

view 1
3-3in conduits
2-4in conduits

VIEW 2

2-4IN CONDUITS

3-3IN CONDUITS

PED

2- 2IN CONDUITS

1-2in for secondary to come from either transformer location

4 - 4in conduits and 2 -2in

potiental future transformer location

2-4IN CONDUITS
3-2IN CONDUITS

P
2-3in from pole to proposed future ped location
P
1-2in conduit
2-3in conduits

2-4IN CONDUITS INSTALLED FROM POLE TO POLE

CONDUIT LOCATIONS SKETCHES FOR FUTURE ALLEY LIGHTING

lighting service can come from this pedestal
P
2-3in from pole to proposed future ped location
P
1-2in conduit
2-3in conduits

1-2in for secondary to come from
either transformer location
4 - 4in conduits and 2 -2in
lighting service can come from existing
padmounts to new meter base
potiental future
transformer location

new lighting service can feed from existing padmount to new meter base via 2in conduit

2-4IN CONDUITS INSTALLED FROM POLE TO POLE

APPENDIX B

PUBLIC OUTREACH MEETING COMMENT FORMS

Public Works
Stormwater and Streets Management
209 Coleman Drive
PO Box 1810
Wilmington, NC 28402-1810
910 343-4777
910 341-0099 fax
wilmingtonnc.gov
Dial 711 TTY/Voice

CITY OF WILMINGTON NORTH CAROLINA

City of Wilmington Public Input Meeting
Quince, Henderson and Wilkinson Alley Improvements

December 10, 2024

The City of Wilmington seeks input from tenants and landowners that are directly adjacent to Quince, Henderson and Wilkinson Alleys.

Name: MICHAEL LAVIGNA

Business: MICHAEL'S ON THE WATERFRONT

Address: 5 SOUTH WATER STREET WILMINGTON

Phone: 843 7960289 Email: MJLAVIGNA@AOL.COM

Please circle the alley(s) you are adjacent to: Quince (Henderson) Wilkinson

Please check all the services and frequency (daily, weekly, monthly) that you currently use that require access to the alley:

City Trash/Recycling - ✓ Frequency - 3 TIMES WEEK

Laundry - _____ Frequency - _____

Grease Collection - ✓ Frequency - ONCE EVERY 2 MONTHS

Deliveries - ✓ Frequency - 3 TIMES A WEEK

Other - _____ Frequency - _____

Additional Input/Issues:

REDO ALLEY IN OFF SEASON

THE ALLEY IS VERY DANGEROUS. THE ALLEY IS UNEVEN + DARK. I CAN'T TELL YOU HOW MANY PEOPLE HAVE FALLEN AND WERE INJURED.

Public Works
Stormwater and Streets Management
209 Coleman Drive
PO Box 1810
Wilmington, NC 28402-1810
910 343-4777
910 341-0099 fax
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CITY OF WILMINGTON NORTH CAROLINA

City of Wilmington Public Input Meeting
Quince, Henderson and Wilkinson Alley Improvements

December 10, 2024

The City of Wilmington seeks input from tenants and landowners that are directly adjacent to Quince, Henderson and Wilkinson Alleys.

Name: DEAN NEFF

Business: Seabird Restaurant

Address: 1 South Front Street

Phone: (478) 501-0651 Email: dean@seabirdnc.com

Please circle the alley(s) you are adjacent to: (Quince) (Henderson) Wilkinson

Please check all the services and frequency (daily, weekly, monthly) that you currently use that require access to the alley:

City Trash/Recycling - ____ Frequency - _____

Laundry - ~~✓~~ Frequency - ~~daily~~

Grease Collection - ____ Frequency - _____

Deliveries - _____ Frequency - _____

Other - _____ Frequency - _____

Additional Input/Issues:

Better lighting in both alley ways would improve safety. We always hope that projects like this do not impact services of power, gas, water, or trash pick up.

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CITY OF WILMINGTON
NORTH CAROLINA

City of Wilmington Public Input Meeting
Quince, Henderson and Wilkinson Alley Improvements

December 10, 2024

The City of Wilmington seeks input from tenants and landowners that are directly adjacent to Quince, Henderson and Wilkinson Alleys.

Name: Gary Coleman

Business: Cape Fear Spice Merchants

Address: 65 Front + 20 Market

Phone: 910 772-2980 Email: cfspicemerchants@gmail.com

Please circle the alley(s) you are adjacent to: (Quince) Henderson Wilkinson

Please check all the services and frequency (daily, weekly, monthly) that you currently use that require access to the alley:

(City Trash/Recycling) ____ Frequency - Daily

Laundry - N/A Frequency - ____

Grease Collection - N/A Frequency - ____

(Deliveries) ____ Frequency - most Days

Other - ____ Frequency - ____

Additional Input/Issues:
=Safety lighting is a must for the Alleys.

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CITY OF WILMINGTON NORTH CAROLINA

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The City of Wilmington seeks input from tenants and landowners that are directly adjacent to Quince, Henderson and Wilkinson Alleys.

Name: Bobby Hamelborg

Business: Investments, Spice Merchants, Edge of Urge

Address: 6 S Front

Phone: 9106176508 Email: BJH2010@AOL.COM

Please circle the alley(s) you are adjacent to: (Quince) Henderson Wilkinson

Please check all the services and frequency (daily, weekly, monthly) that you currently use that require access to the alley:

City Trash/Recycling - ____ Frequency - Daily

Laundry - _____ Frequency - _____

Grease Collection - ____ Frequency - _____

Deliveries - _____ Frequency - Daily

Other - _____ Frequency - _____

Additional Input/Issues:

Lighting very important to do same time project begins to coordinate

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CITY OF WILMINGTON NORTH CAROLINA

City of Wilmington Public Input Meeting
Quince, Henderson and Wilkinson Alley Improvements

December 10, 2024

The City of Wilmington seeks input from tenants and landowners that are directly adjacent to Quince, Henderson and Wilkinson Alleys.

Name: MIKE BOYLAND

Business: BOYLAND BAKERY

Address: 20 S FRONT ST

Phone: 910 [redacted] 547-8657 Email: _____

Please circle the alley(s) you are adjacent to: Quince Henderson (Wilkinson)

Please check all the services and frequency (daily, weekly, monthly) that you currently use that require access to the alley:

City Trash/Recycling - ____ Frequency - 2X DAILY

Laundry - _____ Frequency - _____

Grease Collection - ____ Frequency - _____

Deliveries - _____ Frequency - _____

Other - _____ Frequency - _____

Additional Input/Issues:

_____

_____

_____

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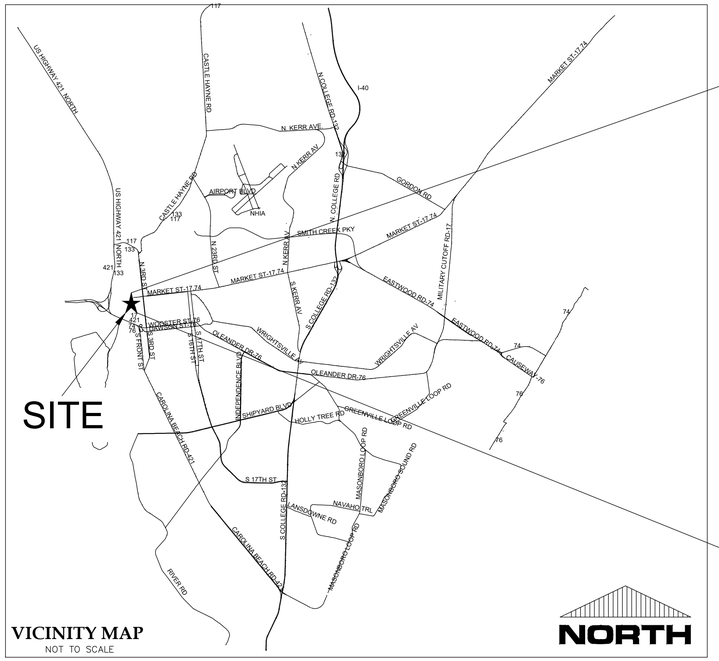

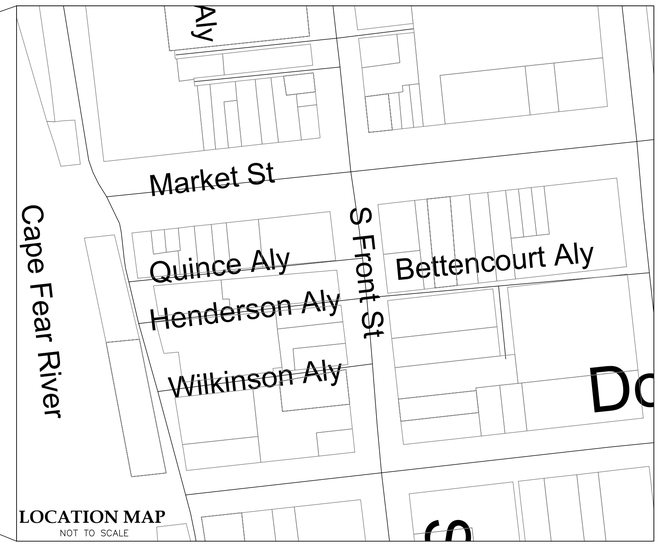

DOWNTOWN ALLEY IMPROVEMENTS PROJECT

PROJECT NUMBER - 2TRST2110

CITY OF WILMINGTON NORTH CAROLINA

Public Works • Stormwater & Streets Management Division
P.O. Box 1810 • 209 Coleman Drive • Wilmington, NC 28402 • (910) 343-4777

MAYOR
Bill Saffo

CITY COUNCIL MEMBERS
Kevin Spears
David Joyner
Salette Andrews
Cassidy Santaguida
JC Lyle
Chakema Clinton-Quintana

CITY MANAGER - Becky Hawke

PUBLIC WORKS DIRECTOR - David B. Mayes, P.E.
PROJECT DIRECTOR - Aaron T. Beckner, P.E.
PROJECT MANAGER - Zach P. Roman, P.E.

SHEET INDEX*

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SHEET 2	GENERAL NOTES
SHEET 3	EXISTING CONDITIONS PLAN
SHEET 4	DEMOLITION & EROSION CONTROL PLAN
SHEET 5	PAVEMENT PLAN
SHEET 6	STORM DRAIN PLAN & PROFILE - QUINCE ALLEY
SHEET 7	STORM DRAIN PLAN & PROFILE - WATER ST.
SHEET 8	STORM DRAIN PLAN & PROFILE - HENDERSON ALLEY
SHEET 9	STORM DRAIN PLAN & PROFILE - WILKINSON ALLEY
SHEET 10	CONSTRUCTION DETAILS
SHEET 11	CONSTRUCTION DETAILS
SHEET 12	CONSTRUCTION DETAILS

*REFER TO THE COVER SHEET FOR THE PLAN SET TITLED "DOWNTOWN ALLEY WATER AND SEWER IMPROVEMENTS", PREPARED BY HIGHFILL INFRASTRUCUTRE ENGINEERING, P.C. FOR THE SHEET INDEX FOR THE WATER/SANITARY SEWER IMPROVEMENTS

811

ISSUED FOR BID NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

DATE: FEBRUARY 2026
PROJECT NUMBER: 2TRST2110
PROJECT ENGINEER: ZACH ROMAN, P.E.

DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

CITY OF WILMINGTON NORTH CAROLINA
Public Works • Stormwater & Streets Management Division
P.O. Box 1810 209 Coleman Drive Wilmington, NC 28412 (910) 341 - 4777

DWG PATH: N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings
FILE NAME : Plans-Downtown Alleys.dwg

COVER SHEET
DOWNTOWN ALLEY IMPROVEMENTS
CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE NOT TO SCALE
SHEET 1 of 12

General Notes for Utility Work Within Existing Public Right of Way - City of Wilmington (July 2024)

The following General Notes are set by the City of Wilmington and shall not be altered. These notes shall be a part of the utility project construction drawings for quick reference.

1. Contractor must possess a valid copy of the City Right-of-Way permit on-site, including the City Standard Provisions in order to conduct work. It is the contractor's responsibility to make sure all crews and subcontractors are familiar with the Permit conditions, the City Standard Provisions, and all other jurisdictional agencies, including NCDOT. Permit amendments may be required where work scope changes occur, or additional excavation areas are necessary.
2. The contractor shall first obtain right-of-entry agreements or easements from property owners prior to access of adjacent properties.
3. Contractor/excavator shall follow NCGS Chapter 87 Article 8A when conducting NC 811 utility locate requests. This includes pre-marking (white lining) for areas of proposed utility excavations, adherence to tolerance zones and reporting of utility strikes.
4. Prior to construction, Contractor shall contact the City Inspector to review the project scope, schedule, material test requirements, and areas of concern. The layout of proposed utilities shall be observed after utility locates have been marked. This may occur during the required pre-construction meeting.
5. It shall be the contractor's responsibility to verify the location of the underground utilities within the project limits. Contractor shall plan for the presence of additional utilities not included in the site plans. If not provided by the designer, Contractor shall utilize SUE Level B (electronic locates) or SUE Level A (electronic locates plus physical identification thru potholing or excavation) for verification of existing utilities, prior to installing utilities. Contractor is expected to perform test holes/trenches, especially at areas of concern, to verify elevations, condition, etc., especially for planned utility crossings and wet utilities prior to beginning installation of utilities
6. Contractor is responsible to notify owner and City for review and input whenever utility conflicts occur with existing conditions, and specifically where field conditions require > 2' shift in horizontal alignment of proposed facilities. Changes in alignment may require modifications or resubmittal of the project drawings or ROW permit.
7. Alignment preferences and offsets between utilities are identified in the City Standard Provisions. For example, utilities >=6" diameter shall have minimum separation of 4' horizontal and 2' vertical from outside edge to outside edge. Smaller conduits and lines shall have a minimum of 18" horizontal and 2' vertical separation from outside edge to outside edge. Installation of underground utilities shall not occur closer than 5' from outside edge of a traffic signal pole foundation.

DATE: JULY, 2024	STANDARD DETAIL	CITY OF WILMINGTON NORTH CAROLINA CITY OF WILMINGTON ENGINEERING PO BOX 1810 WILMINGTON N.C. 28402 (910) 341-7807
DRAWN BY JSR	GENERAL NOTES FOR UTILITY WORK IN PUBLIC R.O.W.	
CHECKED BY B.D.R., P.E.		
SCALE NOT TO SCALE	Sheet 1 of 2	SD 1-08

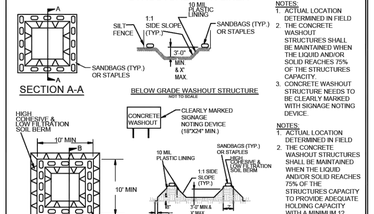
8. Contractor shall adhere to permitted work zones and hours. Traffic and Pedestrian control devices, signs and flagging operations, shall conform to MUTCD and NCDOT standards and be checked daily and adjusted as needed for moving work zones. Contractor must utilize certified personnel when self-performing traffic control. All signage, barriers, drums, etc. shall be site appropriate and in good condition. Violations will be issued when permit conditions are not adhered to.
9. No meters, valves, fire hydrants, hand holes, etc. are to be located in the sidewalk, driveway, curb ramps or on corners. Maximum hand hole size is 24" x 36" unless approved prior to installation.
10. Utility markers, medallions, and bollards no higher than 30" shall be utilized for identification of utility owner on above ground structures. Identification tags of underground conduits and cables are required within hand holes and other vaults.
11. All excavations shall be supervised by an OHSA certified competent person. Safety measures shall occur for excavations within 1:1 slope from the edge of pavement to the bottom of trench, and where shoring is needed.
12. The contractor shall protect the existing traffic control loop detectors. If existing traffic control loop detectors are damaged during construction, contractor shall immediately notify the City, and a qualified contractor must replace the loop wire to the nearest pull box.
13. Contractor shall coordinate all pre-paving and pre-pavement marking walkthroughs with any sub-contractors and City inspectors prior to performance of work. Work conducted outside of normal operating hours is subject to rejection without proper inspection and reporting.
14. Contractor shall prevent environmental pollution or damage of air, water and land by managing construction activities for noise, solid waste, litter, chemicals, erosion and other pollutants. Contractor shall provide ongoing control measures and cleaning of work sites on a daily basis.
15. Contractor shall be responsible to procure and generate the required project compliance reports including but limited to daily reports, as-builts, material specs, delivery tickets, testing documents, environmental reports or mitigation, etc. to the City in a timely manner, appropriate to the schedule of the project. This may require the use of third-party consultants and contractors.
16. All restoration and repairs to be completed to as-is or better conditions, including compliance with current technical standards, ADA requirements, etc.
17. The permit holder shall submit a Right-Of-Way Compliance Certification form to the City within 5 days of completion. Additional ROW work during the subsequent 18-month warranty period requires a separate ROW permit.

DATE: JULY, 2024	STANDARD DETAIL	CITY OF WILMINGTON NORTH CAROLINA CITY OF WILMINGTON ENGINEERING PO BOX 1810 WILMINGTON N.C. 28402 (910) 341-7807
DRAWN BY JSR	GENERAL NOTES FOR UTILITY WORK IN PUBLIC R.O.W.	
CHECKED BY B.D.R., P.E.		
SCALE NOT TO SCALE	Sheet 2 of 2	SD 1-08

Date:

Page:

ONSITE CONCRETE WASHOUT STRUCTURE WITH LINER



PORTABLE TOILETS

1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

PAINT AND OTHER LIQUID WASTE

1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
3. Contain liquid wastes in a controlled area.
4. Containment must be labeled, sized and placed appropriately for the needs of site.
5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

HAZARDOUS AND TOXIC WASTE

1. Create designated hazardous waste collection areas on-site.
2. Place hazardous waste containers under cover or in secondary containment.
3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

CONCRETE WASHOUTS

1. Do not discharge concrete or cement slurry from the site.
2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
4. Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1. Never bury or burn waste. Place litter and debris in approved waste containers.
2. Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
6. Anchor all lightweight items in waste containers during times of high winds.
7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
8. Dispose waste off-site at an approved disposal facility.
9. On business days, clean up and dispose of waste in designated waste containers.

NORTH CAROLINA Environmental Quality

EFFECTIVE DATE: 11/12/2020

NCG-01 MATERIALS HANDLING

COORDINATION WITH UTILITY COMPANIES

THE FOLLOWING LIST INCLUDES ALL UTILITIES MAKING IMPROVEMENTS IN THE PROJECT AREA:

- CITY OF WILMINGTON
- CAPE FEAR PUBLIC UTILITY AUTHORITY
- PIEDMONT NATURAL GAS
- CHARTER
- AT&T

IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH PIEDMONT NATURAL GAS, CHARTER, AND AT&T, AND THEIR CONTRACTORS TO ENSURE THE SUCCESSFUL INSTALLATION OF THE IMPROVEMENTS BY THESE UTILITY COMPANIES WITHIN THE PROJECT AREA.

PROJECT CONSTRUCTION NOTES

1. THE ENGINEER HAS MADE ALL POSSIBLE ATTEMPTS TO LOCATE EXISTING UTILITIES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD-VERIFY THE LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION BY OBSERVATION, ELECTRONIC DEVICES, HAND DIGGING AND PERSONAL CONTACT WITH THE UTILITY COMPANIES. CONTRACTOR SHALL NOTIFY ENGINEER OF ANY CONFLICTS. ANY DAMAGE TO UTILITIES INCURRED DURING CONSTRUCTION IS THE RESPONSIBILITY OF THE CONTRACTOR AND IS TO BE REPAIRED AT THE CONTRACTOR'S EXPENSE. CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ANY FINES OR LOSS SERVICE REVENUE. NORTH CAROLINA ONE-CALL CENTER NUMBER IS 811 OR 1-800-632-4949.
2. PRIOR TO ANY DISTURBANCE, THE CONTRACTOR SHALL DOCUMENT THE AREA TO BE DISTURBED.
3. CONTRACTOR SHALL MAINTAIN A MEANS FOR INGRESS\EGRESS TO EACH PROPERTY AT ALL TIMES.
4. THE CONTRACTOR, PRIOR TO BEGINNING WORK, SHALL ENSURE THE CONTINUATION OF BUISNESS SERVICES TO PROPERTY OWNERS. THESE BUSINESS SERVICES INCLUDE, BUT ARE NOT LIMITED TO, COMPOSTING CARTS, LAUNDRY CARTS, GREASE CONTAINERS, AND RECYCLE / TRASH RECEPTACLES.
5. EXISTING ITEMS THAT MUST BE DISTURBED IN ORDER TO COMPLETE THE WORK SHALL BE CAREFULLY REMOVED AND RESET BY THE CONTRACTOR.
6. ALL MATERIAL CLEARED AND/OR DEMOLISHED BY THE CONTRACTOR IN ORDER TO CONSTRUCT THE WORK SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE PROPERLY DISPOSED OF OFF-SITE.
7. CONTRACTOR SHALL PLAN AND CONSTRUCT WORK SO AS TO CAUSE MINIMUM INCONVENIENCE TO THE OWNER AND THE PUBLIC. THE CONTRACTOR SHALL PROVIDE, ERECT AND MAINTAIN AT ALL TIMES DURING THE PROGRESS OR TEMPORARY SUSPENSION OF WORK, SUITABLE BARRIERS, FENCES, SIGNS OR OTHER ADEQUATE PROTECTION, INCLUDING FLAG MEN AND WATCHMEN AS NECESSARY TO INSURE THE SAFETY OF THE PUBLIC AS WELL AS THOSE ENGAGED IN THE CONSTRUCTION WORK. CONSTRUCTION SIGNAGE SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "CONSTRUCTION AND MAINTENANCE OPERATIONS SUPPLEMENT TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" BY THE NCDOT.
8. BY SUBMITTING A BID THE CONTRACTOR ATTESTS THEY HAVE PERFORMED ALL SITE VERIFICATIONS AS REQUIRED TO BE CONFIDENT IN EXISTING CONDITIONS AND AS SUCH NO CLAIMS FOR ADDITIONAL PAYMENT SHALL BE CONSIDERED FOR FIELD CONDITIONS WHICH MAY DIFFER FROM WHAT IS SHOWN ON THE PLAN SHEETS.
9. EXISTING CONDITIONS WERE TAKEN FROM A SURVEY COMPLETED BY OTHERS. THE SURVEY SHALL BE FIELD VERIFIED BY CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE OWNER IMMEDIATELY.
10. CONTRACTOR SHALL AT ALL TIMES THROUGHOUT THE PROJECT'S DURATION BE SOLELY RESPONSIBLE FOR PLANNING, SCHEDULING, COORDINATING, AND MONITORING THE WORK OF OUTSIDE CONTRACTORS WORKING IN THE PROJECT AREA. OTHERS PLANNING TO WORK IN THE PROJECT AREA MAY INCLUDE DUKE ENERGY PROGRESS, PIEDMONT NATURAL GAS, CHARTER COMMUNICATIONS, AND AT&T. THE CONTRACTOR WORKING WITH THE OWNER (CITY) WILL NOT BE RESPONSIBLE FOR THE WORK PROPOSED BY OTHERS, BUT IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MANAGE THE WORK DONE BY OTHERS WITH THE IMPROVEMENTS PROPOSED BY THE CURRENT PROJECT.
11. A MANDATORY PRE-CONSTRUCTION UTILITY COORDINATION MEETING, ATTENDED BY THE OWNER (CITY) AND ALL OTHER ENTITIES WORKING IN THE PROJECT AREA, MUST BE SCHEDULED AND HELD BY THE CONTRACTOR PRIOR TO WORK BEGINNING ON THE PROJECT. THE CONTRACTOR MUST PROVIDE THE OWNER (CITY) A FULL SCHEDULE DETAILING THE ANTICIPATED START/END DATES AND DURATIONS OF ALL WORK TO BE PERFORMED IN THE PROJECT AREA. THE SCHEDULE MUST INCLUDE ALL WORK TO BE DONE BY OTHERS AND BASED ON THE RESULTS OF THE PRE-CONSTRUCTION UTILITY COORDINATION MEETING.
12. A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO THE OWNER (CITY), BY THE CONTRACTOR, FOR APPROVAL PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES. NO CONSTRUCTION ACTIVITIES SHALL TAKE PLACE WITHOUT A TRAFFIC CONTROL PLAN APPROVED BY THE OWNER (CITY).
13. ADJUST EXISTING MANHOLE LIDS, WATER VALVE BOXES, UTILITY JUNCTION BOXES, METER BOXES, ETC. TO PROPOSED GRADE.
14. CONTRACTOR TO INSTALL CONDUIT PER DRAWINGS FOR FUTURE UNDERGROUNDING OF DUKE POWER LINES. SERVICE CONDUITS ARE FOR THE USE OF THE PRIVATE PROPERTY OWNERS SHOULD THEY CHOOSE TO CONVERT THEIR SERVICES FROM OVERHEAD TO UNDERGROUND. THESE CONDUITS MAY NEED TO BE ADJUSTED DEPENDING ON THE LOCATION OF THE POINTS OF DELIVERY. ADJUSTMENT OF THE CONDUITS WOULD BE THE RESPONSIBILITY OF THE PRIVATE PROPERTY OWNERS.
15. CONTRACTOR TO PROVIDE COORDINATES AT CONDUIT TERMINATION POINTS FOR FUTURE LOCATION.
16. ALL ROOF DRAIN, CONDENSATE LINE, DRAINAGE, AND CONDUIT PIPING AND FITTINGS SHALL BE SCHEDULE 40 PVC, IN ACCORDANCE WITH ASTM D1785.
17. CONTRACTOR TO USE REDUCERS AS NEEDED TO TRANSITION BETWEEN PIPE AND FITTING SIZES NOTED ON DRAWINGS.
18. POWER CONDUIT TO HAVE A MINIMUM BURY DEPTH OF 30" AND MINIMUM SEPARATION FROM SPECTRUM CABLE CONDUIT OF 12".

TYPICAL CONSTRUCTION SEQUENCE PER ALLEY

1. ACQUIRE ALL PERMITS/AUTHORIZATIONS, COMPLETE ALL MEETINGS/COORDINATION, NOTIFY ALL ADJACENT PROPERTY OWNERS, COMPLETE NC811, ETC.
2. INSTALL ALL EROSION CONTROL MEASURES TO PREVENT SEDIMENT FROM LEAVING THE WORK AREA
3. REMOVE EXISTING ALLEY SURFACE, ONLY REMOVE WHAT IS NECESSARY FOR THE INSTALLATION OF NATURAL GAS IMPROVEMENTS BY OTHERS
4. COORDINATE NATURAL GAS IMPROVEMENTS BY OTHERS, CONFIRM NATURAL GAS IMPROVEMENTS WORK BY OTHERS IS FULLY COMPLETED
   4.1. IF BUSINESS SERVICES IMPACTS CAN BE ELIMINATED AND/OR RESOLVED SERVICES, AT THIS POINT, THE CONTRACTOR MAY MOVE TO THE NEXT ALLEY AND COMPLETE STEPS 1 THROUGH 3 ABOVE FOR THE NATURAL GAS IMPROVEMENTS BY OTHERS
5. INSTALL WATER AND SEWER IMPROVEMENTS, REMOVING ABANDONED IN PLACE NATURAL GAS LINE AS NEEDED TO COMPLETE THE WORK
6. COORDINATE COMMUNICATIONS/DATA UTILITY IMPROVEMENTS BY OTHERS, INSTALL STORM DRAINAGE IMPROVEMENTS, INSTALL ELECTRICAL CONDUIT
7. CONFIRM ALL WORK BY CONTRACTOR, AND WORK BY OTHERS IS FULLY COMPLETED AND ACCEPTED BY OWNERS
8. INSTALL NEW ALLEY SURFACE
9. CLEAN UP AND RESTORATION OF SURFACES

PIEDMONT NATURAL GAS COORDINATION NOTES

1. THE NATURAL GAS IMPROVEMENTS, INSTALLED BY A PIEDMONT NATURAL GAS CONTRACTOR, ARE REQUIRED TO BE THE FIRST IMPROVEMENTS INSTALLED AS PART OF THE PROJECT.
2. THE CITY OF WILMINGTON CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLISHING THE EXISTING ALLEY SURFACES PRIOR TO THE PIEDMONT NATURAL GAS CONTRACTOR COMMENCING THEIR WORK. THE CITY OF WILMINGTON CONTRACTOR MUST COORDINATE WITH THE PIEDMONT NATURAL GAS CONTRACTOR TO ENSURE THAT ONLY THE ALLEY SURFACES ARE REMOVED FOR THE IMMEDIATE WORK. DEMOLITION OF ALL ALLEY SURFACES AT ONCE IS NOT PROPOSED.
3. THE PIEDMONT NATURAL GAS CONTRACTOR WILL INSTALL NEW GAS LINES AND ABANDON THE EXISTING GAS LINES IN PLACE; THEY WILL ALSO TIE EXISTING SERVICES INTO THE NEW LINE. IN ADDITION, THE PIEDMONT NATURAL GAS CONTRACTOR WILL RETURN THE EXCAVATED AREAS BACK UP TO EXISTING GRADE AND IN A CONDITION THAT IS USABLE BY PEDESTRIANS AND VEHICLES.
4. ONCE ALL OF THE NATURAL GAS SYSTEM IMPROVEMENTS ARE COMPLETED, THE PIEDMONT NATURAL GAS CONTRACTOR WILL VACATE THE ALLEY AND MOVE TO THE NEXT ALLEY. THE CITY OF WILMINGTON CONTRACTOR MAY THEN BEGIN CONSTRUCTING THE PROPOSED ALLEY IMPROVEMENTS.
5. THE CITY OF WILMINGTON CONTRACTOR MAY REMOVE THE ABANDONED NATURAL GAS LINE AS NEEDED TO INSTALL THE PROPOSED ALLEY IMPROVEMENTS, INCLUDING WATER/SEWER FEATURES.

ISSUED FOR BID NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

DATE: **FEBRUARY 2026**
PROJECT NUMBER: **2TRST2110**
PROJECT ENGINEER: **ZACH ROMAN, P.E.**

DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

CITY OF WILMINGTON NORTH CAROLINA
Public Works • Stormwater & Streets Management Division
P.O. Box 1810 209 Coleman Drive Wilmington, NC 28412 (910) 341 - 4777

DWG PATH: N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings
FILE NAME : Plans-Downtown Alleys.dwg

GENERAL NOTES
DOWNTOWN ALLEY IMPROVEMENTS
CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE N/A
SHEET 2 of 12

SYMBOL LEGEND:

- EXISTING IRON PIPE
- EXISTING IRON PINCH PIPE
- EXISTING IRON ROD
- EXISTING RAILROAD SPIKE
- EXISTING CONCRETE MONUMENT
- EX. RIGHT OF WAY MONUMENT
- EXISTING MASONRY NAIL
- EXISTING MAG NAIL
- EXISTING PK NAIL
- SET IRON ROD
- COMPUTED POINT
- CABLE TV PEDASTAL
- TELEPHONE PEDASTAL
- UTILITY POLE & GUY ANCHOR
- AREA LIGHT
- TRAFFIC LIGHT POLE
- TRAFFIC CONTROL BOX
- ELECTRIC METER
- ELECTRIC TRANSFORMER
- TELEPHONE VAULT
- FIBER OPTIC VAULT
- A/C UNIT ON CONCRETE PAD
- WATER METER
- WATER VALVE
- IRRIGATION CONTROL VALVE
- FIRE HYDRANT
- GAS VALVE
- WELL (WATER)
- SANITARY SEWER MANHOLE
- CLEANOUT
- SEWER VALVE
- STORM DRAIN MANHOLE
- CATCH BASIN/CURB INLET
- SIGN
- FIBER OPTIC MARKER
- MAILBOX
- BUG TRAP
- GAS METER
- BOLLARD
- EX. FLOOR ELEVATION

LINE TYPE LEGEND:

- PROPERTY LINE
- RIGHT OF WAY
- CENTERLINE
- ADJACENT PROPERTY LINE
- EASEMENT LINE
- TIE LINE
- FENCE
- OHP — OHP — OHP — OVERHEAD POWER LINE
- UNDERGROUND CABLE TV LINE
- UGE — UGE — UGE — UNDERGROUND ELECTRIC LINE
- UFO — UFO — UFO — UNDERGROUND FIBER OPTIC LINE
- GAS — GAS — GAS — UNDERGROUND GAS LINE
- UGT — UGT — UGT — UNDERGROUND TELEPHONE
- UNDERGROUND TRAFFIC SIGNAL
- W — W — UNDERGROUND WATER LINE
- STORM SEWER PIPE
- SS — SANITARY SEWER PIPE
- FM — FM — FM — FORCE MAIN PIPE

C.S.F. = 1.0000337
NAD 83 (2011)

FLOOD ZONE "AE" BASE FLOOD ELEV. = 9'

FLOOD ZONE "X SHADED"

FLOOD ZONE "X"

S 27°28'43"W 39.47'

2 MARKET STREET, LLC
BOOK 6119, PAGE 709
R04720-011-010-000

HAROLD W. PETERSON, JR. & PAMELA P. DODGE
BK. 5936, PG. 801
R04720-011-007-000

MTS REALTY
BK. 3039, PG. 612
R04720-011-006-000

JEANNE WHITE POOLE
BK. 4421, PG. 040
R04720-011-005-000

MATT PROPERTIES II, LLC
BOOK 5754, PAGE 1966
R04720-011-004-000

JUDITH F. HAMELBURG
BOOK 398, PAGE 308
R04720-011-003-000

N 06°13'33"W 69.00'

EX SSMH
LID = 3.00'
INV IN 4" PVC(NE) = 0.30'
INV IN 4" PVC(W) = 0.60'
INV IN 8" TC(S) = 0.28'
INV IN & OUT 12" PIPE(N&S) = -4.65'

CP #111

GREASE DRUM

PLASTIC STORAGE CONTAINER

WOOD STORAGE CONTAINER

6" PVC DRAIN

N 83°42'02"E 140.03'

QUINCE ALLEY

ABANDONED 3" CONDUITS

METAL CONDUITS

S 83°43'03"W 252.38'

ABANDONED TELCO PED

ROCK PARKING

LANDSCAPING

EX SSMH
LID = 4.20'
ACCESS UNAVAILABLE IT IS UNDER A LARGE PLANTER

WATER STREET, LLC
BOOK 6019, PAGE 2665
R04720-011-011-000

MEETINGHOUSE PROPERTIES, LLC
BOOK 6085, PAGE 1860
R04720-011-002-000

EX SSMH
LID = 3.92'
INV IN 8" DIP (E) = -1.33'
INV IN 12" (N) = -4.27'
INV OUT 12" (S) = -4.27'

EX SANITARY MANHOLE
LID = 4.26'
INV IN 24" D.I. (E&W) = -0.68'

LIQUID CARBON DIOXIDE BOTTLE

WOOD BORDER

N 83°36'56"E 253.15'

EX STORM DRAIN
MANHOLE
LID = 10.38'
INV OUT 24" RCP (W) = 4.99'

CONC SIDEWALK

"X" CONDUITS
2" CONDUITS

GREASE BIN

HENDERSON ALLEY

ABANDONED 3" CONDUITS

S 83°40'50"W 253.71'

METAL DECK PLATE

JIAN CHEN and wife, QUI QUN WANG
BOOK 5107, PAGE 324
R04720-011-001-000

THIS APPEARS TO BE A 24" DUCTILE IRON LINE. C.F.P.U.A.) CLAIMS IT TO BE A SANITARY SEWER LINE. IT LEAVES THIS MANHOLE AND GOES WEST BUT WE COULD NOT DETERMINE WHERE IT GOES.

S WATER STREET - PUBLIC RIGHT OF WAY VARIES

FRONT STREET - 66' PUBLIC RIGHT OF WAY

S 06°13'33"E 413.33'

N 06°13'33"W 72.20'

WILMINGTON RIVERSIDE PROPERTIES, LLC
BOOK 6177, PAGE 1044
TRACT 1
R05308-002-001-000

EX SSMH
LID = 3.91'
INV IN 4" TILE (E) = -3.49'
INV IN 12" (N) = -4.09'
INV OUT 12" (S) = -3.99'

N 07°26'26"W 3.76'

POWER POLE W/ AREA LIGHT

N 21°28'50"E 4.22'

N 83°48'27"E 50.84'

N 83°21'26"E 50.30'

2" PVC CONC

BLOCK

LATTICE

GATE POST

S 79°37'07"W 9.03'

HOLE W/ SUMP PUMP & DRAIN PIPES

CONC BUMPER

N 82°33'34"E 134.58'

WILKINSON ALLEY

GRANITE CURBING

S 83°44'57"W 146.69'

EX STORM DRAIN DROP INLET
GRATE = 3.29'
INV OUT 12" RCP (S) = 1.24"

EX STORM DRAIN DROP INLET
GRATE = 3.29'

ROCK PARKING

EX STORM DRAIN MANHOLE
LID = 3.69'
INV IN 12" RCP (N) = 1.24'
INV IN 12" RCP (SW) = 1.28'
INV OUT 12" RCP (NE) = 0.74'

PATIO

INV 6" PVC = 6.58'

MASONIC PARTNERS, LLC
BOOK 4981, PAGE 1501
R05308-002-002-000

THE WILKINSON BUILDING
BOOK 1698, PAGE 915
CONDO BOOK 10, PAGE229
R05308-008-002-006

WILMINGTON RIVERSIDE PROPERTIES, LLC
BOOK 6177, PAGE 1044
TRACT 2
R05308-002-002-000

N 06°13'33"W 113.71'

FLOOD ZONE "X SHADED"

FLOOD ZONE "AE" BASE FLOOD ELEV. = 9'

SURVEY NOTE:
THE SURVEY FOR THE PROJECT WAS COMPLETED BY ROBERT H. GOSLEE & ASSOCIATES, PA. THE ORIGINAL SURVEY WAS ISSUED, SIGNED, AND SEALED BY BOB M. JONES JR., PLS, L-2977 ON MAY 26, 2021.

ISSUED FOR BID NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

DATE: FEBRUARY 2026
PROJECT NUMBER: 2TRST2110
PROJECT ENGINEER: ZACH ROMAN, P.E.

DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

CITY OF WILMINGTON NORTH CAROLINA
Public Works • Stormwater & Streets Management Division
P.O. Box 1810 209 Coleman Drive Wilmington, NC 28412 (910) 341 - 4777

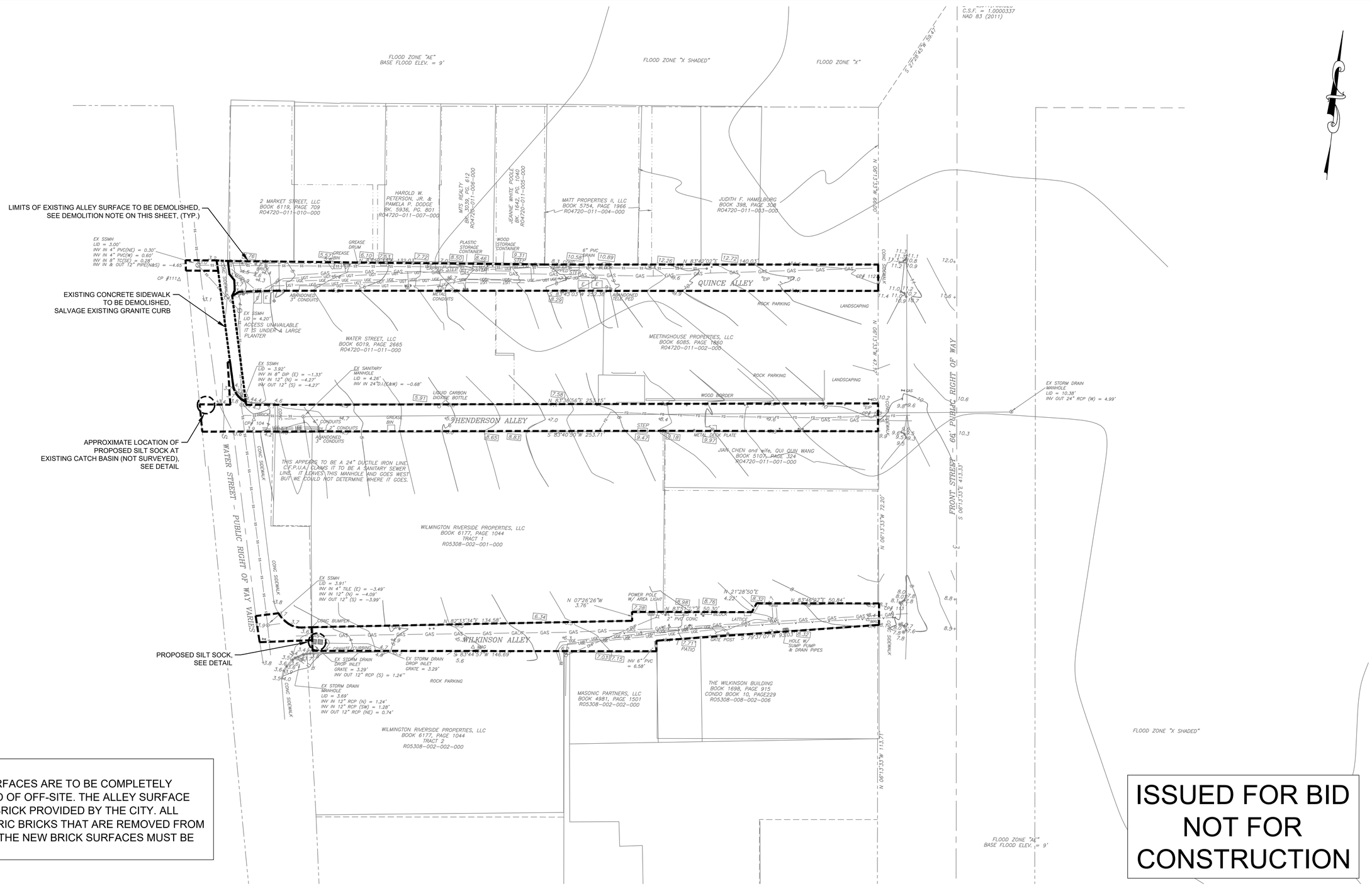
DWG PATH:
N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings
FILE NAME :
Plans-Downtown Alleys.dwg

EXISTING CONDITIONS PLAN
DOWNTOWN ALLEY IMPROVEMENTS

CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE 1"=20'

SHEET 3 of 12



DEMOLITION NOTE:

THE EXISTING ALLEY SURFACES ARE TO BE COMPLETELY REMOVED AND DISPOSED OF OFF-SITE. THE ALLEY SURFACE SHALL REPLACED WITH BRICK PROVIDED BY THE CITY. ALL COBBLES AND/OR HISTORIC BRICKS THAT ARE REMOVED FROM THE ALLEYS TO INSTALL THE NEW BRICK SURFACES MUST BE RETURNED TO THE CITY.

ISSUED FOR BID NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

DATE: **FEBRUARY 2026**
PROJECT NUMBER: **2TRST2110**
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DWG PATH: N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings
FILE NAME : Plans-Downtown Alleys.dwg

DEMOLITION & EROSION CONTROL PLAN
DOWNTOWN ALLEY IMPROVEMENTS

CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE 1"=20'

SHEET 4 of 12

C.S.F. = 1.0000337
NAD 83 (2011)

FLOOD ZONE "AE"
BASE FLOOD ELEV. = 9'

FLOOD ZONE "X SHADED"

FLOOD ZONE "X"

S 37°28'43"W 39.47'

2 MARKET STREET, LLC
BOOK 6119, PAGE 709
R04720-011-010-000

HAROLD W. PETERSON, JR. & PAMELA P. DODGE
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CP #111

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GREASE TRAP

PLASTIC STORAGE CONTAINER

WOOD STORAGE CONTAINER

6" PVC DRAIN

8.3 CONC

N 83°49'03"E 140.03'

ABANDONED 3" CONDUITS

METAL CONDUITS

S 83°43'03"W 252.38'

ABANDONED TELTA PED

ROCK PARKING

LANDSCAPING

CONC SIDEWALK

EX SSMH
LID = 4.20'
INV ACCESS UNAVAILABLE
IT IS UNDER A LARGE PLANTER

PROPOSED CONCRETE SIDEWALK, CONCRETE CURB, AND GRANITE CURB (MATCH EXISTING), SEE DETAIL SHEETS

WATER STREET, LLC
BOOK 6019, PAGE 2665
R04720-011-011-000

MEETINGHOUSE PROPERTIES, LLC
BOOK 6085, PAGE 1860
R04720-011-002-000

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N 83°36'56"E 253.15'

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N 06°13'53"W 47.47'

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LID = 10.38'
INV OUT 24" RCP (W) = 4.99'

FRONT STREET - 66' PUBLIC RIGHT OF WAY

S 06°13'53"E 413.33'

S. WATER STREET - PUBLIC RIGHT OF WAY VARIES

PROPOSED 12"-WIDE CONCRETE BAND, (MATCH EXISTING)

PROPOSED BRICK ALLEY, HISTORIC BRICK TO BE PROVIDED BY OWNER, SEE DETAIL SHEETS, (TYP.)

THIS APPEARS TO BE A 24" DUCTILE IRON LINE. C.F.P.U.A.I. CLAIMS IT TO BE A SANITARY SEWER LINE. IT LEAVES THIS MANHOLE AND GOES WEST BUT WE COULD NOT DETERMINE WHERE IT GOES.

WILMINGTON RIVERSIDE PROPERTIES, LLC
BOOK 6177, PAGE 1044
TRACT 1
R05308-002-001-000

EX SSMH
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S 79°37'07"W 9.03'

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ROCK PARKING

MASONIC PARTNERS, LLC
BOOK 4981, PAGE 1501
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THE WILKINSON BUILDING
BOOK 1698, PAGE 915
CONDO BOOK 10, PAGE229
R05308-008-002-006

WILMINGTON RIVERSIDE PROPERTIES, LLC
BOOK 6177, PAGE 1044
TRACT 2
R05308-002-002-000

N 06°13'53"W 113.37'

N 06°13'53"W 72.20'

FLOOD ZONE "X SHADED"

FLOOD ZONE "AE"
BASE FLOOD ELEV. = 9'

FINISHED GROUND NOTE:

THE FINISHED GROUND ELEVATIONS AFTER ALL IMPROVEMENTS HAVE BEEN CONSTRUCTED MUST MATCH THE PRECONSTRUCTION, EXISTING GROUND ELEVATIONS. THE FINISHED GROUND SURFACE MUST FALL TOWARDS WATER ST AND AWAY FROM ALL BUILDINGS.

ISSUED FOR BID
NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

DATE: FEBRUARY 2026
PROJECT NUMBER: 2TRST2110
PROJECT ENGINEER: ZACH ROMAN, P.E.

DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

CITY OF WILMINGTON NORTH CAROLINA
Public Works • Stormwater & Streets Management Division
P.O. Box 1810 209 Coleman Drive Wilmington, NC 28412 (910) 341 - 4777

DWG PATH:
N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings

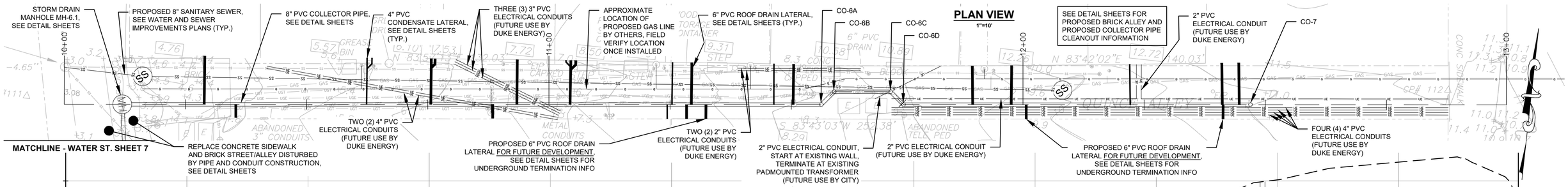
FILE NAME :
Plans-Downtown Alleys.dwg

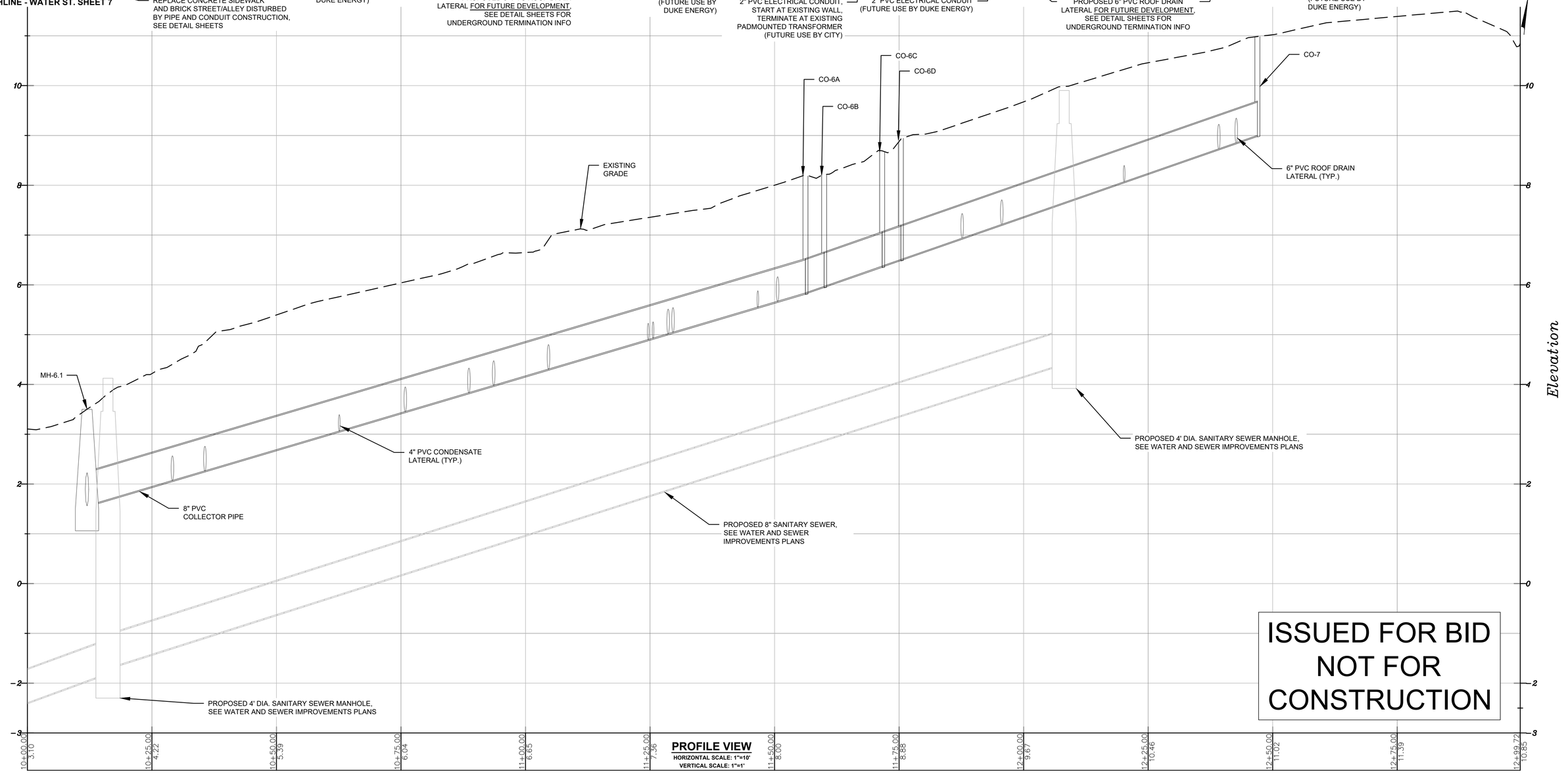
PAVEMENT PLAN
DOWNTOWN ALLEY IMPROVEMENTS

CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE 1"=20'

SHEET 5 of 12





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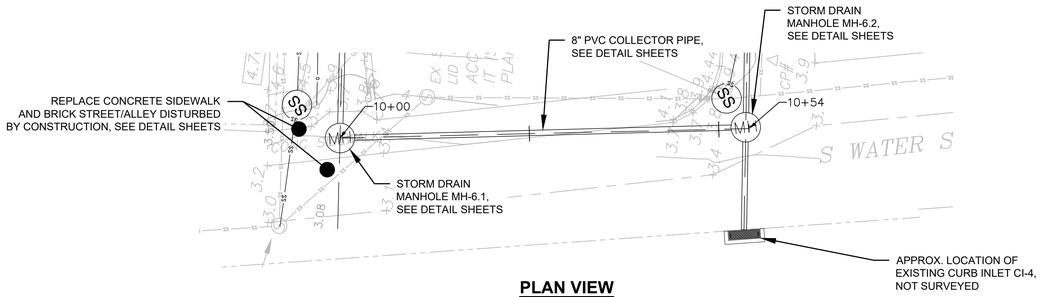
STORM DRAIN PLAN & PROFILE - QUINCE ALLEY
DOWNTOWN ALLEY IMPROVEMENTS

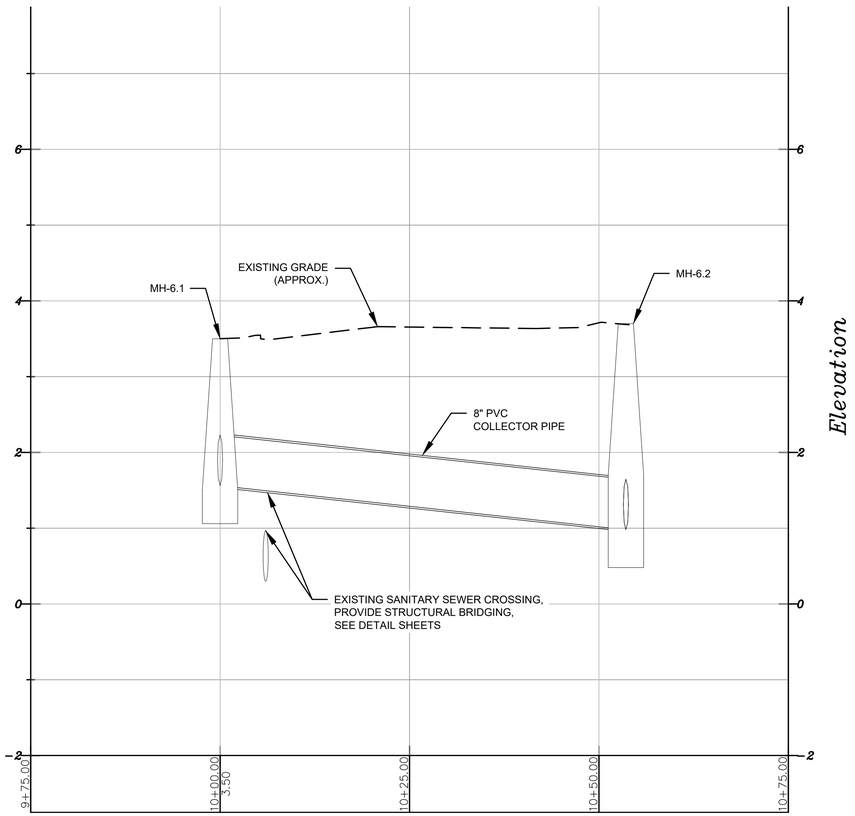
CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE AS NOTED

SHEET 6 of 12



PLAN VIEW
1"=10'



PROFILE VIEW
HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"=1'

ISSUED FOR BID
NOT FOR
CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 049509 ZACHARY P. ROMAN

DATE: FEBRUARY 2026
PROJECT NUMBER: 2TRST2110
PROJECT ENGINEER: ZACH ROMAN, P.E.

DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

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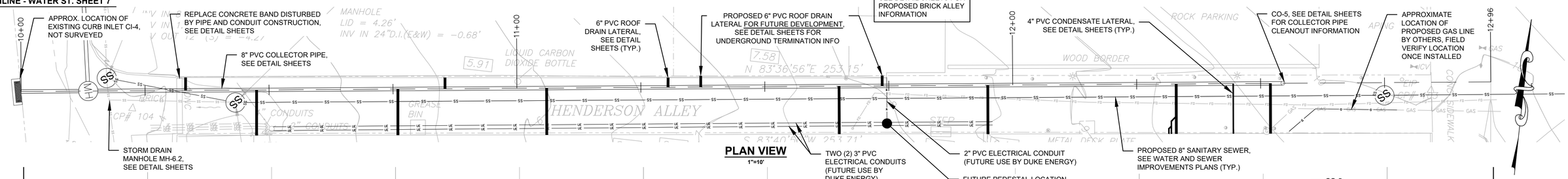
STORM DRAIN PLAN & PROFILE - WATER ST.
DOWNTOWN ALLEY IMPROVEMENTS

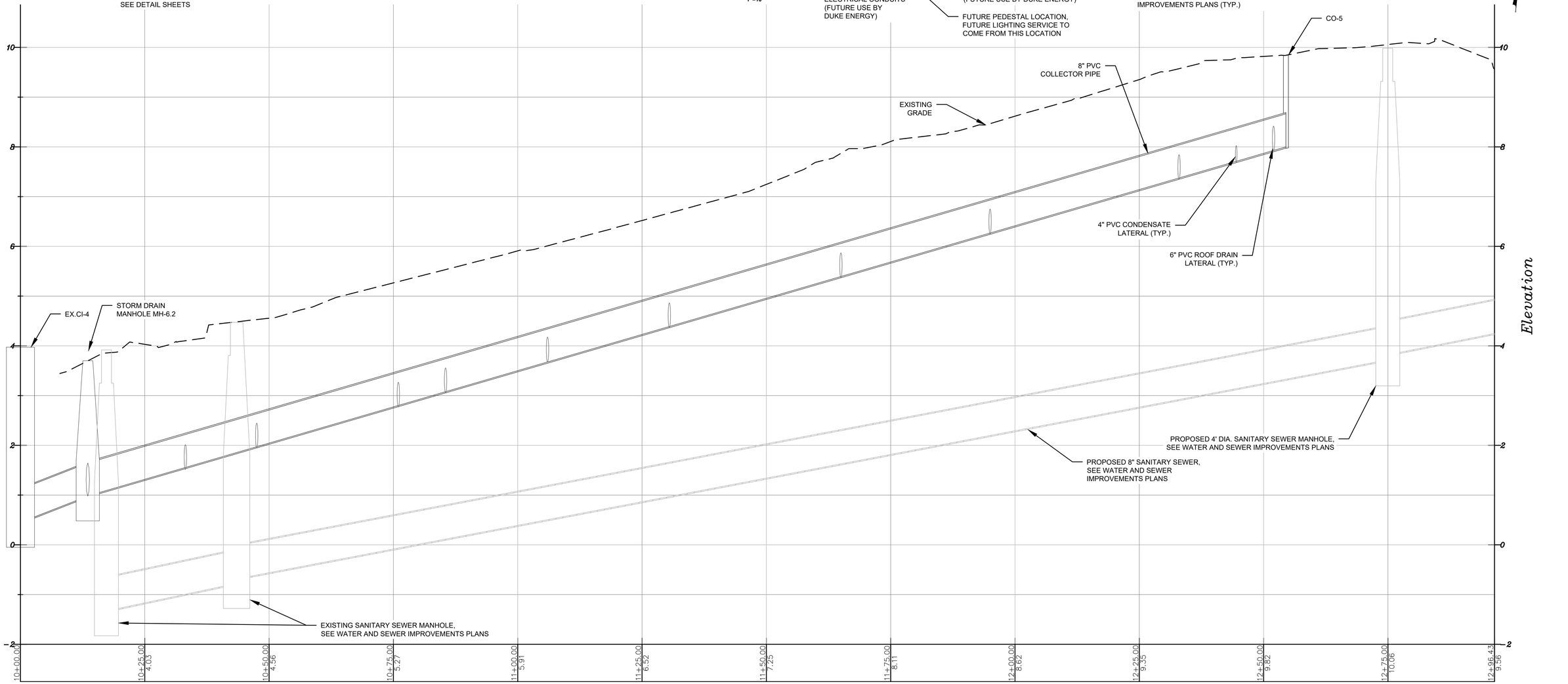
CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE
AS NOTED

MATCHLINE - WATER ST. SHEET 7



PLAN VIEW
1"=10'



PROFILE VIEW
HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"=1'

ISSUED FOR BID, NOT FOR CONSTRUCTION

REV#	DATE

SEAL 049509 NORTH CAROLINA PROFESSIONAL ENGINEER ZACHARY P ROMAN

DATE: FEBRUARY 2026
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DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

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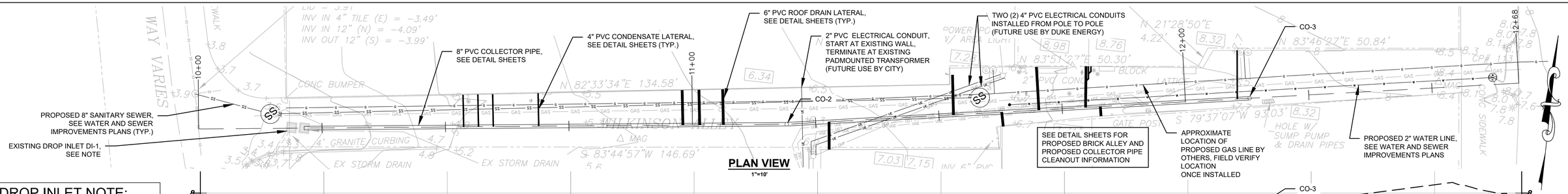
STORM DRAIN PLAN & PROFILE - HENDERSON ALLEY
DOWNTOWN ALLEY IMPROVEMENTS

CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE AS NOTED

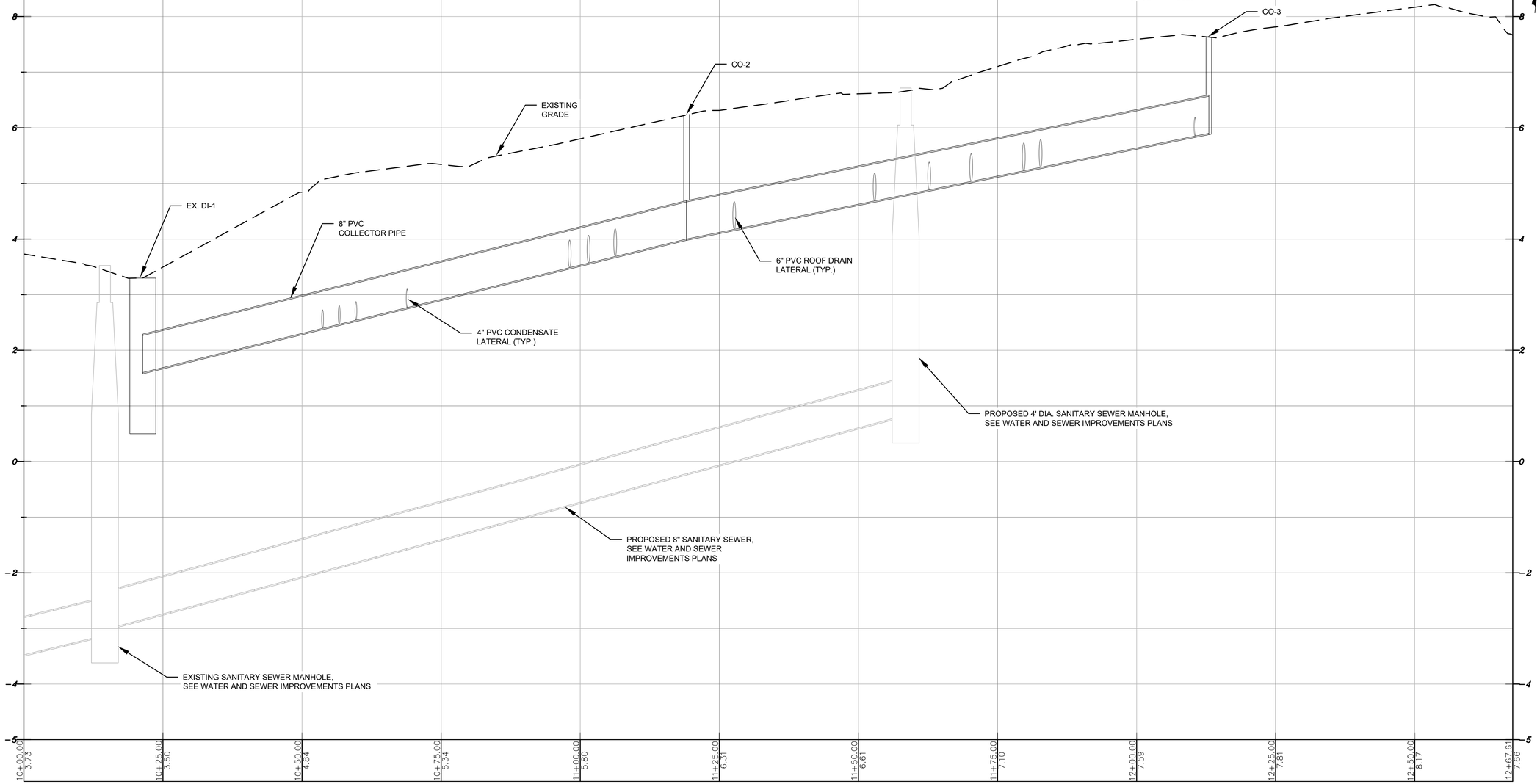
SHEET 8 of 12



PLAN VIEW
1"=10'

DROP INLET NOTE:

REPLACE EXISTING STRUCTURE WITH A NEW STRUCTURE IF REMOVAL IS REQUIRED TO INSTALL PROPOSED WATER AND SEWER IMPROVEMENTS. IF REMOVAL IS NOT REQUIRED FOR PROPOSED WATER AND SEWER IMPROVEMENTS, KEEP AND MAINTAIN THE EXISTING STRUCTURE. SEE DETAIL SHEETS FOR DROP INLET REPLACEMENT INFORMATION.



PROFILE VIEW
HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"=1'

ISSUED FOR BID, NOT FOR CONSTRUCTION

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NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

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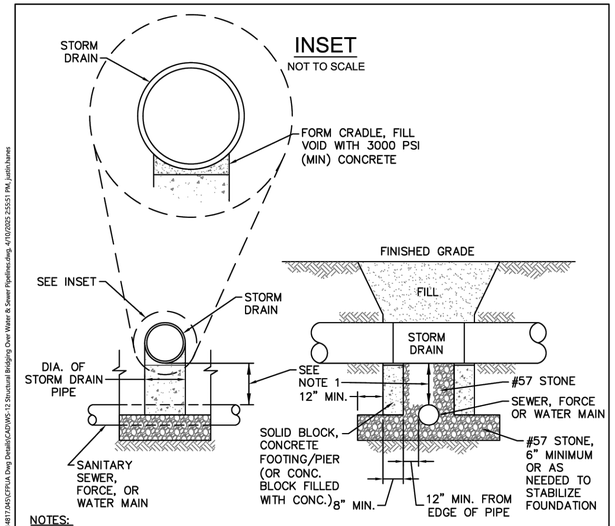
STORM DRAIN PLAN & PROFILE - WILKINSON ALLEY
DOWNTOWN ALLEY IMPROVEMENTS

CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE AS NOTED

SHEET 9 of 12



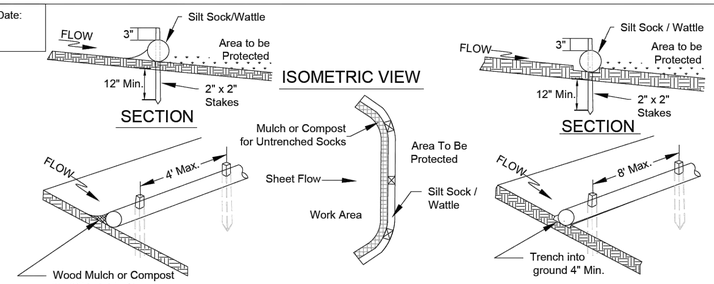
NOTES:

1. STRUCTURAL BRIDGING IS REQUIRED WHEN STATE STANDARD MINIMUM SEPARATIONS CANNOT BE ACHIEVED. IN ADDITION TO STRUCTURAL BRIDGING, A VARIANCE APPROVAL FROM THE REVIEWING STATE AGENCY AND CFPUA SHALL BE OBTAINED.
   1.1. WATER MAIN CROSSING STORM DRAIN SHALL BE LAID TO PROVIDE A MINIMUM VERTICAL SEPARATION OF 12 INCHES.
   1.2. SEWER MAIN AND SEWER FORCE MAIN CROSSING STORM DRAIN SHALL BE LAID TO PROVIDE A MINIMUM VERTICAL SEPARATION OF 18 INCHES.
2. THIS DETAIL IS NOT APPLICABLE TO NCDOT ROADWAYS. ANY STRUCTURAL BRIDGING WITHIN NCDOT RIGHT-OF-WAY MUST ADHERE TO NCDOT REGULATIONS.
3. THIS DETAIL IS APPLICABLE SOLELY TO STORM DRAIN PIPES WITH A DIAMETER OF 24 INCHES OR SMALLER. FOR PIPES EXCEEDING 24 INCHES IN DIAMETER, THE ENGINEER MUST CREATE A CUSTOM STRUCTURAL BRIDGING DETAIL TO SUPPORT THE LARGER PIPES, WHICH WILL BE SUBMITTED TO CFPUA FOR REVIEW AND APPROVAL.

DETAIL: STORM DRAIN STRUCTURAL BRIDGING CROSSING WATER AND SEWER PIPELINES (24" DIAMETER & LESS)		CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	DETAIL NO: **WS-12**
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025 REV. 1 - 04/10/2025		SHEET NO: -

S:\Treatment\Engr\Mgt\Engineers\2005 Project Management\2017 Projects\Standards Update 3148172495\CFPUA Dwg Details\CAD\WS-13 Structural Bridging Over Water & Sewer Pipelines.dwg, 4/10/2025 3:55:53 PM, justin.hines

Date: Page:



UNTRENCHED INSTALLATION

NOTE:

1. Other materials providing equivalent protection against erosive velocities may be substituted for use in silt socks or wattles.
2. Fill silt sock/wattle netting uniformly to the desired length such that logs do not deform.
3. Silt sock/ Wattle should be installed parallel to and a minimum of 10 feet beyond the toe of a graded slope. Silt sock/Wattles located below flat areas should be located at the edge of the land disturbance. The ends of the silt sock/wattles should be turned slightly upslope to prevent runoff from going around the ends of the silt sock/wattles.
4. Oak or other durable hardwood stakes with a 2 inch x 2 inch cross section should be driven vertically plumb, through the center of the silt sock/wattle. Stakes should be placed at a maximum interval of 4 feet or a maximum interval of 8 feet if the silt sock/wattle is placed in a 4 inch trench.
5. In the event staking is not possible (ie. when silt socks/wattles are used on pavement) heavy concrete blocks shall be used behind the silt sock/wattle to hold it in place during runoff events.

ENTRENCHED INSTALLATION*

*THIS APPLICATION MAY NOT BE USED WITH COMPOST SOCKS SMALLER THAN 12".

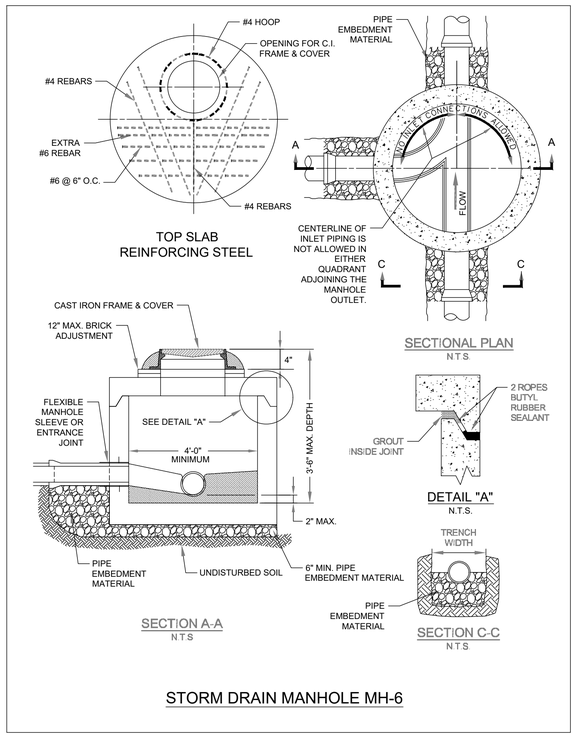
COMPOST SOCK INITIAL FLOW RATES					
Compost Sock Design Diameter	8 Inch (200 nm)	12 Inch (300 nm)	18 Inch (450 nm)	24 Inch (600 nm)	32 Inch (750 nm)
Maximum Slope Length (<2%)	600 Feet (183 m)	750 Feet (229 m)	1,00 Feet (305 m)	1,300 Feet (305 m)	1,650 Feet (500 m)
Hydraulic Flow Through Rate	7.5 gpm/ft (941 l/m/m)	11.3 gpm/ft (141 l/m/m)	15.0 gpm/ft (188 l/m/m)	22.5 gpm/ft (281 l/m/m)	30.0 gpm/ft (374 l/m/m)

MAINTENANCE:

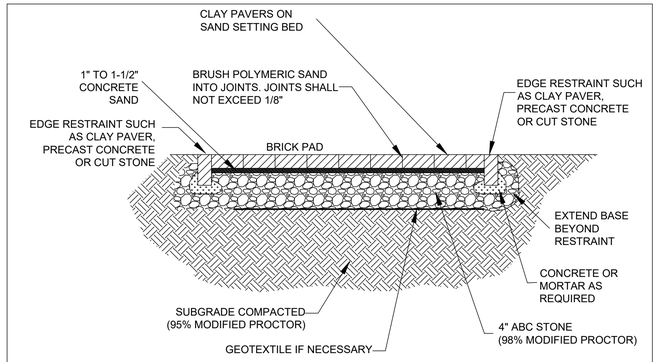
1. Inspect Silt sock/wattle weekly and after each rain of 1 inch or greater. Remove accumulated sediment and any debris as needed to allow for adequate flow.
2. Silt sock/Wattle must be replaced if clogged or torn.
3. If ponding becomes excessive, the silt sock/wattle may need to be replaced with a larger diameter or a different measure.
4. Reinstall if damaged or dislodged.
5. Silt socks/Wattles shall be inspected until land disturbance is compete and the area above the measure has been permanently stabilized.

NORTH CAROLINA Environmental Quality
EFFECTIVE DATE: 11/12/2020

SILT SOCK / WATTLE FOR PERIMETER AND INLET PROTECTION

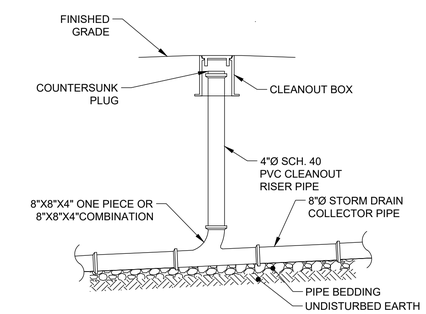


STORM DRAIN MANHOLE MH-6

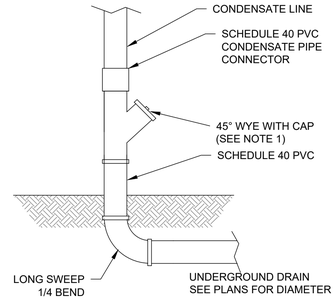


1. BRICK TYPE, SIZE AND PATTERN SHALL BE COORDINATED WITH CITY OF WILMINGTON
2. PAVERS SHALL MEET OR EXCEED ASTM C902 SPECIFICATION FOR PEDESTRIAN AND LIGHT TRAFFIC PAVING BRICK.
3. FINAL DESIGN OF BASE, SETTING BEDS AND EDGE RESTRAINTS SHALL BE DEPENDENT ON THE SOIL CONDITIONS AND APPLICATION.
4. SEE PLAN FOR DIMENSIONS.

BRICK ALLEY
NTS

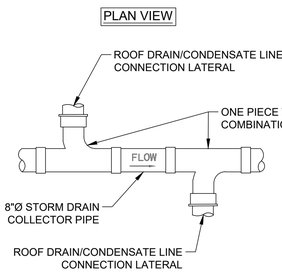


STORM DRAIN COLLECTOR PIPE CLEANOUT



TYPICAL CONDENSATE LINE CONNECTION
NTS

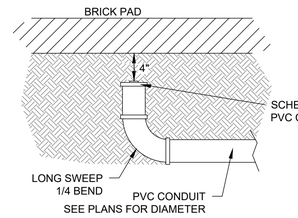
NOTES:
1. WYE TO BE INSTALLED PARALLEL TO ADJACENT WALL WHERE POSSIBLE.



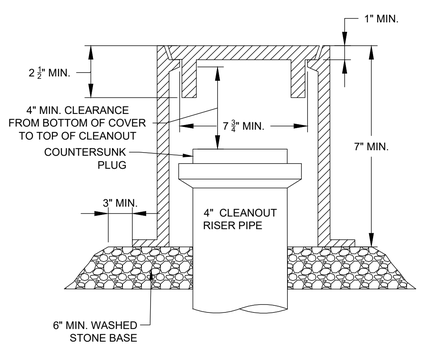
CONDENSATE LINE/ROOF DRAIN TO STORM DRAIN CONNECTION

NOTES:

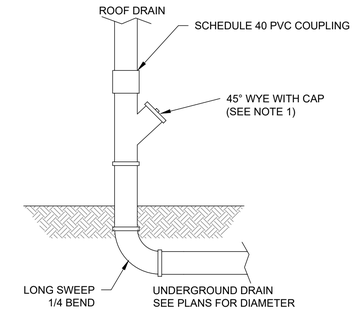
1. CONTRACTOR TO PROVIDE AS-BUILT DRAWINGS WITH COORDINATES (X, Y, AND Z) TIED TO NC GRID FOR TOP OF PVC CAP.



TERMINATE PVC CONDUIT
NTS



STORM DRAIN CLEANOUT BOX
NTS



TYPICAL ROOF DRAIN CONNECTION
NTS

NOTES:
1. WYE TO BE INSTALLED PARALLEL TO ADJACENT WALL WHERE POSSIBLE.

ISSUED FOR BID, NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 049509 ZACHARY P. ROMAN

DATE: **FEBRUARY 2026**
PROJECT NUMBER: **2TRST2110**
PROJECT ENGINEER: **ZACH ROMAN, P.E.**

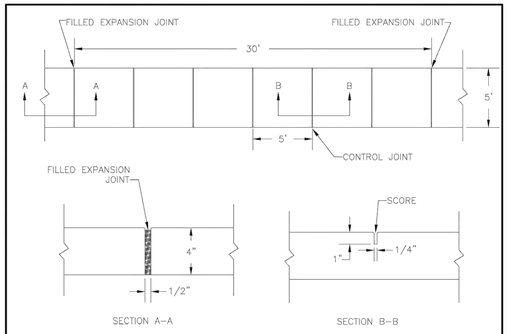
DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

CITY OF WILMINGTON NORTH CAROLINA
Public Works • Stormwater & Streets Management Division
P.O. Box 1810 209 Coleman Drive Wilmington, NC 28412 (910) 341 - 4777

DWG PATH: N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings
FILE NAME : Plans-Downtown Alleys.dwg

CONSTRUCTION DETAILS
DOWNTOWN ALLEY IMPROVEMENTS
CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE NOT TO SCALE
SHEET 10 of 12



NOTES:

1. SANITARY SEWER CLEAN-OUTS, WATER METERS, MANHOLES, VALVE LIDS, ETC SHALL NOT BE LOCATED WITHIN THE SIDEWALK AREA WITHOUT DESIGN APPROVAL FROM THE CITY OF WILMINGTON AND THE CFPUA, AND TRAFFIC-RATED FRAME AND COVER USED OVER A PROPERLY PREPARED SUBGRADE WITH 95% COMPACTION.
2. MINIMUM SIDEWALK WIDTH TO BE 6' MINIMUM IF PLACED AT BACK OF CURB.
3. CONCRETE FOR ALL SIDEWALKS (EXCEPT ANY PORTION CONTAIN WITHIN A DRIVEWAY APRON) SHALL BE CLASS "A" – 3,000 PSI.
4. MINIMUM REPLACEMENT FOR REPAIRS IS A FULL PANEL, TYPICALLY 5'x5'.
5. EXPANSION JOINT MATERIAL TO COMPLY WITH CURRENT NCDOT STANDARDS.
6. 4" STONE BASE MAY BE REQUIRED FOR POOR SOIL OR UNSTABLE SUB-GRADE CONDITIONS.
7. TUNNELING OR DRILLING UNDER SIDEWALK SHALL BE MINIMUM OF 12" UNDER SIDEWALK AND PRE-APPROVED BY THE CITY INSPECTOR.
8. MIN GRADE FOR DRAINAGE IS 1% IN AT LEAST 1 DIRECTION. PREFERRED CROSS SLOPE IS 1.5%. MAX CROSS SLOPE IS 2%. MAX LONGITUDINAL SLOPE IS 8.3% FOR A MAXIMUM OF 30' BEFORE REQUIRING A 10' LANDING WITH MAX 2% SLOPE.
9. ANY SLOPES GREATER THAN 10% FOLLOWING ADJACENT ROADWAYS MUST FOLLOW ADA DESIGN STANDARDS.

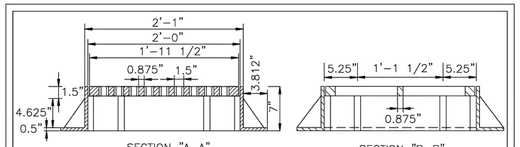
DATE:	MARCH, 2024
DRAWN BY	JSR
CHECKED BY	DEC, P.E.
SCALE	NOT TO SCALE

STANDARD DETAIL

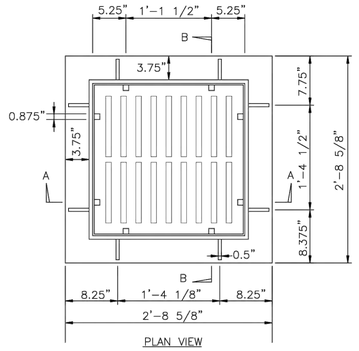
CONCRETE SIDEWALK

CITY OF WILMINGTON ENGINEERING
PO BOX 1810
WILMINGTON N.C. 28402
(910) 341-7807

SD 3-10



MINIMUM AVERAGE WEIGHT
FRAME 195 LBS.
GRATE 145 LBS.



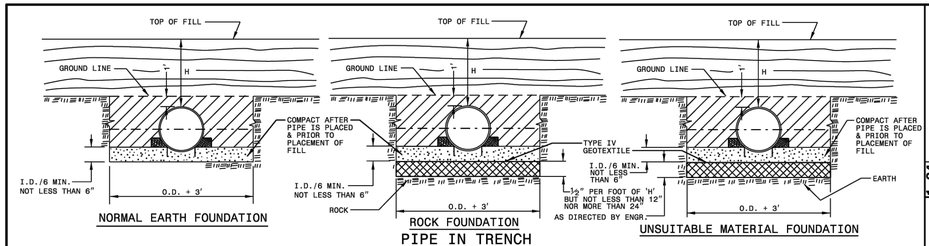
DATE:	2001
DRAWN BY	JSR/CMR
CHECKED BY	B.P., P.E.
SCALE	NOT TO SCALE

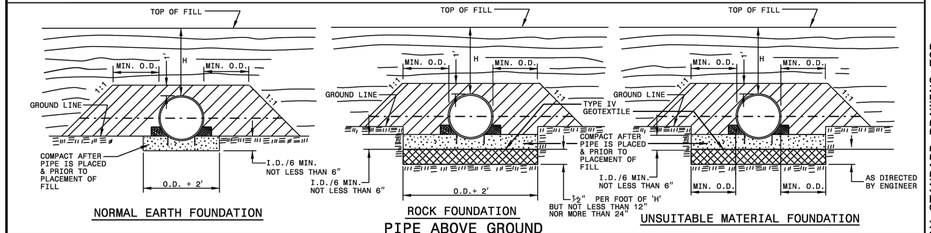
STANDARD DETAIL

DROP INLET CASTINGS

CITY OF WILMINGTON ENGINEERING
PO BOX 1810
WILMINGTON, NC 28402
(910) 341-7807

SD 14-04





GENERAL NOTES:

I.D. = THE MAXIMUM HORIZONTAL INSIDE DIAMETER DIMENSION.
O.D. = THE MAXIMUM HORIZONTAL OUTSIDE DIAMETER DIMENSION.
H = THE FILL HEIGHT MEASURED VERTICALLY AT ANY POINT ALONG THE PIPE FROM THE TOP OF THE PIPE TO THE TOP OF THE EMBANKMENT AT THAT POINT.

APPROVED SUITABLE LOCAL MATERIAL.

TAKE CARE TO FULLY COMPACT HAUNCH ZONE OF PIPE BACKFILL.

LOOSELY PLACED SELECT MATERIAL CLASS III OR CLASS II, TYPE 1 FOR PIPE BEDDING. LEAVE SECTION DIRECTLY BENEATH PIPE UNCOMPACTED AS PIPE SEATING AND BACKFILL WILL ACCOMPLISH COMPACTION.

DO NOT OPERATE HEAVY EQUIPMENT OVER ANY PIPE CULVERT UNTIL THE PIPE CULVERT HAS BEEN PROPERLY BACKFILLED AND COVERED WITH AT LEAST 3 FEET OF APPROVED MATERIAL.

REFER TO NCDOT PIPE MATERIAL SELECTION GUIDE AND STANDARD SPECIFICATIONS FOR ALLOWABLE PIPE FILL HEIGHTS AND PIPE SPECIFICATIONS.

SPRINGLINE OF PIPE

SELECT BACKFILL MATERIAL CLASS III OR CLASS II, TYPE 1 ABOVE AND BELOW SPRINGLINE.

UNDISTURBED EARTH MATERIAL

SELECT MATERIAL CLASS V OR VI FOR FOUNDATION CONDITIONING. ENCAPSULATE WITH TYPE IV GEOTEXTILE AS DIRECTED BY THE ENGINEER.

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

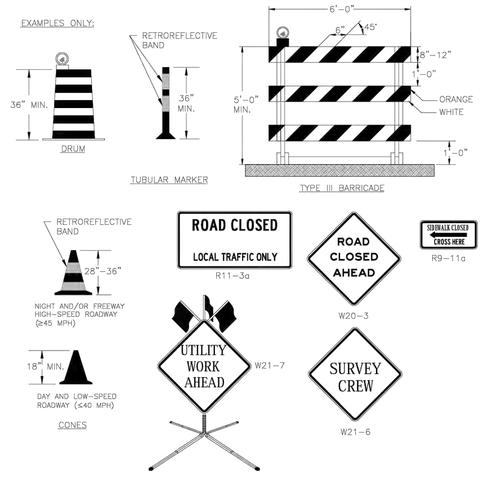
ROADWAY STANDARD DRAWING FOR

METHOD OF PIPE INSTALLATION

FLEXIBLE PIPE

SHEET 1 OF 2

300.01



1-ALL CONSTRUCTION, MAINTENANCE AND UTILITY WORK IN THE RIGHT OF WAY SHALL BE PERMITTED AND FOLLOW MUTCD (PART 6) AND/OR NCDOT GUIDELINES FOR TEMPORARY TRAFFIC CONTROL (TTC).
2-A TTC PLAN SHALL CONSIDER SAFETY AND ACCESSIBILITY OF ALL MOTORISTS, BICYCLISTS AND PEDESTRIANS AND BE PERMITTED BY THE CITY PRIOR TO PLACING SIGNS, ETC.

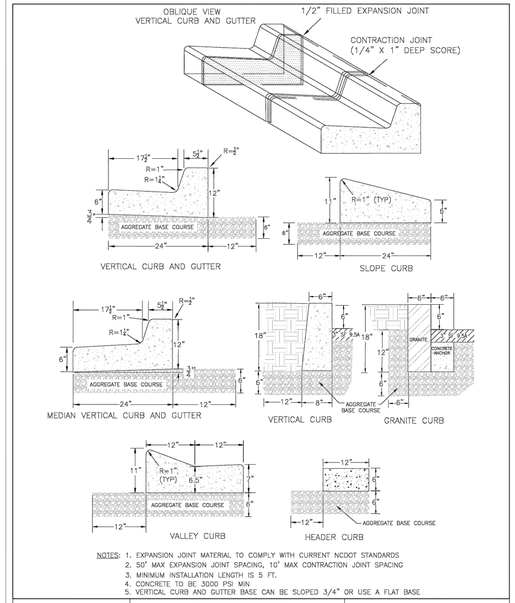
DATE:	DECEMBER, 2011
DRAWN BY	JSR
CHECKED BY	BDR., P.E.
SCALE	NOT TO SCALE

STANDARD DETAIL

GUIDELINES FOR TEMPORARY TRAFFIC CONTROL

CITY OF WILMINGTON ENGINEERING
PO BOX 1810
WILMINGTON, NC 28402
(910) 341-7807

SD 15-07



NOTES:
1. EXPANSION JOINT MATERIAL TO COMPLY WITH CURRENT NCDOT STANDARDS
2. 50' MAX EXPANSION JOINT SPACING, 10' MAX CONTRACTION JOINT SPACING
3. MINIMUM INSTALLATION LENGTH IS 5 FT.
4. CONCRETE TO BE 3000 PSI MIN
5. VERTICAL CURB AND GUTTER BASE CAN BE SLOPED 3/4" OR USE A FLAT BASE

DATE:	AUGUST, 2011
DRAWN:	PB/JSR
CHECKED:	DEC
SCALE	NOT TO SCALE

STANDARD DETAIL

CURBING

CITY OF WILMINGTON ENGINEERING
PO BOX 1810
WILMINGTON N.C. 28402
(910) 341-7807

SD 3-11

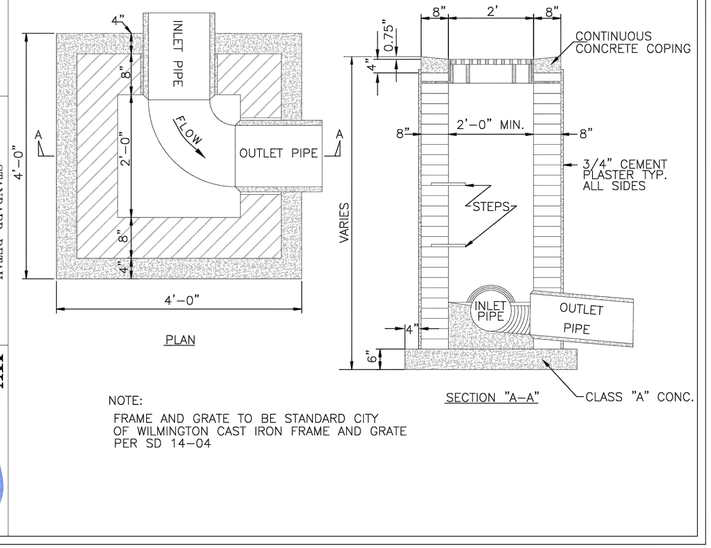
SCALE	NOT TO SCALE
CHECKED BY	B.P., P.E.
DRAWN BY	JSR
DATE:	2001

DROP INLET

STANDARD DETAIL

CITY OF WILMINGTON ENGINEERING
PO BOX 1810
WILMINGTON, NC 28402
(910) 341-7807

SD 2-02



NOTE:
FRAME AND GRATE TO BE STANDARD CITY OF WILMINGTON CAST IRON FRAME AND GRATE PER SD 14-04

ISSUED FOR BID, NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

DATE
FEBRUARY 2026
PROJECT NUMBER
2TRST2110
PROJECT ENGINEER
ZACH ROMAN, P.E.

DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

CITY OF WILMINGTON NORTH CAROLINA
Public Works • Stormwater & Streets Management Division
P.O. Box 1810 209 Coleman Drive Wilmington, NC 28412 (910) 341 - 4777

DWG PATH:
N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings

FILE NAME :
Plans-Downtown Alleys.dwg

CONSTRUCTION DETAILS
DOWNTOWN ALLEY IMPROVEMENTS
CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE NOT TO SCALE
SHEET 11 of 12

CUSTOMER RESPONSIBILITIES

- THE CONDUIT DESIGN WILL BE PROVIDED BY THE DUKE ENERGY DESIGNER. THE DESIGN WILL SHOW THE LOCATION WHERE ALL FACILITIES (CONDUIT, PULL BOXES/MANHOLES, PEDESTALS, TRANSFORMERS, SWITCHGEAR, POLES, ETC.) WILL BE INSTALLED. ANY PROPOSED CHANGES IN THE CONDUIT DESIGN MUST BE REVIEWED AND APPROVED BY THE DUKE ENERGY DESIGNER PRIOR TO INSTALLATION.
- PROVIDE ALL MATERIAL RELATED TO THE CONDUIT SYSTEM AND THE LABOR TO INSTALL THIS MATERIAL.
- COMPLY WITH ALL REQUIREMENTS LISTED IN THIS DOCUMENT.
- INSPECT THE CONDUIT SYSTEM AND CORRECT ALL INSTANCES OF NON-COMPIANCE WITH THE REQUIREMENTS LISTED IN THIS DOCUMENT.
- CUSTOMER IS RESPONSIBLE FOR INSTALLING CONDUIT AND CABLE UP TO THE POINT OF DELIVERY AS DEFINED IN THE SERVICE REQUIREMENTS MANUAL.

DUKE ENERGY RESPONSIBILITIES

- THE CONDUIT DESIGN WILL BE PROVIDED BY THE DUKE ENERGY DESIGNER. THE DESIGN WILL SHOW THE LOCATION WHERE ALL FACILITIES (CONDUIT, PULL BOXES/MANHOLES, PEDESTALS, TRANSFORMERS, SWITCHGEAR, POLES, ETC.) WILL BE INSTALLED, ANY PROPOSED CHANGES IN THE CONDUIT DESIGN MUST BE REVIEWED AND APPROVED BY THE DUKE ENERGY DESIGNER PRIOR TO INSTALLATION.
- PROVIDE ALL CABLE AND ASSOCIATED MATERIALS ALONG WITH THE LABOR TO INSTALL THESE MATERIALS UP TO THE POINT OF DELIVERY.
- COORDINATE WITH THE CUSTOMER TO DETERMINE THE BEST METHOD OF MARKING THE ROUTE OF ALL APPLICABLE PRIMARY AND SECONDARY CABLE, AND THE LOCATION OF ALL EQUIPMENT (TRANSFORMERS, SWITCHGEAR, ETC.); PEDESTALS, PULL BOXES, RISERS AND STREET LIGHT POLES. EQUIPMENT WILL NORMALLY BE PLACED DIRECTLY ON TOP OF THE CABLE ROUTE TO REDUCE THE NUMBER OF 90-DEGREE BENDS.
- SPECIFY THE SIZE, NUMBER AND POSITION OF CONDUITS THAT WILL BE INSTALLED IN EACH PIECE OF EQUIPMENT (TRANSFORMER, PEDESTAL, ETC.).
- INSPECT THE CONDUIT SYSTEM PRIOR TO THE INSTALLATION OF CABLE.
- DUKE ENERGY RESERVES THE RIGHT TO REFUSE ACCEPTANCE OF ANY PORTION OF A CONDUIT SYSTEM THAT DOES NOT MEET ALL THE REQUIREMENTS LISTED IN THIS DOCUMENT. IT WILL BE THE CUSTOMER'S RESPONSIBILITY TO CORRECT ALL INSTANCES OF NON-COMPLIANCE.
- ONCE THE CONDUIT SYSTEM HAS BEEN INSPECTED BY DUKE ENERGY AND ALL CABLE AND EQUIPMENT HAVE BEEN INSTALLED, DUKE ENERGY WILL MAKE ANY NECESSARY FUTURE REPAIRS OR ALTERATIONS TO THE CONDUIT SYSTEM AT ITS EXPENSE.

TRENCH REQUIREMENTS

- THE UNDERGROUND TRENCH CONTAINING ELECTRIC CABLES IS FOR THE SOLE USE OF DUKE ENERGY. NO OTHER UTILITIES OR FACILITIES FOR IRRIGATION, LIGHTING, SECURITY, PLUMBING, OR ANY OTHER PURPOSE MAY BE INSTALLED IN THE TRENCH WITHOUT THE EXPRESS PERMISSION OF DUKE ENERGY.
- THE BOTTOM OF THE TRENCH MUST BE SMOOTH AND FREE OF ROCKS, ROOTS, CONSTRUCTION DEBRIS OR ANY OTHER HARD OR SHARP OBJECT. IF NECESSARY, INSTALL A FEW INCHES OF CLEAN BACKFILL TO COVER ANY OF THESE ITEMS THAT CANNOT BE REMOVED.
- ALL CONDUIT MUST BE INSTALLED AT THE PROPER DEPTH AND WITH PROPER SEPARATION AS SHOWN ON THE TABLES ON DWG. 22.08-101D.
- THE MAXIMUM TRENCH DEPTH MUST NOT EXCEED FOUR (4) FEET, EXCEPT WHERE REQUIRED AT ENTRANCE POINTS FOR CONDUIT BENDS INTO PIT PADS OR PULL BOXES.
- THE CUSTOMER MUST BACKFILL ALL TRENCHES WHERE CUSTOMER-INSTALLED CONDUIT WAS PROVIDED.
- ALL BACKFILL MUST BE FREE OF ROCKS, CONSTRUCTION DEBRIS, OR ANY OTHER HARD OBJECTS.
- ALL BACKFILL MUST BE COMPACTED TO THE FIRMNESS OF UNDISTURBED SOIL.
- THE CUSTOMER WILL BE RESPONSIBLE FOR ANY SETTLING OR WASHOUT OF THE TRENCH.

3					
2					
1	8/17/21	FLETCHER	EAKES	DRAWAR	
0	7/19/19	FLETCHER	EAKES	DRAWAR	
REVISED		BY	CHK'D	APPR.	

CUSTOMER GUIDE FOR INSTALLING CONDUIT

DUKE ENERGY.

DEC	DEM	DEP	DEF
X		X	

22.08-101C

ALL CONDUIT MUST BE INSTALLED AT THE PROPER DEPTH AND WITH PROPER SEPARATION AS SHOWN BELOW.

TABLE 1: MINIMUM CONDUIT COVER

CABLE OR APPLICATION	MINIMUM COVER (X)	SPECIFIC NOTES
SECONDARY / SERVICE	30"	SEE NOTE 2
PRIMARY (1Ø OR 3Ø)	36"	SEE NOTE 2
ROAD CROSSINGS (ANY VOLTAGE)	36"	
PARKING LOT CROSSINGS (ANY VOLTAGE)	36"	SEE NOTE 2

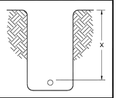
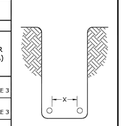


TABLE 2: REQUIRED MINIMUM HORIZONTAL SEPARATION BETWEEN CONDUITS.

COLUMN 1	MINIMUM HORIZONTAL SEPARATION FROM CABLES IN COLUMN 1 (X)				
CABLE	SECONDARY/ SERVICE	PRIMARY, 200A (1Ø OR 3Ø)	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE NOT** PART OF THE SAME LOOP	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE** PART OF THE SAME LOOP	FEEDER (>200A)
SECONDARY / SERVICE	NO REQUIRED SEPARATION SEE FIGURE 1	NO REQUIRED SEPARATION SEE FIGURE 1			36" SEE FIGURE 3
PRIMARY, 200A (1Ø OR 3Ø)	NO REQUIRED SEPARATION SEE FIGURE 1		NO REQUIRED SEPARATION SEE FIGURE 1	36" SEE FIGURE 2	36" SEE FIGURE 3
FEEDER (>200A)	36" SEE FIGURE 3	36" SEE FIGURE 3			36" SEE FIGURE 3



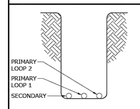


FIGURE 1
NO SEPARATION BETWEEN CONDUITS

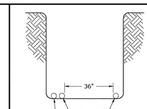


FIGURE 2
36" SPACING BETWEEN CONDUITS OF SAME PRIMARY LOOP

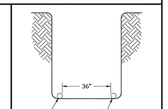


FIGURE 3
36" SPACING BETWEEN FEEDER CONDUITS AND THOSE CONTAINING ANY OTHER TYPE OF CABLE

NOTES:

1. DISTANCES ARE MEASURED TO THE SURFACE OF THE CABLE OR CONDUIT.
2. PRIMARY CABLES LESS THAN 30" DEEP OR SECONDARY CABLES LESS THAN 24" DEEP MUST BE INSTALLED IN MINIMUM SCHEDULE 40 CONDUIT WITH A MINIMUM OF TWO (2) INCHES OF CONCRETE ABOVE AND BESIDE THE CONDUIT AND A MINIMUM OF SIX (6) INCHES OF COVER.
3. FEEDER (>200A) CONDUITS MUST BE SEPARATED HORIZONTALLY FROM CONDUITS CONTAINING ANY OTHER TYPE OF CABLE BY 36".
4. EITHER ONE WIDE TRENCH OR TWO NARROW TRENCHES MAY BE USED, BASED ON ECONOMICS, TO OBTAIN REQUIRED HORIZONTAL SEPARATION.

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MATERIAL REQUIREMENTS

- PVC CONDUIT AND CONDUIT FITTINGS MUST BE SCHEDULE 40 OR GREATER, RATED FOR USE WITH 90º C ELECTRICAL CABLE, UL LISTED AND GRAY IN COLOR. NO WATER, SEWER, GAS OR TELECOMMUNICATION PIPE MAY BE USED. EACH LENGTH OF CONDUIT AND EACH BEND MUST HAVE AN INTEGRAL BELL ON ONE END. THE CONDUIT MANUFACTURER'S NAME, CONDUIT SIZE, TYPE AND DATE CODE MUST BE PRINTED ON THE SURFACE OF THE CONDUIT.
- HDPE CONDUIT MUST BE SDR 13.5 OR GREATER, RATED FOR USE WITH 90ºC ELECTRICAL CABLE, AND BLACK WITH EITHER 3 OR 4 RED STRIPES OR TOTALLY RED. THE CONDUIT MANUFACTURER'S NAME, CONDUIT SIZE, TYPE AND DATE CODE MUST BE PRINTED ON THE SURFACE OF THE CONDUIT.

CONDUIT SIZE WILL BE AS FOLLOWS.

APPLICATION	CONDUIT SIZE
SINGLE-PHASE PRIMARY	3"
THREE-PHASE PRIMARY (1/0 AWG)	4"
THREE-PHASE PRIMARY (GREATER THAN 1/0 AWG)	6"
600V SECONDARY (TX TO PEDESTAL)	3"
600V SERVICES (RESIDENTIAL) (SEE NOTE 1)	2-1/2"
LIGHTING CABLE	2"

NOTE 1: DUKE ENERGY WILL PROVIDE THE REQUIRED CONDUIT SIZE FOR RESIDENTIAL BUILDINGS WHERE THE SERVICE CABLE WILL FEED GANGED METER PANELS.

- WHEN HDPE CONDUIT IS USED, PVC BENDS MUST BE ATTACHED TO ALLOW THE CONDUIT SYSTEM TO ENTER TRANSFORMERS, SWITCHGEAR, PEDESTALS, ETC. THE FOLLOWING OPTIONS ARE THE ONLY APPROVED METHODS TO CONNECT HDPE CONDUIT TO PVC CONDUIT OR FITTINGS. THESE OPTIONS MAY ALSO BE USED TO JOIN TWO PIECES OF HDPE CONDUIT, EXCEPT WHEN ONE OF THE PIECES WILL BE USED TO PULL THE OTHER INTO POSITION THROUGH A DIRECTIONAL BORE.

A. SHUR LOCK II COUPLINGS: THESE ARE PLASTIC, SLIP-ON COUPLINGS, WITH STAINLESS STEEL BANDS MADE BY DURALINE.

B. BONDUIT ADHESIVE: THIS ADHESIVE IS FORMULATED TO BOND TO BOTH HDPE AND PVC.

C. MOR CLAMP COUPLINGS: THESE ARE BOLTED, STAINLESS STEEL, SLIP-ON COUPLINGS MADE BY DURALINE. THESE COUPLINGS ARE EXPENSIVE, SO THEY WILL TYPICALLY BE USED ONLY ON LARGE CONDUIT AND ONLY WHEN NECESSARY BECAUSE THE CONDUIT IS OUT-OF-ROUND.

THESE METHODS ALSO ALLOW HDPE CONDUIT PIECES TO BE JOINED TOGETHER OR FOR HDPE CONDUIT TO BE JOINED TO PVC CONDUIT.

- ALL PVC COUPLINGS MUST HAVE A CENTER STOP.
- ALL 6" BENDS MUST HAVE A 48" MINIMUM RADIUS AND ALL OTHER BENDS MUST HAVE A 36" MINIMUM RADIUS. ALL BENDS MUST HAVE AN INTEGRAL BELL ON ONE END.
- PULL STRINGS MUST BE MADE OF A MATERIAL THAT WILL NOT ROT, (I.E., NYLON).

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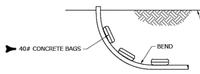
CONDUIT AND FITTING INSTALLATION

- EXAMINE ALL CONDUIT AND CONDUIT ACCESSORIES BEFORE THEY ARE INSTALLED FOR SHARP EDGES, OUT-OF-ROUND SHAPE, CRACKS, CHIPS, BURRS, AND INSIDE PROTRUSIONS THAT WOULD DAMAGE THE CABLE WHEN IT IS PULLED INTO POSITION. SUCH PIECES SHALL NOT BE INSTALLED.
- REMOVE ANY SHARP EDGES THAT ARE CREATED ON THE INSIDE OR OUTSIDE OF CONDUIT WHEN IT IS CUT.
- ALL SECTIONS OF PVC CONDUIT AND ALL FITTINGS MUST BE CEMENTED TOGETHER USING A PVC CONDUIT SOLVENT CEMENT FOR USE WITH ELECTRICAL PVC CONDUIT THAT CHEMICALLY BONDS THE TWO PVC PARTS TOGETHER. DO NOT USE CEMENT DESIGNED FOR USE WITH PLUMBING PVC PIPE. THE MATING SURFACES MUST BE: 1) PROPERLY CLEANED; 2) A THIN, UNIFORM COATING OF CEMENT APPLIED OVER THE ENTIRE MATING SURFACES (THE OUTER SURFACE OF A PLAIN END AND THE INNER SURFACE OF A BELL END); 3) FULLY SEAT BOTH PIECES; AND 4) TWIST THE PIECES ONE QUARTER TURN TO THEIR REQUIRED POSITION.
- CONDUIT MUST LIE FLAT ON THE BOTTOM OF THE TRENCH.
- A CONTINUOUS PULL STRING, WITH NO KNOTS OR SPLICES, MUST BE PROVIDED THROUGHOUT THE LENGTH OF EACH INDIVIDUAL CONDUIT SEGMENT AND EXTEND AT LEAST THREE FEET OUTSIDE OF EACH STUB-UP. FOR EXAMPLE, A SINGLE PULL STRING MUST EXTEND FROM A TRANSFORMER, PASS THROUGH ALL BENDS AND CONDUIT PIECES, AND THEN EXIT AT A PEDESTAL.
- PULL STRINGS MUST BE TESTED TO VERIFY THEY WERE NOT INADVERTENTLY GLUED TO A PIECE OF CONDUIT OR A FITTING. THE CUSTOMER WILL BE REQUIRED TO INSTALL NEW PULL STRINGS IN ANY CONDUIT SEGMENT WHERE THE INITIAL PULL STRINGS ARE NOT USABLE.
- EACH CONDUIT SEGMENT (TRANSFORMER TO TRANSFORMER, TRANSFORMER TO PEDESTAL, PEDESTAL TO SERVICE RISER, ETC.) MUST BE COLOR CODED ON EACH END WITH THE SAME COLOR OF VINYL TAPE OR SPRAY PAINT OR, WEATHER-RESISTANT, NON-FADABLE ADHESIVE LABELS MAY BE APPLIED. WHEN MULTIPLE BENDS OR CONDUITS ARE BANDED TOGETHER, SUCH AS IN A TRANSFORMER, THE COLOR CODING OR LABELS ON EACH BEND OR CONDUIT MUST BE READILY VISIBLE.
- CUSTOMER SHALL PULL A SOLID MANDREL, NO MORE THAN 1/2 INCH SMALLER THAN THE INSIDE DIAMETER OF THE CONDUIT, THROUGH ALL CONDUIT SEGMENTS TO VERIFY THEY ARE IN GOOD CONDITION AND FREE OF OBSTACLES.
- CONDUITS MUST BE PLUGGED TO PREVENT DEBRIS, RAIN, ETC. FROM ENTERING THE CONDUIT. TAPE OR RAGS ARE NOT SUFFICIENT. THESE PLUGS MUST **NOT** BE CEMENTED ONTO THE CONDUIT OR FITTING.
- NO WIRES, CABLES, CONDUITS, INNER-DUCTS, OR ANY OTHER ITEMS MAY BE INSTALLED IN THE CONDUITS INSTALLED FOR DUKE ENERGY. THIS INCLUDES FACILITIES FOR LIGHTING, SECURITY, LANDSCAPING, COMMUNICATION, OTHER UTILITIES OR THE CUSTOMER. THE CUSTOMER WILL BE REQUIRED TO REMOVE ANY SUCH FACILITIES THAT ARE FOUND.
- WHEN MULTIPLE DEVELOPERS ARE INSTALLING CONDUIT FOR DUKE ENERGY ALONG A SINGLE CONDUIT SEGMENT (ONE TRANSFORMER TO ANOTHER TRANSFORMER, A TRANSFORMER TO A PEDESTAL, ETC.), THE DEVELOPERS ARE REQUIRED TO JOIN THEIR CONDUIT SECTIONS TOGETHER, INSTALL A SINGLE PULL STRING FROM ONE END OF THE CONDUIT SEGMENT (THE TRANSFORMER, PEDESTAL, ETC.) TO THE OTHER END OF THE CONDUIT SEGMENT, AND TO PROPERLY LABEL BOTH ENDS OF THE CONDUIT SEGMENT.
- MULTIPLE BENDS/CONDUITS MUST BE FIRMLY BANDED TOGETHER IN THE PROPER CONFIGURATION AND WITHIN THE REQUIRED DIMENSIONS PROVIDED IN THIS DOCUMENT WHEN INSTALLED IN TRANSFORMERS, SWITCHGEAR, PEDESTALS, ETC.
- ALL CONDUITS MUST BE FREE OF WATER, MUD, DIRT OR ANY OTHER FOREIGN MATTER. THE CUSTOMER MUST INSPECT, CLEAN AND REPAIR ANY CONDUITS THAT CONTAIN FOREIGN MATTER.
- PLACE TWO, FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH 90º BEND CONTAINING SECONDARY/ SERVICE CABLE AND THREE, FORTY (40) POUND BAGS AGAINST BENDS CONTAINING PRIMARY CABLE TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER, AND PLACE THEM AGAINST THE BEND.
- IT IS NOT NECESSARY TO DOUBLE THE REQUIRED NUMBER OF CONCRETE BAGS WHEN TWO BENDS ARE INSTALLED SIDE-BY-SIDE. USE THE NUMBER OF BAGS REQUIRED FOR A SINGLE BEND AND POSITION THE BAGS SO THEY WILL COVER BOTH BENDS.



SECURING BENDS WITH BAGS OF CONCRETE

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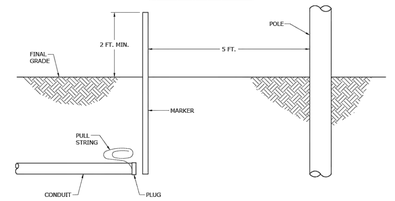
CONDUIT POSITIONING AT RISERS

- DUKE ENERGY WILL STAKE THE EXACT LOCATION OF THE POLE RISER.
- STOP THE CONDUIT FIVE (5) FEET FROM THE POLE.
- A MINIMUM OF FIVE (5) FEET OF PULL STRING MUST EXTEND OUT OF THE CONDUIT AND BE PLACED IN A COIL AT THE END OF THE CONDUIT.
- PLACE A PLUG ON THE END OF THE CONDUIT BUT DO NOT CEMENT THIS PLUG TO THE BEND.
- PLACE A MARKER (A PIECE OF CONDUIT FOR EXAMPLE) AT THE END OF THE CONDUIT THAT WILL EXTEND ABOVE FINAL GRADE A MINIMUM OF TWO (2) FEET.

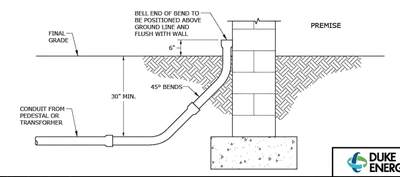
RISER POLE INSTALLATION



CONDUIT POSITIONING AT PREMISE RISERS

- THE TOP OF THE CONDUIT BEND MUST BE IN CONTACT WITH THE PREMISE.
- EXTEND CONDUIT SIX (6) INCHES ABOVE FINAL GRADE OF THE SOIL.
- THE PULL STRING MUST EXTEND A MINIMUM OF FOUR (4) FEET OUTSIDE OF THE CONDUIT.
- INSTALL A PLUG ON THE CONDUIT TO KEEP DIRT, RAIN, ETC. OUT OF THE CONDUIT. DO NOT GLUE THE PLUG ONTO THE CONDUIT.

PREMISE SERVICE RISER



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CLEARANCES

SEPARATION MUST BE MAINTAINED BETWEEN CONDUITS INSTALLED FOR DUKE ENERGY AND OTHER CABLES, PIPES OR STRUCTURES AS SHOWN IN THE FOLLOWING TABLE AND DRAWINGS.

PRIMARY OR SECONDARY CABLES IN A CONDUIT SYSTEM

PARALLELING	HORIZONTAL SEPARATION (IN)	CROSSING	VERTICAL SEPARATION (IN) (SEE NOTE 2)
COMMUNICATION LINES	12	COMMUNICATION LINES	12
WATER LINES	36	WATER LINES	12
SEWER LINES	36	SEWER LINES	12
FUEL LINES	36	FUEL LINES	12
STEAM LINES	60	STEAM LINES	36
CUSTOMER-OWNED CABLES	36	CUSTOMER-OWNED CABLES	12
IN-GROUND SWIMMING POOL	60	IN-GROUND SWIMMING POOL	N/A

NOTES:

1. THE HORIZONTAL AND VERTICAL SEPARATION SHOULD BE ADEQUATE TO PERMIT ACCESS AND MAINTENANCE OF EITHER FACILITY TO LIMIT DAMAGE TO THE OTHER. THE DISTANCES SHOWN IN THE TABLE ABOVE HAVE BEEN FOUND TO MEET THESE CRITERIA.
2. VERTICAL SEPARATION MUST BE SUFFICIENT TO LIMIT THE LIKELIHOOD OF DETRIMENTAL LOAD BEING TRANSFERRED TO EITHER OF THE UTILITIES OR STRUCTURES INVOLVED. THE DISTANCES SHOWN IN THE ABOVE TABLE HAVE BEEN FOUND TO MEET THESE CRITERIA.
3. CONTACT DUKE ENERGY WHEN DIMENSIONAL VARIANCES ARE REQUIRED.

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DUKE ENERGY.

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ISSUED FOR BID, NOT FOR CONSTRUCTION

REV#	DATE

NORTH CAROLINA PROFESSIONAL SEAL 049509 ENGINEER ZACHARY P. ROMAN

DATE: FEBRUARY 2026
PROJECT NUMBER: 2TRST2110
PROJECT ENGINEER: ZACH ROMAN, P.E.

DESIGNED	ATB/ZPR
DRAWN	ATB/ZPR
CHECKED	ZPR
PROJ. ENGR.	ZPR

CITY OF WILMINGTON NORTH CAROLINA
Public Works • Stormwater & Streets Management Division
P.O. Box 1810 209 Coleman Drive Wilmington, NC 28412 (910) 341 - 4777

DWG PATH: N:\PROJECT FILES\Street Improv-Downtown Alley Improvements\Design\Drawings
FILE NAME : Plans-Downtown Alleys.dwg

CONSTRUCTION DETAILS
DOWNTOWN ALLEY IMPROVEMENTS

CITY OF WILMINGTON WILMINGTON TOWNSHIP NEW HANOVER COUNTY, NORTH CAROLINA

SCALE NOT TO SCALE

SHEET 12 of 12

TECHNICAL SPECIFICATIONS

FOR

DOWNTOWN ALLEY WATER AND SEWER IMPROVEMENTS

CAPE FEAR PUBLIC UTILITY AUTHORITY

Technical Specifications Numbered 33 01 30.XX

December 11, 2025
HIGHFILL Project No. CFA2202

Prepared by:
Highfill Infrastructure Engineering, P.C.
3804 Park Avenue, Unit A
Wilmington, North Carolina 28403
Tel 910-313-1516
NC Firm License No. C-2586

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01 30 00	Administrative Requirements
01 33 00	Submittals
01 35 00	Special Procedures
01 40 00	Quality Requirements
01 51 00	Temporary Sewer Bypass Pumping
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APPENDICES – ATTACHMENTS

Section	Title
Appendix A	Permits

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Work Description
   2. CFPUA Capital and Development Specifications
   3. References
   4. Defined Terms

1.2 WORK DESCRIPTION

A. Work of the Project includes construction, alteration, or rehabilitation of CFPUA water and sewer facilities.

B. Work may be performed by CFPUA contractor, Developer contractor, NCDOT contractor, City of Wilmington contractor, or other contractors permitted to perform work related to CFPUA water and sewer facilities.

C. Work shall be coordinated and scheduled with CFPUA, public utilities, and public or private agencies to minimize conflict and facilitate operation of existing utilities and infrastructure.

1.3 CFPUA CAPITAL AND DEVELOPMENT SPECIFICATIONS

A. Fundamental differences in the legal aspects of privately-owned-funded contracts and publicly-owned-funded contracts require separation of some specification sections in DIVISION 01 – GENERAL REQUIREMENTS. Those sections are identified accordingly in their title heading and as listed below:

   01 20 00 - Price and Payment Procedures (CFPUA Capital Projects)

   01 30 00 - Administrative Requirements (CFPUA Capital Projects)
   01 30 00 - Administrative Requirements (Development Projects)

   01 33 00 - Submittals (CFPUA Capital Projects)
   01 33 00 - Submittals (Development Projects)

   01 50 00 - Temporary Facilities and Controls (CFPUA Capital Projects)

   01 70 00 - Execution and Closeout Requirements (CFPUA Capital Projects)
   01 70 00 - Execution and Closeout Requirements (Development Projects)

B. Except those listed above, all other sections in the CFPUA Technical Specifications shall apply to both privately-owned-funded projects and publicly-owned-funded projects related to CFPUA facilities.

1.4 REFERENCES

A. CFPUA Development Process & Procedures Manual

B. CFPUA Design Guide

C. CFPUA Materials Specification Manual

D. CFPUA Standard Drawing Details

E. CFPUA Procurement & Contracting Requirements

F. EJCDC C-700 Standard General Conditions of the Construction Contract, 2007

1.5 DEFINED TERMS

A. Definitions and terms used in these specifications follow the EJCDC C-700 Standard General Conditions of the Construction Contract, except the following with underlined additions:

1. *Agreement—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.* Also, the written instrument which is evidence of the agreement between CFPUA and Developer covering the Work.
2. *CFPUA*—Cape Fear Public Utility Authority.
3. *Engineer—The individual or entity named as such in the Agreement.* Also, the Engineer that seals the approved drawings, provides certifications, and provides record drawings.
4. *Owner—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.* Also, a Developer requesting approvals or conveyance by CFPUA.
5. *Resident Project Representative—The authorized representative of Engineer who may be assigned to the Site or any part thereof.* Also, a CFPUA employee assigned to inspect the Work.
6. *Work—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.* For Developer led projects, the Work is limited to water and sewer facilities, appurtenances, and easements to be conveyed to CFPUA.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION – Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

(CFPUA CAPITAL PROJECTS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contingency allowances.

B. Schedule of Values.

C. Application for Payment.

D. Change procedures.

E. Defect assessment.

F. Unit prices.

G. Alternates.

1.2 CONTINGENCY ALLOWANCES

A. Include in Contract a stipulated sum/price as indicated on Bid Form, for use upon Owner's instruction as a contingency allowance.

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead, and profit will be included in Change Orders authorizing expenditure of funds from this contingency allowance.

C. Funds will be drawn from contingency allowance only by Change Order.

D. At closeout of Contract, funds remaining in contingency allowance will be credited to Owner by Change Order.

1.3 SCHEDULE OF VALUES

A. Submit Progress Estimate schedule on EJCDC C-620 or Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values within 15 days after date of Owner-Contractor Agreement.

C. Format: Identify each line item with number and title. Also identify site mobilization, bonds and insurance. Schedule values shall total bid/agreement total(s).

D. Include within each line item, direct proportional amount of Contractor's overhead and profit.

E. Revise schedule to list approved Change Orders with each Application for Payment.

1.4 APPLICATION FOR PAYMENT

A. Submit copies of each Application for Payment on EJCDC C-620 - Contractor's Application for Payment as directed by Engineer at Preconstruction Meeting.

B. Content and Format: Use Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment, when requested by Engineer.
   1. Current construction photographs.
   2. Record Documents, for review by Owner, which will be returned to Contractor.
   3. Affidavits attesting to off-Site stored products.
   4. Construction Progress Schedule, revised and current.

1.5 CHANGE PROCEDURES

A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Engineer of any error, inconsistency, omission, or apparent discrepancy.

C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Engineer; establish procedures for handling queries and clarifications.
   1. Use CSI Form 13.2A - Request for Interpretation for requesting interpretations.
   2. Engineer may respond with a direct answer on the Request for Interpretation form, EJCDC C-942, or Proposal Request.

D. Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on EJCDC C-942.

E. Engineer may issue Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within 10 days.

F. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Sum/Price and Contract Time with full documentation.

G. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's price quotation or Contractor's request for Change Order as approved by Engineer.

H. Unit Price Change Order: For Contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of that which are not predetermined, execute Work under Work Directive Change, when necessary for expediency. Changes in Contract Sum/Price or Contract Time will be computed as specified for Change Order.

I. Work Directive Change: Owner/Engineer may issue directive, on EJCDC C-940 - Work Change Directive (Owner's version) signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

J. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.

K. Change Order Forms: EJCDC C-941 - Change Order (Owner's version).

1.6 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Owner.

D. Defective Work will be partially repaired according to instructions of Engineer/Owner, and unit sum/price will be adjusted to new sum/price at discretion of Owner.

E. Authority of Owner to assess defects and identify payment adjustments is final.

1.7 UNIT PRICES

A. Unit Price Schedule and Measurement of Quantities:
   1. The Bid Form stipulates the unit price schedule for payment. Unit price items are measured by each, weight, volume, area, linear means, etc. as specified in the measurement and payment section prepared for the project by Engineer/Owner.

B. Take measurements and compute quantities. Engineer will verify measurements and quantities.

C. Unit Quantities: Quantities and measurements indicated on Bid Form are for Contract purposes only. Actual quantities provided shall determine payment.
   1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit sum/prices.

2. When actual Work requires 25 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim a Contract Price adjustment.

D. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application, or installation of item of the Work; overhead and profit.

E. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

1.8 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.

B. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.
   1. Coordinate related requirements among Specification Sections as required.
   2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
   3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 25 00
MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Related Section

1. 01 20 00 Price and Payment Procedures

1.2 MEASUREMENT AND PAYMENT

A. Measurement of Unit Price Work

1. Measurements shall be made by the Contractor in the presence of the Engineer's RPR to allow quantification of the Work at the close of each day's construction. A copy of the log shall be furnished to the RPR daily by the Contractor.

2. The quantities to be paid for and their respective locations shall be recorded and agreed upon at the close of each week's construction by the RPR and the Contractor's personnel in charge. The Contractor shall furnish the Owner with a weekly statement of the agreed-upon quantities and their respective locations.

B. Unit Price Description

Item 1. Mobilization:

A lump sum payment less than or equal to 3% of the total Bid Price (to include all bonds, insurance, and mobilization of equipment) will be allowed for 'mobilization' as a progress payment line item. The actual cost of bonds and insurance (up to the maximum payment of 3%) will be considered in the initial payment request if Contractor furnishes cost documentation suitable to the Engineer. The outstanding balance of the mobilization pay item will be payable when the Work is 10% complete as indicated by the approved progress payments excluding the cost of mobilization and stored materials.

Item 2. 8" C900 DR18 PVC Sanitary Sewer:

At the contract unit price per linear foot of pipe installed at the various depths. The unit price shall include but not be limited to excavation, sheeting and shoring, de-watering, locating and disconnecting service laterals, maintaining service, stone bedding, pipe, joining, fittings (excluding the lateral tap fitting), connections to new manholes, backfilling, off-site disposal of refuse and excess material, CCTV inspection, testing and related appurtenant work. The new pipe shall be measured to the nearest foot continuously along a horizontal line from center of manhole to center of manhole. In the case of stubs for future service connections, from the center of the manhole to the end of the pipe installed.

Item 3. Excavate and Replace Sanitary Sewer with 8" C900 DR18 PVC:

At the contract unit price per linear foot of pipe replaced with new pipe at the various depths. The unit price shall include but not be limited to excavation, sheeting and shoring, de-watering, locating, and disconnecting services, maintaining service, stone bedding, pipe, joining, fittings (excluding the lateral tap fitting), connections to new manholes, backfilling, off-site disposal of refuse

and excess material, CCTV inspection, testing, and related appurtenant work. The new pipe shall be measured to the nearest foot continuously along a horizontal line from center of manhole to center of manhole for sewers. In the case of stubs for future service connections, from the center of the manhole to the end of the pipe installed.

Item 4. 4-Foot Diameter Standard Manhole:

At the contract unit price per each manhole installed where an existing manhole is not removed at the various depths. Depth shall be measured from the invert out elevation to the finished elevation of the manhole cover. Unless there are changes in locations as directed by the Engineer or the Contractor can demonstrate that the depth is significantly greater than shown, then the Drawings shall be used to establish the depths for this Pay Item. The unit price shall include but not be limited to excavation, sheeting and shoring, dewatering, stone bedding, backfill, coating, testing, frames, covers, steps, sleeves, vent pipe (if required), and associated appurtenances as shown on the Drawings.

Item 5. 8" PVC Cored Sanitary Sewer Connection to Existing Manhole:

At the contract unit price per each for core drilling the manhole wall, bench, and invert, providing a new boot with stainless steel strap, installing the pipe, and rebuilding the manhole bench, invert, channel, and bottom to accept the newly installed pipe. The unit price shall include but not be limited to excavating, sheeting and shoring, dewatering, demolishing and rebuilding, installing pipe and materials, removal and proper disposal of debris, backfilling, and associated appurtenances as shown on the Drawings.

Item 6. Connect 8” Sewer to Existing 8” Manhole Opening:

At the contract unit price per each for removing the existing pipe, replacing, the boot and stainless-steel strap, installing the new pipe, and grouting and sealing the manhole wall around the pipe. The unit price shall include but not be limited to excavating, sheeting and shoring, dewatering, installing pipe and materials, grouting and sealing around the new pipe, removal and proper disposal of debris, backfilling, and associated appurtenances as shown on the Drawings.

Item 7. Brick and Mortar 24" Manhole Opening to Reduce for 8" Connection:

At the contract unit price per each for the removal of a portion of the manhole wall around the pipe opening and reconstructing the manhole wall around the pipe with brick and mortar and removing and reconstructing the bench, invert, and channel to align with the new pipe. The unit price shall include but not be limited to excavating, sheeting and shoring, dewatering, installing pipe and materials, brick, mortar, grouting and sealing around the new pipe, removal and proper disposal of debris, backfilling, and associated appurtenances as shown on the Drawings.

Item 8. Cementitious Patch of 8" or 6” Pipe Hole in Manhole Wall:

At the contract unit price per each patch of manhole wall sealed and restored. This pay item shall include preparation, sealing, patching, and finishing an area of the manhole wall and bypassing flow where necessary for the work.

Item 9. 6" PVC Cored Lateral Connection to New Manhole:

At the contract unit price per each for core drilling the manhole wall, providing a new boot with stainless steel strap, installing the lateral pipe, and building the manhole bench, invert, and channel.

Item 10. 6" PVC Lateral Connection on New PVC:

At the contract unit price per each for furnishing and installing a 6-inch lateral tap fitting on new PVC and the remaining components as illustrated in CFPUA details. The unit price shall include but not be limited to lateral tap fitting, service pipe, fittings, connection to new or existing service lateral pipe, backfilling, and related appurtenant work.

Item 11. 6" PVC Lateral Pipe by Open Excavation:

At the contract unit price per linear foot of sanitary sewer service lateral pipe furnished and installed by open excavation. The unit price shall include but not be limited to excavation, sheeting and shoring, de-watering, locating and disconnecting service laterals, maintaining service, stone bedding, pipe, joining, fittings, connections to new or existing service laterals at the cleanout, backfilling, off-site disposal of refuse and excess material, CCTV inspection, testing and related appurtenant work.

Item 12. 6” Sanitary Sewer Cleanout:

At the contract unit price per each sanitary sewer cleanout installed. The unit price shall include but not be limited to excavation, stone bedding, pipe, joining, fittings, 6” to 4” reducer, connections to new or existing laterals, backfilling, and related appurtenant work.

Item 13. Clean, Televise, and Inspect 24” Sewer Main Prior to Sliplining:

a. At the contract unit price per linear foot for the various sizes for materials, operations, flow bypassing, labor, tools, equipment, and other incidentals necessary to complete the work as shown on the drawings and specified herein.

b. Measured on a linear foot basis to the nearest foot along the horizontal centerline of the pipe with no deductions for manholes or access points from the center of manhole or access point to center of manhole or access point.

c. For sewers to be sliplined, cleaning shall be sufficient to identify and document only those defects which could negatively affect sliplining operations. Full cleaning and documentation of all defects is not required. Lateral shall be dye tested to determine if they are active.

d. All other work required for complete sewer main cleaning, televising, and inspecting as described herein, shown on the Drawings, and included as part of these contract documents shall be considered as incidental to the project and no additional payment will be made.

Item 14. Slipline 65 LF of 24" VCP with 8" DIPS DR17 HDPE:

a. At the contract lump sum price. The lump sum price shall include but not be limited to locating and disconnecting services, maintaining service, fusing and inserting pipe, grouting between the new and existing pipes, sealed connections to existing and new manholes, CCTV inspection, testing, and related appurtenant work.

b. The cost for this work shall include work as required for a complete operable installation.

Item 15. Excavate and Replace Existing 1.25" Steel Water Line with 2" SDR21 PVC:

At the contract until price per linear foot furnished and installed measured continuously along a horizontal line through valves, fittings, couplings, encasements, and other components. The unit price shall include compensation for all labor, equipment, and materials to excavate, demolish, remove, and dispose of the existing pipe, blow-off assemblies, and other components; furnish and install new pipe and bedding; provide sheeting, shoring, concrete reaction blocking, rodding, and identification tape and tracer wire; backfill excavations; disinfect, sample, and test; and all other incidental items and work required to provide a ready-to-use system as specified by the Contract Documents.

Item 16. Replace Ex. Water Valve with 2" Gate Valve:

By the contract unit price per each valve assembly installed. Price shall include full compensation for all labor, equipment, and materials to furnish and install the valve, valve box or manhole, restraint, and all other incidentals required for assembly and installation as specified by the Contract Documents.

Item 17. 2” Blow-off Assembly:

By the contract unit price per each furnished and installed complete in place including blow-off assembly, gate valve, valve box, pipe, joint restraint, concrete blocking, concrete collar, valve box, stem extension, pavement marker, incidental items and other appurtenances.

Item 18. 1” Water Service by Open Cut:

At the contract price per each, complete in place via open cut on the near side of the road at a minimum depth of 24 inches. The price shall include all equipment, labor, and materials including installation, water main connection, service line, meter box, meter setter/yoke, testing and disinfection.

Item 19. Flowable Fill:

At the contract unit price per cubic yard of flowable fill installed within the limits shown on the Drawings and as directed by the Engineer.

Item 20. Miscellaneous Concrete Below Grade:

At the contract unit price per cubic yard of concrete installed within the limits shown on the Drawings and as directed by the Engineer.

Item 21. Perform Additional Excavation:

At the contract unit price per cubic yard for additional trench or pit excavation greater than six inches below the elevation shown on the drawings, only where directed by Engineer. The quantity to be paid shall be the volume of materials excavated as measured in place by the RPR. No payment will be made for excavation beyond the Maximum Trench Excavation Limits, as shown on the Drawings. Any excavation not authorized by the Engineer will be at the Contractor's expense. Additional excavation less than or equal to six inches below the depths shown on the Drawings, including allowance for required bedding materials, shall be considered incidental to the work and no additional payment will be made. If excavation is directed to a depth greater than six inches, then the entire additional depth beyond the typical excavation limits will be considered for payment.

Item 22. Additional Compacted Stone Bedding:

At the contract unit price per cubic yard compacted in place to backfill additional trench or pit excavation only where directed by the Engineer. The quantity to be paid shall be the volume of materials measured in place by the RPR. Stone bedding specified as bedding for pipe, manholes, or other structures shall be incidental to the item to which it relates and will not be included for payment under this Pay Item. No payment will be made for stone bedding when soil excavation is carried deeper than the required trench depths or outside the specified trench limits, except where the Contractor is directed by the Engineer to excavate beyond the specified depth and trench limits.

Item 23. Select Backfill:

At the contract unit price per cubic yard compacted in place where native materials are determined to be unsuitable for backfill by the Engineer. For each location where select backfill is authorized, the volume shall be determined by the average depth of the fill area times the average of the bottom and top trench width times the length of the fill area authorized.

C. Incidental items

1. The following items shall be considered incidental to the Work and included in the price of the item to which they relate: Project signs, traffic control, maintenance of existing conditions, demolition, removal and reinstallation of conflicting items, shoring, sheeting and bracing, dewatering, excavation, concrete blocking, temporary support of conflicting items, backfill, compaction, final grading, cleaning and waste management, and all other incidental work.

1.3 FINAL PAYMENTS

A. Final payments to the Contractor will be made based on actual quantities of Work completed, as determined by field measurements, in accordance with the Unit Price Pay Items. Pay item numbers are referenced to the Bid Form. Work shall comply with the requirements of CPFUA Standard Specifications dated January 1, 2025.

1.4 SUMMARY

A. Payments noted above shall constitute full compensation for Work shown and required by the Drawings and Construction Specifications for this contract.

B. The cost of other auxiliary operations and/or materials required to make a completed project shall be included in the lump sum or contract unit price to which it relates.

1.5 SALES TAX

A. Requirements for sales tax are provided in the Supplementary Conditions.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION – Not Used

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

(CFPUA CAPITAL PROJECTS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and Project conditions.

B. Preconstruction meeting (CFPUA Pre-Con Checklist Attached).

C. Progress meetings.

D. Pre-installation meetings.

E. Substantial Completion meeting.

F. Closeout meeting.

G. Permits.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.

1.3 PRECONSTRUCTION MEETING

A. Engineer will schedule and preside over meeting after Notice of Award.

B. Attendance Required: Engineer, Owner, Resident Project Representative, appropriate governmental agency representatives, major Subcontractors, and Contractor.

C. Minimum Agenda:
   1. Submission of schedule of values, and Progress Schedule.
   2. Designation of personnel representing parties in Contract.
   3. Communication procedures.
   4. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
   5. Scheduling.
   6. Critical Work sequencing.
   7. Traffic Control Plan.
   8. See attached CFPUA PRE-CON CHECKLIST.

D. Engineer: Record minutes and distribute copies to participants within two days after meeting.

1.4 PROGRESS MEETINGS

A. Engineer/Owner to schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Engineer/Owner to make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.

C. Attendance Required: Job Superintendent, major Subcontractors, and suppliers, Engineer, and Owner, as appropriate to agenda topics for each meeting.

D. Minimum Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems impeding planned progress.
   5. Review of submittal schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of Progress Schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of project progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on Progress Schedule and coordination.
   13. Other business relating to Work.

E. Engineer/Owner to record minutes and distribute copies to participants within two days after meeting.

1.5 PRE-INSTALLATION MEETINGS

A. When required in individual Specification Sections, convene pre-installation meetings at Project Site before starting Work of specific Section.

B. Require attendance of parties directly affecting, or affected by, Work of specific Section.

C. Notify Engineer/Owner four days in advance of meeting date.

D. Prepare agenda and preside over meeting:
   1. Review conditions of installation, preparation, and installation procedures.
   2. Review coordination with related Work.

E. Record minutes and distribute copies to participants within two days after meeting.

1.6 SUBSTANTIAL COMPLETION MEETING

A. Attendance Required: Contractor, major Subcontractors, Engineer, Owner, and other appropriate to agenda.

B. Minimum Agenda:
   1. Contractor notification required in accordance with General Conditions.
   2. Testing requirements.
   3. System demonstration and observation.
   4. Operation and maintenance instructions for Owner's personnel.
   5. Inspection of Work.
   6. Preparation of "punch list."
   7. Inspections by authorities having jurisdiction.
   8. Status of certification and testing requirements.
   9. Status of record drawings.
   10. Schedule for Engineer inspection to determine date of Substantial Completion.
   11. Review closeout Submittal requirements:
      a. Project record documents.
      b. Operating and maintenance documents.
      c. Operating and maintenance materials.
      d. Affidavits.
      e. Warranties.

C. Record minutes and distribute copies to participants within two days after meeting.

1.7 CLOSEOUT MEETING

A. Attendance Required: Contractor, major Subcontractors, Engineer, Owner, and other appropriate to agenda.

B. Minimum Agenda:
   1. Status of "punch list."
   2. Preparation for final inspection of Work.
   3. Completion time for correcting deficiencies.
   4. Procedure to request Final Payment.

5. Final cleaning.
6. Preparation for final inspection.
7. Closeout Submittals:
    a. Project record drawings and documents.
    b. Operating and maintenance documents.
    c. Operating and maintenance materials.
    d. Affidavits.
    e. Warranties
8. Contractor's demobilization of Site.
9. Maintenance.
10. Final Application for Payment.

C. Record minutes and distribute copies to participants within two days after meeting.

1.8 PERMITS

A. Furnish all necessary permits for construction of Work that are not provided by Owner including the following:
    1. New Hanover County Building Permit for permanent facility sites.
    2. City of Wilmington Utility Work Permit.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

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235 Government Center Drive
Wilmington, NC 28403
Phone: (910) 332-6560
Fax: (910) 332-6353
www.cfpua.org

CFPUA PRE-CON CHECKLIST

□ 1. CFPUA Technical Specifications, Material Specification Manual and Details must be followed.

□ 2. For scheduling purposes, the contractor must give two business days' notice (by e-mail) to the assigned CFPUA inspector (the exact date will be determined by the CFPUA Inspector and CFPUA Operations schedule) for each of the following:

- When construction begins
- Operating any CFPUA valve (including tapping, tie-in, fire line or service valves)
- If the contractor pulls off the site for more than two (2) weeks
- Installing a sewer main out of a tie-in to an existing manhole
- Cutting in a new manhole on an existing line
- Coring an existing manhole
- Tapping an existing sewer main, water main or force main.
- Any bores and threading carrier pipes
- All camera work, testing, chlorination, and water sampling
- Setting up or operating a sewer by-pass

□ 3. The contractor is to notify the Design Engineer with any request to deviate from the CFPUA approved For Construction stamped plans. The Design Engineer will then notify the CFPUA Construction Project Manager for review and final approval by CFPUA. The design engineer and CFPUA Construction Project Manager must approve the deviation prior to work beginning.

□ 4. Any changes to CFPUA details must be approved by the CFPUA Construction Project Manager. These changes will be noted/clouded on CFPUA Detail Sheet.

□ 5. Notify the CFPUA Inspector when material is delivered to the job site for verification that materials meet CFPUA Technical Specifications, Material Specification Manual, or approved submittal.

□ 6. No CFPUA valve shall be operated without a CFPUA Inspector or CFPUA Water Quality employee present.

□ 7. Any work after normal working hours (Monday – Friday 7:00 AM – 3:30 PM) must be pre-approved and scheduled with the CFPUA Project Manager and Inspector. An "After Hours Inspection Fee" will be charged unless after hours work is required by CFPUA.

□ 8. All shutdowns must be pre-approved and scheduled with the CFPUA Project Manager and Inspector. They will coordinate with the proper CFPUA departments. Shutdowns on critical lines will require a pre-shutdown meeting. Additional information and pre-inspection of material will be required.

□ 9. No cutting in of manholes on existing sewer, water or sewer force main tie-ins or shutdowns will be made on Friday thru Monday unless pre-approved by CFPUA Operations.

□ 10. It is the Contractor's responsibility to request CFPUA Standard Operating Procedures for items not covered in the Technical Specifications, Material Specification Manual and Details (i.e., abandoning infrastructure, work on older materials, shut down procedures, coring locations in manholes).

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□ 11. For meters 3" or greater, when the meter vault installation is approved and the main/service line is certified and activated (if permitted), and the back flow inspection has been completed and passed by CFPUA Community Compliance the CFPUA Inspector will send an email to the Developer, Builder, Contractor and CFPUA Meter Services that a "Large Meter Set Installation Appointment" can be requested. The contractor will call (910)332-6550 to make the request two business days in advance.

□ 12. It is the Contractor's responsibility to verify that corporation stops, or valves are open on all services

□ 13. Boring and Jacking

- Approved "Boring and Jacking Plan" per CFPUA SPECS (33 05 07.23).
- Approved pipe (mechanical or restrained joints) to be used when main is to be operating under pressure per CFPUA SPECS (33 05 07.23 and 33 05 09.33).

□ 14. Sewer Bypass Pumping (CFPUA Spec 01 51 00)

- Must submit and have approved a "Bypass Pumping Plan" per CFPUA SPECS (01 51 00 1.4).
- All bypass pumping operations must be monitored 24 hours / 7 days a week.
- Monitoring person must be properly trained, experienced, and mechanically qualified.

□ 15. In the event of a water/sewer main line or service break, the CFPUA Emergency number (910-332-6565) will be called immediately. Then, the CFPUA Inspector will be notified to assist in obtaining the proper response, if any, from CFPUA.

□ 16. In the event an acceptance test, i.e. hydro test, bac-t sample, chlorination, air, vacuum … has to be repeated at no fault of CFPUA a "Water/Sewer Line Acceptance Testing Reinspection" fee will apply. If the testing is after normal working hours (Monday – Friday 7:00 AM – 3:30 PM) a "Water/Sewer Line Acceptance Testing Reinspection – After Hours Fee" will apply.

□ 17. Shrubs, bushes, trees and similar vegetation shall be planted in a manner that will provide a minimum of three feet unrestricted access from the meter box and clean-out to the road. No shrubs, bushes, or trees shall be planted within three feet around the meter box or clean-out that may hinder Authority's ability to maintain infrastructure. Small (less than 18" diameter and height), shallow rooted or seasonal planting may be approved within three feet of the meter box or cleanout, provided that these plantings do not hinder the Authority's ability to access and maintain the infrastructure at the planting's mature growth.

□ 18. The installation of electrical, phone and cable transformers and pedestals are to be installed at a minimum of 1' to 1' separation from CFPUA appurtenances to include manholes, sewer cleanouts and water meters.

□ 19. As built and CCTV inspections are completed in the order that they are received. The typical review time is generally ten (10) to fifteen (15) business days for CCTV and five (5) to twenty (20) business days for as-built's but will depend on the complexity of the project, size, and quality of the submittal.

□ 20 Provide a minimum of six (6) inches of separation between edge of manhole core holes and manhole barrel joints. Provide a minimum of six (6) inches separation between edges of core holes. Coring the manhole cone section is not allowed. All manhole main line and service piping shall be installed at a minimum of crown to crown of the largest diameter pipe.

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□ 21 Prior to the contractor scheduling a tap inspection the following items must be completed:

- All CFPUA fees must be paid.
- A copy of the NCDOT encroachment agreement or City of Wilmington Street Cut permit must be sent to the CFPUA Construction Project Manager.
- If an NC DOT Encroachment has been obtained, a separate NC DOT Pre-Con must be conducted. If any changes are made to the approved CFPUA utility plans during the NCDOT pre-con, the project engineer of record must submit revised plans to CFPUA for approval.
- If an encroachment or street cut permit is not required, an email from the owner of the right of way stating such must be sent to the CFPUA Construction Project Manager.

□ 22 All water services will be opened and flushed during the initial flushing of the system. The CFPUA Inspector will witness and confirm that all services had water available at the meter setter.

□ 23. If water meter boxes or sewer cleanouts are installed outside of the right of way, they must be a minimum of 5’ from the public utility easement line.

□ 24. As-builts shall incorporate Contractor's final survey and shall accurately represent final horizontal alignments and vertical depths with respect to final grade. Provide Contractor's final survey, including all horizontal and vertical direction changes, or at every 200 feet for water mains and force mains. Survey shall include final grade.

□ 25. Failure to comply with any of the above-mentioned items shall result in CFPUA Community Compliance issuing a Notice of Violation for failure to comply.

_____ _____

Project Name CFPUA File #

_____ Date: _____

Contractor Signature (required)

_____ Date: _____

CFPUA Project Manager/Project Engineer Signature

SECTION 01 33 00

SUBMITTALS

(CFPUA CAPITAL PROJECTS)

PART 1 GENERAL

1.1 DESCRIPTION

A. Construction Progress Schedule.

B. Special Procedures.

C. Submittal procedures.

D. Use of electronic CAD files of Project Drawings.

E. Shop Drawings.

F. Certificates.

G. Manufacturer's instructions.

H. Manufacturer's field reports.

I. Erection Drawings.

J. Contractor review.

K. Engineer review.

1.2 CONSTRUCTION PROGRESS SCHEDULE

A. At Preconstruction Meeting, submit proposed complete bar chart schedule for review.

B. Submit updated schedules at monthly progress meetings.

C. Schedule Updates:
   1. Overall percent complete, projected and actual.
   2. Completion progress by listed activity and sub-activity, to within five working days prior to submittal.
   3. Changes in Work scope and activities modified since submittal.
   4. Delays in submittals or resubmittals, deliveries, or Work.
   5. Adjusted or modified sequences of Work.
   6. Other identifiable changes.
   7. Revised projections of progress and completion.

D. Narrative Progress Report:
   1. Submit with each monthly submission of Progress Schedule.

2. Summary of Work completed during the past period between reports.
3. Work planned during the next period.
4. Explanation of differences between summary of Work completed and Work planned in previously submitted report.
5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.
6. Corrective action taken or proposed.

E. Format
1. Computer-generated bar chart schedule to include at least:
    a. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:
        1) Subcontract Work.
        2) Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
        3) Move-in and other preliminary activities.
        4) Equipment and equipment system test and startup activities.
        5) Project closeout and cleanup.
        6) Work sequences, constraints, and milestones.
    b. Listings identified by Specification Section number.
    c. Identification of the following:
        1) Horizontal time frame by year, month, and week.
        2) Duration, early start, and completion for each activity and sub-activity.
        3) Critical activities and Project float.
        4) Sub-schedules to further define critical portions of Work.

1.3 SPECIAL PROCEDURES

A. At Preconstruction Conference submit Special Procedures as follows:
1. Pre-Construction Audio/Video Inspections and Photography
2. Work Safety
3. Excavation Safety
4. Traffic Control and Maintenance
5. Notifications for Local Residents Impacted by Work
6. Backflow Prevention
7. Damage Restoration

1.4 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer-accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project, and deliver to Engineer at business address or post electronic submittals as PDF electronic files to Project website or submit electronic submittals via email as PDF electronic files. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized nor processed.

L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.5 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
   1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
   2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
   3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
   4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
   5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.

6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.6 SHOP DRAWINGS

A. Shop Drawings: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
   1. Include signed and sealed calculations to support design.
   2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submittals
   1. Submit number of opaque reproductions Contractor requires, plus copies Engineer will retain, or
   2. Post electronic submittals as PDF electronic files to Project website, or
   3. Submit electronic submittals via email as PDF electronic files.

E. After review, produce copies and distribute.

1.7 CERTIFICATES

A. Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

1.8 MANUFACTURER'S INSTRUCTIONS

A. Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.9 MANUFACTURER'S FIELD REPORTS

A. Submit reports for Engineer's knowledge as Contract administrator or for Owner.

B. Submit report in duplicate within 5 days of observation to Engineer for information.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.10 ERECTION DRAWINGS

A. Submit Drawings for Engineer's knowledge as Contract administrator or for Owner.

B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.11 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.

B. Contractor: Responsible for:
   1. Determination and verification of materials including manufacturer's catalog numbers.
   2. Determination and verification of field measurements and field construction criteria.
   3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
   4. Determination of accuracy and completeness of dimensions and quantities.
   5. Confirmation and coordination of dimensions and field conditions at Site.
   6. Construction means, techniques, sequences, and procedures.
   7. Safety precautions.
   8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

1.12 ENGINEER REVIEW

A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.

B. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order or Work Change Directive.

C. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 35 00

SPECIAL PROCEDURES

PART 1 GENERAL

1.1 DESCRIPTION

A. Pre-Construction Audio/Video Inspections and Photography

B. Safety Plan

C. Work Along Streets, Highways, and Railroads

D. Notification to Local Residents Impacted by Work

E. Protection of Work and Property

F. Responsibility for Damage

G. CFPUA Water Supply and Backflow Prevention

H. NCDEQ Minimum Separation of Water and Sewer Facilities

I. Restoration of Disturbed Areas

J. Regulatory Enforcement Actions Imposed

1.2 PRE-CONSTRUCTION AUDIO-VIDEO INSPECTIONS AND PHOTOGRAPHY

A. The Contractor shall be responsible for performing and submitting audio-video (AV) inspections and photographs of the project areas prior to performing any Work. AV inspections and photographs shall clearly document preconstruction conditions at all proposed Work locations. AV inspections and photography work shall be considered incidental to the contract.

B. The purpose of the AV inspections and photographs shall be to document the pre-construction conditions for comparison with the final restored Work. If Engineer, Owner, or third-party claims damage or deficient restoration in a Work area that cannot be disproved by preconstruction A/V inspections and photographs, then Contractor shall be responsible for repairs or additional restoration at no additional cost, and as necessary to resolve the claim.

C. The AV inspection shall be submitted in an electronic format accompanied with the following:
   1. Data stored on USB flash drive
   2. Map of overall work area showing.
      a. AV sequence and direction of travel
      b. AV elapsed time by location at no greater than 5-minute intervals

1.3 SAFETY PLAN

A. The Contractor shall prepare a detailed Safety Plan. This plan shall indicate the intended procedures to be used by the Contractor to comply with all OSHA requirements. Such Plan should further identify a competent person that will work with each crew. Safety plan shall be available for review at the job site at all times.

1.4 WORK ALONG STREETS, HIGHWAYS AND RAILROADS

A. Traffic Control and Maintenance:
   1. The proposed work may be performed within rights-of-way or easements as follows:
      a. NC Department of Transportation public streets and roads
         1) Encroachment agreement obtained by Engineer/Owner
      b. City of Wilmington public streets and roads
         1) Encroachment permit obtained by Contractor
      c. CSX rights-of-way
         1) Encroachment permit obtained by Engineer/Owner
      d. Dedicated utility rights-of-way or easements
         1) Encroachment obtained by Contractor/Owner
   2. Contractor shall adhere to the bounds as set forth in all rights-of-way and easements unless prior written approval of the current property owner is obtained and submitted to the Engineer and State, City, and local utility authorities for approval.
   3. Contractor shall submit a traffic control plan for approval by NCDOT or City of Wilmington in accordance with the respective encroachment agreement. When feasible, at least one lane of traffic will be safely maintained at all times when construction is in progress, otherwise, a detour plan must be submitted and approved with the traffic control plan.
   4. Traffic will be maintained on all streets or private drives throughout the work. All matters related to traffic maintenance must be done in a manner consistent with the Manual on Uniform Traffic Control Devices, City of Wilmington Traffic Standards and/or the NCDOT's "Uniform Traffic Control Devices". No roads shall be closed for construction activities unless approved otherwise.
   5. Access to businesses and residences along the roads shall be maintained at all times. All lanes will be open when work is suspended for three hours or longer. Warning signs and devices will be placed in advance of all construction activity in accordance with the most recent copy of the Manual on Uniform Traffic Control Devices, the City of Wilmington Traffic Standards, and the North Carolina Department of Transportation's "Uniform Traffic Control Devices".
   6. The Contractor shall provide all appropriate signing and barricades and shall provide flag persons at all times and places necessary.
   7. Traffic control will be strictly enforced in order to provide fire and police protection to the area and access to drives while construction is in progress.
   8. In the event of a necessary road or driveway closure, occupants and/or property owners must be notified a minimum of two business days in advance to any private drive closings.
   9. Where businesses have only one means of access, the Contractor shall provide an alternative means of access or perform work during hours when the business is closed.

10. Property owners and surrounding residents will be provided an additional notice if work is to extend outside normal business hours.
11. For projects requiring City of Wilmington right-of-way permit, the Contractor is always required to keep a copy of the permit at the construction site.
12. The Contractor will notify CFPUA two business days prior to commencing any construction within any right-of-way or easement.

B. Installation of Pipe Under Streets, Highways and Railroads:
1. The Contractor shall furnish and install protective steel pipe casings and/or carrier pipe under highways/railroads in the pipe size, thickness, length, location, and details as shown on the drawings and specified herein.
2. The construction shall not be started until the necessary permits have been obtained, a copy is at the job site, and proper notice and approval for construction has been obtained from the owner of the street/highway/railroad and the Engineer.
3. All necessary materials, equipment, labor, and traffic protection devices shall be on the job site before starting the Work.
4. Steel casings and the installation thereof required for street/highway/railroad crossings shall be in accordance with the permitted standards and requirements of the City of Wilmington, NCDOT, or CSX Railroads.

1.5 NOTIFICATION TO LOCAL RESIDENTS IMPACTED BY WORK

A. The Contractor shall provide work schedules, traffic control plans, and other information needed for accurate notifications to local residents of construction activity area. The Contractor shall coordinate with CFPUA, NCDOT and the City of Wilmington to provide public notifications within seven (7) days prior to beginning work in an area. CFPUA shall be responsible for issuing public notification to the media when necessary. Contractor shall be responsible for placing door hangars in advance of scheduled work. Copies of door hangars to be distributed to local residents shall be submitted to the CFPUA Project Manager for approval prior to distribution.

1.6 PROTECTION OF WORK AND PROPERTY

A. Property Monuments: The Contractor shall be responsible for the preservation of all public and private property and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed. Any property monuments, iron pins, etc., disturbed by the Contractor's actions will be restored at the Contractor's expense. Only licensed land surveyors will be utilized to restore property monuments, etc.

B. Clearing: To lessen the impact to adjacent property owners, the Contractor will submit a request to the Engineer and Owner for any clearing activities. Only the area required for access and Work will be cleared, as approved by the Engineer and CFPUA.

C. Protection of Shallow Buried Pipelines: The Contractor shall protect the integrity of all shallow public and private utility mains at all times, via approved resources such as

wood road mats, crane mats, PE mats, road plates, etc., to be installed prior to the beginning of work. The approved protection method shall be maintained during and properly removed at the end of the Work.

D. Tree Protection: All trees located in the road right-of-way and along the sewer easements shall be protected from damage. Any trees damaged shall be replaced to the satisfaction of the Engineer and CFPUA at no additional cost to the Owner.

1.7 RESPONSIBILITY FOR DAMAGE

A. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

B. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or inconsequence of the non-execution thereof by the contractor, he shall restore, at his own expense, such property to a condition equal to or better than existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.

1.8 CFPUA WATER SUPPLY AND BACKFLOW PREVENTION REQUIREMENTS

A. The Contractor shall meet all CFPUA requirements for connecting to hydrants. The Contractor shall obtain a permit for connecting to the CFPUA's hydrants. The permit application is titled "Procedure for Obtaining Special Water Use" and can be obtained from CFPUA, Community Compliance at 628 Groundwater Way, Wilmington, NC 28411.

B. The requirements for connecting to hydrants are specified by the CFPUA, Community Compliance. No mobile hydrant meter shall be connected to an CFPUA hydrant without approval from Community Compliance. The Contractor is responsible for the purchase and assembly of an approved mobile hydrant meter with backflow preventer assembly. All approved standard assemblies can be obtained from Community Compliance. A permit and complete assembly are required for each vehicle that will obtain water – meters cannot be moved from one vehicle to another unless otherwise approved by the CFPUA, Community Compliance. The hydrants shall be operated in a manner as defined by CFPUA. The Contractor shall be responsible for any damage caused by improper operation of hydrants. The Contractor is responsible for meeting all requirements whether listed herein or not.

C. The Contractor shall submit to the Engineer or CFPUA, a copy of the approved permit for each vehicle prior to obtaining water.

D. Backflow Prevention
   1. Typical Design Template for Mobile Hydrant Meter with Reduced Pressure Backflow Prevention Shown Below:

Coupling w/ hose connector	RP backflow preventer	Coupling	Meter	Connection for hose to hydrant

a. Diameters may vary, a 2” meter assembly is shown. When assembly is set up for a smaller size meter (e.g., 3/4”), then the couplings would be 3/4” or 5/8”.
b. Fire hose fitting shall be a 2-1/2" Wilmington Thread. Adapters are available for Wilmington Thread to National Standard Thread.
c. Meters shall register in gallons. Kent, Sensus, Hersey, or Neptune meters are approved for this application.
d. Local material suppliers for this assembly:
    1) Core and Main – 6501 Amsterdam Way
    2) National Water Works – 407 Landmark Drive
    3) Wilmington Rubber & Gasket – 609 Greenfield Street
    4) Fortiline Waterworks – 3321 US-421 N.
e. A partial list of approved reduced pressure backflow preventers follows. Others may also be approved.

Febco 835B	Conbraco 40-202-A2	Watts 009M2QT	Wilkins 975	Ames 4000B
Febco 825	Conbraco 40-203-02	Watts 909	Wilkins 975XL	Ames 4000SS
Febco 825Y	Conbraco 40-205-A4	Watts 009QT	Wilkins 975XLV	
Febco 860	Conbraco 40-200-02	Watts 009M1QT	Wilkins 575	
	Conbraco 40-204-99T	Watts 009SSQT		
	Conbraco 40-203-A2			

1.9 NCDEQ MINIMUM SEPARATION OF WATER AND SEWER UTILITIES

A. In accordance with 15A NCAC 02T .0305 (f), the following minimum separations shall be provided for the sewer system except as allowed by Paragraph (g) of this Rule:

1. Storm sewers and other utilities not listed below (vertical)	18 inches
2. Water mains (vertical water over sewer including in benched trenches)	18 inches
(horizontal)	10 feet
3. Reclaimed water lines (vertical – reclaimed over sewer)	18 inches
(horizontal)	2 feet
4. Any private or public water supply source, including any wells, WS-I waters or Class I or Class II impounded reservoirs used as a source of drinking water	100 feet
5. Waters classified WS (except WS-I or WS-V), B, SA, ORW, HQW, or SB from normal high water (or tide elevation) and wetlands	50 feet
6. Any other stream, lake, impoundment, or ground water lowering and surface drainage ditches	10 feet
7. Any building foundation	5 feet
8. Any basement	10 feet
9. Top slope of embankment or cuts of 2 feet or more vertical height	10 feet
10. Drainage systems and interceptor drains	5 feet
11. Any swimming pool	10 feet
12. Final earth grade (vertical)	36 inches

B. In accordance with 15A NCAC 02T .0305 (g), the following alternatives where separations in Paragraph (f) of this Rule cannot be achieved. Nothing in this Paragraph shall supersede the allowable alternatives provided in the Commission for Public Health Public Water Supply Rules (15A NCAC 18C), Commission for Public Health Sanitation Rules (15A NCAC 18A) or the Groundwater Protection Rules (15A NCAC 02L and 15A NCAC 02C) that pertain to the separation of sewer systems to water mains or public or private wells:

1. For storm sewers, engineering solutions such as ductile iron pipe or structural bridging to prevent crushing the underlying pipe.
2. For public or private wells, piping materials, testing methods and acceptability standards meeting water main standards shall be used where these minimum separations cannot be maintained. All appurtenances shall be outside the 100-foot radius. The minimum separation shall however not be less than 25-feet from a private well or 50-feet from a public well.
3. For public water mains horizontal or vertical separations, alternatives as described in 15A NCAC 18C .0906.
4. For less than 36-inches cover from final earth grade, ductile iron pipe shall be specified. Ductile iron pipe or other pipe with proper bedding to develop design supporting strength shall be provided where sewers are subject to traffic bearing loads.

5. For all other separations, materials, testing methods and acceptability standards meeting water main standards (15A NCAC 18C).

1.10 RESTORATION OF DISTURBED AREAS

A. The Contractor will be required to complete all restoration to disturbed areas within a timely manner following work completion.

B. All restoration work shall conform to the CFPUA, City of Wilmington, and NCDOT permits for replacement and/or restoration and shall equal or exceed pre-construction conditions.

C. Restorations include, but is not limited to, grading, seeding, mulching, pavement, sidewalks, driveways, storm drain pipes, curbs and gutters, fences, sign replacement and mailbox replacement.

D. Existing fences that are disturbed during construction shall be repaired or replaced to a condition equal to or better than the original unless a release is obtained in writing from the property owner and submitted to the Engineer or CFPUA. All fences shall be replaced immediately after operations have cleared the fence line.

E. Restoration of affected areas shall begin immediately upon termination of operations in the area disturbed.

F. If the Contractor fails to adhere to this provision, all Work operations will be stopped until compliance is met.

G. Restoration will be performed by the Contractor to the satisfaction of the Engineer and State, City or local utility permitting authorities.

H. All costs for restoration shall be incidental to the contract.

1.11 REGULATORY ENFORCEMENT ACTIONS IMPOSED

A. The Contractor shall be fully responsible for any and all violations of regulatory permit conditions issued for the Work. In the event that a violation occurs or if a Notice of Violation (NOV) is received, the Contractor shall take immediate action to correct the violation as directed or required by State and Federal Agencies, Engineer or CFPUA. Any penalties and fines resulting from such violation shall be assessed to the Contractor. In the event that a violation resulting from the Contractor's activities results in a Cease Work Order by the U.S. Corps of Engineers or other responsible state or federal agency, the Contractor shall be held fully responsible for all damages resulting from such delay and any associated penalties.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control.

B. References.

C. Labeling.

D. Testing and inspection services.

E. Manufacturers' field services.

1.2 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.

B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Perform Work using persons qualified to produce required and specified quality.

D. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current as of date for receiving Bids except where specific date is established by code.

C. Obtain copies of standards and maintain on Site when required by product Specification Sections.

D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.4 LABELING

A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
   1. Model number.
   2. Serial number.
   3. Performance characteristics.

1.5 TESTING AND INSPECTION SERVICES

A. Testing Services Provided by Contractor: Testing necessary to satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor. Unless otherwise specified, Contractor shall provide all testing services in connection with the following:
   1. Any inspections, tests or approvals required for Engineer acceptance of materials or equipment to be incorporated in the Work. This includes any items required for acceptance of materials, concrete mix designs or equipment submitted for approval prior to Contractor’s purchase for incorporation in the Work.
   2. Tightness testing of containment structures and pressure, leakage, or disinfection testing of piping as specified.
   3. Any Work (or part thereof) required by the Contract Documents to be approved by Owner, Engineer or other designated individual or entity. Contractor shall assume full responsibility for arranging and obtaining such approvals, pay all costs in connection therewith and submit to Engineer the required certificates of approval. Excluding those conducted directly by an Authority Having Jurisdiction or expressly specified to be conducted directly by Contractor, inspections and tests shall be performed by independent inspectors, approved agencies or other qualified individuals or entities acceptable to Owner and Engineer.

B. Testing Services and Special Inspections Provided by Owner: Testing services provided by Owner are for the sole benefit of Owner and/or as required by the governing building code. Owner shall employ and pay for the services of an independent testing laboratory, approved agency or other qualified individual or entities for inspections, tests or approvals required by the Contract Documents for field quality control. These include items indicated as Owner provided in the following sections:
   1. 03 05 00 Concrete (For Smaller Projects)
   2. 32 13 01 Concrete Sidewalks, Driveways, and Gutters
   3. 31 23 34.01 Excavating, Trenching, Dewatering and Backfilling
   4. 33 14 20 Disinfection of Water Pipelines, Facilities and Appurtenances
   5. 43 21 39.13 Submersible End Suction Pumps
   6. Other materials and equipment at the discretion of Owner.

Contractor shall provide access to the site and Work. Contractor shall give timely notice of the readiness of the Work for inspection, tests or approvals and shall cooperate with the inspection and testing personnel to facilitate the required tests and inspections. Contractor shall furnish all sample materials and cooperate in the testing activities, including sampling. Contractor shall interrupt the Work when necessary to allow testing, including sampling, to be performed. When testing activities, including sampling, are performed in the field by Engineer or Agency personnel, Contractor shall furnish personnel and facilities to assist in the activities as required.

C. Transmittal of Test Reports: Written reports of tests and engineering data furnished by Contractor for Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for 01 33 00 Submittals.

1.6 MANUFACTURER'S FIELD SERVICES

A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment as applicable, and to initiate instructions when necessary.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 51 00

TEMPORARY SEWER BYPASS PUMPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Temporary bypass pumping for daily system shutdowns of sewer systems.
   2. Temporary bypass pumping for overnight or extended shutdowns of sewer systems.

B. Related Requirements
   1. CFPUA Material Specification Manual (MSM).

1.2 REFERENCES

A. Abbreviations and Acronyms
   1. ORC Operator in Responsible Charge (CFPUA)
   2. SSO Sanitary Sewer Overflow

B. Definitions
   1. Daily System Shutdowns: System gravity flows shall be restored daily before the end of regular work hours.
   2. Firm Capacity: The pumping capacity of a temporary bypass pumping system with the largest pump out of service.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination
   1. Coordinate temporary bypass pumping system testing with Engineer and ORC. Provide a minimum of three business days' notice prior to system testing. Engineer or ORC representative must observe testing for it to be accepted.
   2. Coordinate system shutdowns with Engineer and ORC.

B. Sequencing
   1. Operate temporary bypass pumping systems in accordance with the sequencing and phasing indicated on the Drawings.

C. Scheduling
   1. The Project Schedule shall include the sequencing and coordination of maintaining wastewater flow during all phases of construction including but not limited to:
      a. Sewer pump station upgrades and replacements
      b. Drainage, cleaning, and replacement of sewer mains, manholes, and force mains
      c. Trenchless rehabilitation of sewer and force mains
      d. Inspection and testing of new or rehabilitated sewers
      e. Connections to existing sewer mains and force mains

1.4 SUBMITTALS

A. Provide in accordance with Section 01 33 00 – Submittals.
   1. Temporary Bypass Pumping Plans designated by type and location.
      a. The Engineering Committee of the NC Board of Examiners for Engineers and Surveyors (NCBELS) ruled that providing design plans and calculations for temporary bypass pump systems is the practice of engineering and requires licensure with NCBELS per G.S. 89C-23 and -24, meaning the design work shall be done by Professional Engineers and companies licensed to practice engineering in North Carolina.
   2. System test results and operation logs.
   3. Obtain Engineer and ORC approval of submittals prior to mobilization of equipment included in the plans.

B. Temporary Bypass Pumping Plan – For Daily System Shutdowns
   1. Outline provisions and precautions to be taken to convey and maintain existing wastewater flows during construction.
   2. Ensure proper protection of existing facilities, the project area, and surrounding properties from damage due to the discharge of flows.
   3. Provide adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be located at the mainline flow bypassing locations, ready for use in the event of primary pump failure. In this event, promptly repair or replace the failed equipment.
   4. Include the following as a minimum:
      a. Manufacturer's product data for bypass pumps including sizes, capacities, power requirements, and number of each size to be on site including primary, secondary, and spare pumps.
      b. Manufacturer's product data for bypass piping including make, material, material properties, diameter, thickness, pressure rating, and number to be on site.
      c. Calculations to demonstrate sufficient pump capacity for potential flows.
      d. Method of noise control for pumps, motors, and generators.
      e. Location and method of connection to the existing sewer on each side of the bypass if not provided in the Contract Documents.
      f. Number, size, material, and method of installation of suction and discharge piping, valves (isolation and air release), fittings, and other components for connection to the existing sewer system.
      g. Sewer isolation or plugging method and types of plugs or valves and fittings.
      h. Emergency plan for adverse weather and flooding for various phases of the Work.
      i. Incidental items required to ensure proper protection of the facilities.
      j. Traffic Control Plan where roads are impacted.
      k. Plan to divert pedestrian access where sidewalks are impacted.

C. Temporary Bypass Pumping Plan – For System Shutdowns Overnight or for Extended Periods
   1. Prepare and submit a project- and site-specific detailed temporary bypass pumping plan that provides detailed descriptions and layout drawings of the proposed temporary bypass pumping system(s). Outline provisions and

precautions to be taken by the Contractor to convey and maintain existing wastewater flows during construction.

2. Ensure proper protection of existing facilities, the project area, and surrounding properties from damage due to the discharge of flows.
3. Include the following as a minimum:
   a. Size of pipeline or conveyance system to be bypassed.
   b. Staging areas for pumps.
   c. Manufacturer's product data for temporary bypass pump sizes, capacities, power requirements, and number of each size to be on site including primary, secondary, and spare pumps. Provide method of operation and control, and redundancy sufficient to prevent SSOs.
   d. Provisions for standby power including generator size and location.
   e. Provisions for stand-by lighting.
   f. Method of noise control for pumps, motors, or generators.
   g. Location and method of connection to the existing sewer on each side of the bypass if not provided in the Contract Documents.
   h. Size and location of manholes or access points for suction and discharge hose or piping.
   i. Plan indicating location of temporary bypass pumping pipe locations.
   j. Number, size, material, location, and method of installation of suction and discharge piping, valves (isolation and air release), fittings, and connections to the existing sewer system.
   k. For buried piping, typical sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
   l. Thrust and restraint block sizes and locations. Provide details necessary to demonstrate the integrity of restraint of suction and discharge piping including piping and fittings associated with primary and secondary pumping units.
   m. Sewer isolation or plugging method and types of plugs or valves and fittings.
   n. Discharge plan including method of protecting discharge manholes or structures from erosion and other damage.
   o. Access plans to temporary bypass pumping locations indicated on the drawings.
   p. Heavy equipment required for installation of pumps, piping, valves, fittings, and other materials.
   q. Temporary pipe supports and anchoring.
   r. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted).
   s. Calculations for selection of temporary bypass pumping pipe size.
   t. Schedule for installation, operation, maintenance, and removal of the temporary bypass pumping system(s).
   u. Emergency plan for adverse weather and flooding for various phases of the Work.
   v. Contractor's plan for providing continuous (24-hour) monitoring of the temporary bypass pumping operation as well as the monitoring persons' qualifications. Additionally, an auto-dialer alarm system shall be provided for loss of primary pump or high level at suction location.
   w. Plan for refueling pump sets on demand.
   x. Demonstration of compliance with the requirements and permit conditions specified in the Contract Documents.
   y. Incidental items necessary to insure proper protection of the facilities.

1.5 QUALITY ASSURANCE

A. Demonstrate, or employ the services of a subcontractor, who can demonstrate that they specialize in the design and operation of temporary sewer bypass pumping systems.

B. Comply with North Carolina OSHA Standards, Underwriter Laboratories, and other authorities having jurisdiction. The temporary bypass pumping system shall meet the requirements of codes and regulatory agencies having jurisdiction.

C. Materials and appurtenances shall be clearly, legibly, and appropriately marked for identification purposes. Marking shall include listing/approval stamp, label, or other marking indicating conformance with specified standards.

D. Perform temporary bypass pumping system testing in accordance with Part 3.

PART 2 PRODUCTS

2.1 TEMPORARY SEWER BYPASS PUMPING SYSTEMS FOR SYSTEM SHUTDOWNS EXTENDING OVERNIGHT

A. Pumps shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. Pumps may be electric, or diesel powered. Diesel powered pumps shall include critical grade silencing when used in residential settings or areas where excessive noise levels would create a disturbance. Critical grade silencing is not required on redundant bypass pumping.

Silencing Grade	Expected Attenuation (dBA)
Industrial	15 to 20
Residential	20 to 25
Critical	25 to 32
Super Critical	30 to 38
Hospital	35 to 42
Hospital Plus	35 to 50
Extreme	40 to 55
Super Extreme	45 to 60

B. Provide level detection equipment, alarms, drives, controls, fittings, valves, air release valves, fuel tanks, auxiliary fuel tanks, and other components for a reliable stand-alone system. Provide sufficient components for a redundant system.

C. Include 100 percent on-line pumping redundancy. Include a redundant bypass pump, intake and discharge conduit, and other equipment necessary to provide continuous wastewater flow and prevent the backing up of sewage in the event of primary system failure.

2.2 PERFORMANCE REQUIREMENTS

A. Design, install, operate, and maintain a temporary bypass pumping system to maintain continuous wastewater service to customers of CFPUA. The Contractor shall be responsible for bypass pumping of wastewater as required to prevent backing up of sewage (except as approved by CFPUA) and provide appropriate conditions for proper drainage, inspection, replacement, rehabilitation, testing or reconnections to existing sewers.

B. Temporary Bypass Pumping System Capacities

Location	Firm Capacity (GPM)

C. Operation
   1. Operators
      a. Provide on-site manual oversight by a responsible operator of temporary bypass pumping operations 24 hours per day, 7 days per week when the temporary bypass pumping systems are in operation.
      b. The 24-hour monitoring operator shall be properly trained, experienced, and mechanically qualified so that they can quickly and effectively address potential emergency and non-emergency situations associated with the pumps and temporary bypass pumping system.
   2. Controls
      a. Pumps shall operate on redundant control systems and be equipped with an auto-dialer, cellular, or SCADA monitoring and control. Controls shall be set so that the systems do not surcharge and create an SSO in upstream manholes or a backup of wastewater into residential or commercial facilities.
   3. Operation Sequences
      a. Comply with operating sequences provided by Engineer and ORC.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect Work area and verify that existing conditions match the conditions depicted on the Drawings. Notify Engineer immediately of any discrepancies.

B. System Testing
   1. Perform leakage and pressure tests of the temporary bypass pumping discharge piping using clean water prior to operation. Pressure and leakage tests shall be conducted at 1.5 times the maximum working pressure, based on the approved Temporary Bypass Pumping Plan, for a period of two hours. No leakage is permitted during this test. Provide a leakage and pressure test report that documents start time and pressure, pressure at 15-minute intervals, stop time, end

of test pressure, and amount of leakage. Report shall be signed by the Contractor's on-site superintendent and project manager, and the Engineer or CFPUA representative.
2. Demonstrate that the temporary bypass pumping system is in good working order and is sufficiently sized to successfully convey wastewater flows by operating the system in automatic mode for a period of 24 hours prior to beginning Work.
3. Demonstrate alarms function as designed.
4. Demonstrate back-up pumps and systems operate as designed.

3.2 PREPARATION

A. Temporary bypass pumping operations shall not proceed until submittals have been approved.

B. Do not interrupt sewer service without prior approval of CFPUA.

C. Precautions
1. Locate existing utilities in proximity to the temporary bypass pumping system. Install temporary bypass pumping system components to minimize disturbance to existing utilities and in accordance with the Temporary Bypass Pumping System Plan. Costs associated with relocating existing utilities and obtaining approvals shall be borne by the Contractor.
2. During temporary bypass pumping system operation, protect the existing sanitary sewer facilities from damage inflicted by any equipment. The Contractor shall be responsible for physical damage to the existing sanitary sewer facilities caused by human or mechanical failure.

D. Protect existing facilities in accordance with Section 01 50 00 – Temporary Facilities and Controls.

3.3 INSTALLATION

A. General
1. Prevent damage to existing structures. Discharge piping to gravity sewer systems shall be designed in such a manner as to prevent discharge from contacting manhole walls or benching. Full discharge shall go into the downstream pipe in a manner to minimize turbulence. It may be necessary to remove manhole cones to provide sufficient space for the bypass piping. Contractor is responsible for any damage to manholes. Repair damaged manholes to preconstruction condition.
2. Make connections to the existing sewer and construct temporary bypass pumping structures only at the access locations indicated on the Drawings.
3. The new sewer may be used by the Contractor to convey the sanitary flows after the new sewer has passed inspection and testing. CFPUA shall approve any temporary connections to the new sewer.
4. Plugging or blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge and that prevents surcharging or causing other major disturbances downstream.

5. When working inside a manhole or force main in the presence of sewer gases, combustible or oxygen-deficient atmospheres, and confined spaces, the Contractor shall exercise caution and comply with OSHA requirements.
6. Installation of bypass pipelines is prohibited in wetland areas unless specifically indicated or allowed in the Contract Documents. The pipeline must be located off streets (except where streets are shut down and detours or lane shifts are provided) and sidewalks and on shoulders of the roads or within easements. When the bypass pipeline crosses local streets and private driveways, install temporary road ramps.

B. Steel Pipe shall be installed in accordance with manufacturer recommendations. Locking pins shall be placed in couplings.

C. HDPE pipe shall be installed in accordance with AWWA M55 “PE Pipe – Design and Installation” and the “Handbook of Polyethylene Pipe” by the Plastics Pipe Institute. The pipe shall be joined by the butt fusion procedure outlined in ASTM F 2620 or PPI TR-33. Fusion joints shall be made in compliance with the pipe or fitting manufacturer’s recommendations. Fusion joints shall be made by qualified fusion technicians per PPI TN-42.

3.4 OPERATION

A. Maintain flows in the existing upstream pumps stations, sewer interceptors, and tributary collector and lateral lines at all times and under all weather conditions except for brief periods when mains and services are disconnected and reconnected. Take actions and precautions necessary to prevent discharge of wastewater during disconnection and reconnection of mains including performing those tasks during off peak hours or providing additional temporary bypass measures. Interruption of flows that result in the discharge of wastewater will not be permitted.

B. Maintain sewer flow at the work area in a manner that will not cause surcharging of sewers or damage to sewers, and that will protect public and private property from damage and flooding.

C. Anticipate severe weather conditions and increases in peak flows during rain events and design and plan for these accordingly.

D. Immediately notify CFPUA should a sanitary sewer overflow (SSO) occur. Take necessary action to clean up and disinfect the spillage to the satisfaction of CFPUA and other governmental agencies with jurisdiction. If sewage is spilled onto public or private property, wash down, clean up, and disinfect the spillage to the satisfaction of the property owner, utility owner, and governmental regulatory agencies.

E. Overflows from temporary bypass operations shall not be permitted to enter streams or bodies of water. The Contractor shall be solely responsible for paying fines imposed and legal actions taken by state and federal regulatory agencies if overflows occur as a result of the temporary bypass pumping operations. Reimburse CFPUA for any damages, operational costs, fines, and other effects. Immediately remove and dispose of wastewater and waste material spilled during the temporary bypass pumping at his own expense.

F. Make every effort to avoid causing unplanned service outages. CFPUA will investigate service outages resulting from Contractor's operations. If the investigation determines that the Contractor could have avoided the service outage, then the outage shall result in disciplinary actions including but not limited to reimbursement to the CFPUA for any damages, operational costs, fines, and other effects.

G. Provide pipeline plugs, temporary suction piping, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the sewer main can be safely diverted around the section of sewer designated for rehabilitation. Do not stop or impede the main flows without prior approval by CFPUA.

H. Temporary bypass pumping systems for system shutdowns extending overnight shall be operated 24 hours per day.

I. Where portions of the Work require that tributary pump stations be taken out of service for prolonged periods, the Contractor shall construct a temporary bypass pumping system for those pump stations that discharge into either the existing piping downstream of the affected area, or to a neighboring gravity sewer (as identified by CFPUA) that flows to an unaffected pump station.

J. Temporary road ramps shall be used where necessary to maintain traffic flow in accordance with the Traffic Control Plan as required by Section 01 35 00, Special Procedures.

K. Cease bypass pumping operations and return flows to the new or existing sewer when directed by CFPUA.

L. Contractor shall repair, at his own expense, any damage to public or private property caused by his operations.

M. A copy of the CFPUA approved Temporary Bypass Pumping Plan shall be available onsite at all times during temporary bypass pumping operations.

3.5 MONITORING

A. Operators shall perform inspections of the temporary bypass pumping system and operation at a minimum of hourly intervals. Inspections shall include at a minimum:
   1. Observation of all components of the temporary bypass system, including all piping and appurtenances, to ensure the system is operating as specified and no leakage or damage is occurring.
   2. Observation of the suction and discharge locations of the temporary bypass pumping system, including upstream and downstream sewers, to ensure flow levels are as expected and no surcharging of the sewer or damage is occurring.
   3. Verification of adequate fuel supply.

B. Inspections shall be documented in the operation log at the time that the inspection is performed.

3.6 PROTECTION

A. Protect temporary bypass pumping systems from traffic in proximity to system components and vandalism. Repair or replace damaged components immediately.

3.7 MAINTENANCE

A. Ensure that the temporary bypass pumping system is properly maintained in accordance with the Temporary Bypass Pumping Plan and manufacturer recommendations. There shall be no leakage from the temporary bypass pumping system.

B. Sufficient spare parts for pumps and piping shall be kept on site to maintain operation of the redundant system. Immediately replace spare parts that are placed into service.

3.8 DISASSEMBLY AND REMOVAL

A. When bypass operations are complete, bypass piping shall be flushed with fresh water and drained into the wastewater system prior to disassembly. Piping shall be disassembled in a manner to prevent an SSO.

B. Upon completion of the bypass pumping operations, and after the receipt of written permission from CFPUA, the Contractor shall disassemble and remove piping and restore property to pre-construction condition.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

1.2 PRODUCTS

A. At minimum, comply with specified requirements and reference standards in CFPUA Materials Specification Manual (MSM).

B. MSM specified products define standard of quality, type, function, dimension, appearance, and performance required.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products according to manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products according to manufacturer's instructions.

B. Store products with seals and labels intact and legible.

C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

D. For exterior storage of fabricated products, place products on sloped supports aboveground.

E. Provide bonded off-Site storage and protection when Site does not permit on-Site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by MSM Description Only: Products complying with specified reference standards or description.

B. Products Specified by Naming Three or More Manufacturers: Products of manufacturers named and complying with Specifications; no options or substitutions allowed without CFPUA approval.

C. Substitutions to be reviewed and permitted before bid receipt or final plan approval.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

(CFPUA CAPITAL PROJECTS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field surveying.

B. Closeout procedures.

C. Starting of systems.

D. Demonstration and instructions.

E. Testing, adjusting, and balancing.

F. Project record documents.

G. Operation and maintenance data.

H. Spare parts and maintenance products.

I. Product warranties and product bonds.

J. Examination.

K. Preparation.

L. Execution.

M. Cutting and patching.

N. Protecting installed construction.

O. Final cleaning.

1.2 FIELD SURVEYING

A. Employ land surveyor registered for Project layout and location records.

B. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.

C. Control datum for survey is established by Engineer-provided survey and indicated on Drawings.

D. Verify easements; confirm Drawing dimensions and elevations.

E. Provide field surveying and recording services. Establish elevations, lines, and points using recognized survey practices.

F. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.

H. Final Record Survey: Prior to Substantial Completion, submit markup of final record in accordance with Project Record Documents in this section.

1.3 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
   1. Submit maintenance manuals, Project record documents, markups, warranty letters and other similar final record data in compliance with this Section.
   2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
   3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
   4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities.
   5. Deliver spare parts to Owner.
   6. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
   7. Discontinue or change over and remove temporary facilities and services from Project Site.
   8. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:
   1. When Contractor considers Work to be substantially complete, submit to Engineer:
      a. Written certificate that Work, or designated portion, is substantially complete.
      b. List of items to be completed or corrected (initial punch list).
   2. Should Engineer determine that Work is not substantially complete:
      a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
      b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
      c. Engineer will reinspect Work.
      d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.
   3. When Engineer finds that Work is substantially complete, Engineer will:

a. Prepare Certificate of Substantial Completion on Owner's Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.

4. After Work is substantially complete, Contractor shall:
   a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
   b. Complete Work listed for completion or correction within time period stipulated.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
   1. When Contractor considers Work to be complete, submit written certification that:
      a. Contract Documents have been reviewed.
      b. Work has been examined for compliance with Contract Documents.
      c. Work has been completed according to Contract Documents.
      d. Work is completed and ready for final inspection.
   2. Submittals: Submit following:
      a. Final punch list indicating all items have been completed or corrected.
      b. Final adjusting change order documents.
      c. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
      d. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
      e. Contractor's affidavit of payment of debts and claims.
      f. Contractor affidavit of release of liens.
      g. Consent of surety to final payment.
   3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:
   1. Engineer will make inspection to determine whether Work or designated portion is complete.
   2. Should Engineer consider Work to be incomplete or defective:
      a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
      b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
      c. Engineer will reinspect Work.
      d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

1.4 STARTING OF SYSTEMS

A. Coordinate schedule for startup of various equipment and systems.

B. Notify Engineer seven days prior to startup of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.

G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

1.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of startup or Substantial Completion.

B. Demonstrate Project equipment and instructed by authorized manufacturer's representative who is knowledgeable about the Project.

C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, product data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Record information concurrent with construction progress, not less than weekly. Report recording status at progress meetings.

D. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates used.
   3. Changes made by Addenda and modifications.

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
   1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
   2. Include locations of concealed elements of the Work.
   3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
   4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
   5. Identify and locate existing buried or concealed items encountered during Project.
   6. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   7. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   8. Field changes of dimension and detail.
   9. Details not on original Drawings.

F. Certified, surveyed record drawings (“as-built” plans), sealed by a North Carolina licensed Professional Engineer and Professional Land Surveyor, shall be furnished to CFPUA by the Engineer of Record upon completion and acceptance of the infrastructure by CFPUA. The “as-built” plans shall conform to the as-built checklist included herein.

G. For sewer projects, the “as-built” plans shall include accurate information regarding pipe size, pipe material, pipe length, manhole construction (size of manhole, invert, rim, alignment, location), services, and pump stations along with any relevant rights-of-way, property boundaries and easements. Plans shall also include sewer profiles showing any utility crossings along with the aforementioned information.

H. For pump station projects, the “as-built” plans shall include accurate information regarding interior and exterior pipe sizes, material, length, as well as all structural dimensions of the pump station, all electrical equipment (make and model), pump information (make, model, and impeller size), and site layout information. Top plan, sectional plan, and full cross-section views are required on the “as-built” plans.

I. For water projects, the “as-built” plans shall include accurate information regarding pipe size, pipe material, pipe length, valve locations (and turn direction), hydrant locations, fitting locations, services, and blow-off locations along with any relevant rights-of-way, property boundaries and easements.

J. Submit marked-up paper copy documents to Engineer at each payment request and before Substantial Completion.

K. Digital “as-built” information shall be provided by the Engineer of Record in AutoCAD format and PDF format with seal, signature, and date by surveyor and engineer and shall include all information required on the “as-built” drawings. No other digital formats will be accepted.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit in PDF composite electronic indexed file.

B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.

C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project**,** and subject matter of binder when multiple binders are required.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Contact information for warranty items.
      g. Safety precautions to be taken when operating and maintaining or working near equipment.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop Drawings and product data.
      b. Certificates.
      c. Photocopies of warranties and bonds.

1.8 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.

1.9 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.

B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include table of contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Examine and verify specific conditions described in individual Specification Sections.

C. Verify that utility services are available with correct characteristics and in correct locations.

3.2 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step, in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
   1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
   2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.

E. Allow for expansion of materials.

F. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
   1. Refer questionable mounting heights choices to Engineer for final decision.

G. Adjust operating products and equipment to ensure smooth and unhindered operation.

H. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.3 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   4. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and nonconforming Work.
   4. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products according to requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest joint or intersection; for equipment assembly, refinish entire unit.

J. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.4 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Protect corrosion protected (coated) surfaces. When activity is necessary, obtain recommendations for protection from coating material manufacturer.

D. Prohibit traffic from landscaped areas.

3.5 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.

B. Clean Site; sweep paved areas, rake clean landscaped surfaces.

C. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION

AS-BUILT CHECK LIST Rev. 6
CAPE FEAR PUBLIC UTILITY AUTHORITY

Date: _____

Subdivision Name: _____

Reviewed by: _____

CFPUA Project Number: _____

CFPUA Technical Specification: 01 70 00 Execution and Closeout Requirements

W	S	#	√ - COMPLETED	X - INCOMPLETE	N/A – NOT APPLICABLE
		1	Name of subdivision (if applicable), owners name, date of construction, north arrow, scale, vicinity map and as-built plan.		
		2	Drawings shall indicate water/sewer phases and their relationship to subdivision phases.		
		3	Sheet numbers and number of total sheets.		
		4	Clearly indexed cover sheet with location of plan - profile sheets on cover sheet, by sheet number.		
		5	Accurate location map and index planning map at a scale of 1 inch = 200 feet.		
		6	Total linear feet on cover sheet listed by phases:		
			Water lines:	Gravity line:	Force main:
		7	Certification notes listed by phase and location on cover sheet.		
		8	All lettering shall be at least 0.10 inches in height. The scale shall be 1” = 50’ (horizontal) and 1” = 5’ (vertical).		
		9	The contractor’s final survey shall be provided with a copy of the as-builts. The survey shall be completed in accordance with CFPUA Technical Specification 01 70 00.		
		10	Engineer has incorporated Contractor’s final survey into the as-builts. As-builts shall accurately represent final horizontal and vertical alignments with respect to final grade. Shall also include all utility separations, both horizontal and vertical, with respect to all other utilities.		
		11	The final elevation of water mains and force mains shall be surveyed every 50’ or at each change in horizontal and vertical direction, and at each valve location with final grade in place.		
		12	Final grade shall include elevation directly over the utility main as well as the elevation at the edge of pavement. Profile shall include both grade lines to distinguish the elevation drop from the edge of pavement.		
		13	All crossings shall be identified, and separations shall be verified with the Contractor's survey to confirm as-built separation. All proposed minimum separation notes from the design plans shall be removed.		
		14	All inverts into and out of manholes shall be field verified to 1/100 ft.		
		15	Show manhole top elevation & flood elevation or surface water flow levels @ each MH.		
		16	Elevations shall be tied to mean sea level. Indicate any benchmarks within project area.		
		17	All monuments shall be identified including manhole sewer monuments.		
		18	Show vertical and horizontal separations of waterlines, sewer mains, and force mains to proposed or existing utilities and structures (includes storm water piping).		
		19	For each sewer reach, show pipe diameter, length, type, slope, existing surface elevations and proposed finish grades. Show station or distance to beginning and end of change in pipe material.		
		20	Show location of air release valves, gate valves and fittings along water main and sanitary sewer force main.		
		21	Station numbers shall be included.		
		22	Plans shall show stubs for individual services. C/O shown open circle, water meters open box. Sewer Cleanouts (COs) shall be located by measuring from each manhole along the sewer main up stream to a point which lies on a line that is perpendicular to the sewer main and connects said point and C.O. - zero point shall be the immediate downstream manhole and measured from main to C/O, i.e., 127/14R. No stations shall be used. Indicate size and location of all of services.		
		23	Indicate size of services greater than 4”.		
		24	Indicate manhole service taps, service casing &/or material transition.		
		25	Water services shall be clearly drawn including the location of the tap to the meter box. An open square shall be used to identify the meter boxes.		
		26	All casing pipes shall be identified including the start and end of the casing.		

		27	Existing infrastructure where crossings are located or where connections were made shall be referenced by title and page of as-built drawing. The Authority will assist with obtaining this information, (i.e. existing manhole number, project name, CFPUA number and sheet number. Show information on plan-profile sheet and cover sheet.
		28	All proposed design language shall be removed including minimum and maximum installation requirements. Depths of pipe shall be verified with Contractor's survey and updated accordingly on the as-builts.
		29	Lot numbers, property lines and owner reference lines, street names and all easements.
		30	Engineer’s seal and Surveyor’s seal as applicable or required.
		31	Show all water supply wells within 50' & community wells within 100' of sewer main.
		32	Water & sewer layers to be bolder line type than drainage, streets, etc.
		33	All final contour lines shall be reflected on the as-built.
		34	A PDF and digital copy (format no older than AutoCAD 2005) of the Final as-built plans must be provided to the Authority. All drawings shall become the property of the Cape Fear Public Utility Authority.
		35	Permitted main line final as-built plans shall be inked on original base mylar sheets (24” X 36”), or the engineer shall provide drawings on Dupont Crovx Erasable Image (wash-off) sheets or approved equal. All drawings shall become the property of the Cape Fear Public Utility Authority.

Date Final Inspection Completed: _____

Inspectors Signature: _____

SECTION 03 05 00

CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete:
      a. Concrete mixes.
      b. Form materials.
      c. Reinforcing materials.
      d. Water stops.
      e. Grout mixes.
   2. Grouting:
      a. Portland cement grout.
      b. Rapid-curing epoxy grout.
      c. Non-shrink cementitious grout.
   3. Initial and final curing of horizontal and vertical concrete surfaces.

B. Requirements:
   1. Scope:
      a. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete, reinforcing, and related materials.
      b. The Work includes:
         1) Providing concrete consisting of Portland Cement, fine and coarse aggregates, water, and approved admixtures; combined, mixed, transported, placed, finished, and cured.
         2) Fabricating and placing reinforcing, including ties and supports.
         3) Design, erection, and removal of formwork.
         4) Building into the concrete all sleeves, frames, anchorage devices, inserts, and other items required to be embedded in concrete.
         5) Providing openings in concrete as required to accommodate Work under this and other Sections, and work under other contracts.
   2. Coordination:
      a. Review installation procedures under other Sections and coordinate installation of items to be installed in the concrete Work.
   3. Classifications of Concrete:
      a. The requirements in this section shall apply to the following types of concrete:
         1) Class A1 Concrete: Normal weight structural concrete to be used in all structures, sidewalks, and pavements, except where noted otherwise in the Contract Documents. All concrete shall be Class A1 concrete unless another class is specifically called for on Contract Documents or specified herein.
         2) Class A2 Concrete: Not Used
         3) Class A3 Concrete: Normal weight structural concrete to be used where specifically called for on Contract Drawings or where specifically

requested by Contractor and approved by Engineer. Class A3 concrete shall be similar to Class A1 except Class A3 concrete shall contain a mandatory addition of high range water reducer to aid in placement of concrete.

4) Class A4 Concrete: Not Used
5) Class A5 Concrete: Not Used
6) Class A6 Concrete: Normal weight structural concrete used where concrete is placed under pressure (pumped). Class A6 concrete shall be used only where specifically approved by Engineer.
7) Class B Concrete: Normal weight structural concrete used for duct bank encasements, catch basins, fence and guard post embedment, concrete fill, and other areas where specifically noted on Contract Drawings.
8) Class C Concrete: Not Used

1.2 REFERENCES

A. Standards referenced in this Section are:
1. ACI 224R, Control of Cracking in Concrete Structures.
2. ACI 301, Specifications for Structural Concrete for Buildings.
3. ACI 302R, Guide for Concrete Floor and Slab Construction.
4. ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
5. ACI 305R, Hot Weather Concreting.
6. ACI 306R, Cold Weather Concreting.
7. ACI 308.1, Specification for Curing Concrete.
8. ACI 309R, Guide for Consolidation of Concrete.
9. ACI 318, Building Code Requirements for Structural Concrete and Commentary.
10. ACI 347, Guide to Formwork for Concrete.
11. ACI 350-06, Code Requirements for Environmental Engineering Concrete Structures.
12. ACI/CRSI, Adhesive Anchor Installers.
13. ACI SP-66, ACI Detailing Manual.
14. ANSI/NSF Standard 61, Drinking Water Systems Components.
15. ASTM A82, Specification for Steel Wire, Plain, for Concrete Reinforcement.
16. ASTM A185, Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
17. ASTM A615, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
18. ASTM C31, Practice for Making and Curing Concrete Test Specimens in the Field.
19. ASTM C33, Specification for Concrete Aggregates.
20. ASTM C39, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
21. ASTM C94, Specification for Ready-Mixed Concrete.
22. ASTM C109 – Standard Test Method for Comprehensive Strength of Hydraulic Cement Mortars.
23. ASTM C138, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
24. ASTM C143, Test Method for Slump of Hydraulic-Cement Concrete.
25. ASTM C150, Specification for Portland Cement.
26. ASTM C171, Standard Specification for Sheet Materials for Curing Concrete.
27. ASTM C172, Practice for Sampling Freshly Mixed Concrete.

28. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
29. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
30. ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
31. ASTM C494, Specification for Chemical Admixtures for Concrete.
32. ASTM C531, Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing's, and Polymer Concretes.
33. ASTM C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing's, and Polymer Concretes.
34. ASTM C1077, Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
35. ASTM D638, Standard Test Method for Tensile Properties of Plastics.
36. ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
37. ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.
38. ASTM E1745, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
39. CRD-C 572, U. S. Army Corps of Engineers Specification for Polyvinylchloride Water stops.
40. CRD-C 621, Non-Shrink Grout.
41. CRSI MSP-1, Manual of Standard Practice.
42. ICC-ES AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

1.3 QUALITY ASSURANCE

A. Laboratory Trial Batch:
   1. Refer to Section 01 40 00 Quality Requirements.
   2. Owner shall employ third-party testing laboratory experienced in design and testing of concrete materials and mixes to perform material evaluation tests and to design concrete mixes. Contractor to abide by all third-party testing requirements.
   3. Tests on materials used in the production of concrete shall be required as specified in PART 2 -- PRODUCTS. These tests shall be performed by an independent testing laboratory approved by the Engineer.
   4. Trial concrete mixes shall be tested when required in accordance with Article 3.9.
   5. Field quality control tests, as specified in this Section, unless otherwise stated, will be performed by a materials testing consultant employed by the Owner. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. Any individual who samples and tests concrete to determine if the concrete is being produced in accordance with this Specification shall be certified as a Concrete Field-Testing Technician, Grade I, in accordance with ACI CP-1 or equivalent. Testing laboratory shall conform to requirements of ASTM C-1077.
   6. Contractor shall provide a sample of reinforcing steel from each delivery if requested by Owner.
   7. Third-party testing is required for each truck delivery unless otherwise directed by Owner.

8. Each concrete mix design specified shall be verified by laboratory trial batch, unless indicated otherwise.
9. Perform the following testing on each trial batch:
    a. Aggregate gradation for fine and coarse aggregates.
    b. Slump.
    c. Air content.
    d. Compressive strength based on three cylinders each tested at seven days and at 28 days.

B. Field Tests
1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to ensure continued compliance with these Specifications. The specimens will be made by the Engineer or its representative.
    a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days, and any additional time period as appropriate.
    b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time as appropriate.
2. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor shall assist the Engineer in obtaining specimens for testing. The Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens, at no additional cost to the Owner.
3. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
    a. List of concrete materials and concrete mix designs proposed for use. Include results of tests performed to qualify the materials and to establish the mix designs. Do not start laboratory trial batch testing until this submittal is approved by Engineer.
    b. Concrete placement drawings showing the location and type of all joints.
    c. Drawings for fabricating, bending, and placing concrete reinforcing. Comply with ACI SP-66. For walls and masonry construction, provide elevations to a minimum scale of 1/4-inch to one foot. Show bar schedules, stirrup spacing, adhesive dowels, splice lengths, diagrams of bent bars, arrangements, and assemblies, as required for fabricating and placing concrete reinforcing.
2. Product Data:
    a. Manufacturer’s specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.

B. Third-Party Submittals: Submit the following:
   1. Laboratory Trial Batch Reports: Submit laboratory test reports for concrete cylinders, materials, and mix design tests.
   2. Project identification name and number (if applicable).
   3. Date of test report.
   4. Complete identification of aggregate source of supply.
   5. Tests of aggregates for compliance with the Contract Documents.
   6. Scale weight of each aggregate.
   7. Absorbed water in each aggregate.
   8. Brand, type, and composition of cementitious materials.
   9. Brand, type, and amount of each admixture.
   10. Amounts of water used in trial mixes.
   11. Proportions of each material per cubic yard.
   12. Gross weight and yield per cubic yard of trial mixtures.
   13. Measured slump.
   14. Measured air content.
   15. Compressive strength developed at seven days and 28 days, from not less than three test cylinders cast for each seven day and 28-day test, and for each design mix.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 – Product Requirements.

B. Transportation, Delivery, and Handling:
   1. Deliver concrete reinforcing products to Site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings on approved Shop Drawings.
   2. Materials used for concrete shall be clean and free from foreign matter during transportation and handling and kept separate until measured and placed into concrete mixer.
   3. Implement suitable measures during hauling, piling, and handling to ensure that segregation of coarse and fine aggregate particles does not occur, and grading is not affected.
   4. Deliver materials from manufacturers in unopened containers that bear intact manufacturer labeling. Inspect packaging for damage before accepting.

C. Storage:
   1. Store materials according to manufacturer instructions.
   2. Store formwork materials above ground on framework or blocking. Cover wood for forms and other accessory materials with protective, waterproof covering. Provide for adequate air circulation or ventilation under cover.
   3. Store concrete reinforcing materials to prevent damage and accumulation of dirt and excessive rust. Store on heavy wood blocking so that reinforcing does not come into contact with the ground. Space framework or blocking supports to prevent excessive deformation of stored materials.
   4. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight.
   5. For storage of concrete materials, provide bins or platforms with hard, clean surfaces.

D. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection according to manufacturer instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Admixtures:
   1. Air-Entraining Admixture: ASTM C260.
   2. Water-Reducing Admixture: ASTM C494, Type A.
   3. Water Reducing and Set-Adjusting Admixtures: ASTM C494, Types D and E.
   4. High Range Water-Reducing Admixture: ASTM C494, Type F/G.
   5. Use only admixtures that have been tested and approved in the mix designs.
   6. Do not use calcium chloride or admixtures containing chloride ions.

B. Aggregates: ASTM C33:
   1. Fine Aggregate:
      a. Washed natural sand.
      b. Gradation:
         1) Comply with ASTM C33.
         2) Represented by smooth granulometric curve within required limits.
      c. Free from injurious amounts of organic impurities according to ASTM C40.
   2. Coarse Aggregate:
      a. Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter.
      b. Coarse aggregate shall comply with the following:
         1) Crushed stone, processed from natural rock or stone.
         2) Washed gravel, either natural or crushed. Slag, pit gravel, and bank-run gravel are not allowed.
      c. Coarse Aggregate Size: ASTM C33, Nos. 57 or 67, unless otherwise approved by Engineer.

C. Concrete Mix:
   1. As specified per manufacturer.
   2. Portland Cement, sand, and water.
   3. Do not use ferrous aggregate or staining ingredients in grout mixes.

D. Membrane-Curing Compound Type A:
   1. Comply with ASTM C309, Type 1, Class A.
   2. Manufacturers:
      a. Super Diamond Clear VOX by the Euclid Chemical Company.
      b. MasteKure CC 300 SB by BASF Master Builder Solutions.
      c. Cure & Seal 30 Plus by Symons Corporation.
      d. Or equal. As specified in Section 01 60 00 – Product Requirements.

E. Portland Cement: Comply with ASTM C150/C150M, Type I and II:
   1. Minimum 28-day compressive strength of 4,000 psi.

F. Water: Clean, potable:
   1. No impurities, suspended particles, algae, or dissolved natural salts in quantities capable of causing:
      a. Corrosion of steel
      b. Volume change increasing shrinkage cracking.
      c. Efflorescence.
      d. Excess air entraining.
         1) NBEC Grout by Five Star Products, Inc.
         2) Or equal. As specified in Section 01 60 00 – Product Requirements.

G. Epoxy Grout:
      a. Pre-packaged, non-shrink, non-metallic, 100 percent solids, solvent-free, moisture-insensitive, three-component epoxy grouting system.
      b. Minimum Seven-day Compressive Strength: 14,000 psi, when tested in accordance with ASTM C579.
      c. Products and Manufacturers:
         1) Euco High Strength Grout, by Euclid Chemical Company.
         2) Sikadur 42, Grout Pak, by Sika Corporation.
         3) Five Star Epoxy Grout, by Five Star Products, Inc.
         4) Or equal. As specified in Section 01 60 00 – Product Requirements.

H. Grout Fill:
      a. Grout mix shall consist of cement, fine and coarse aggregates, water, and admixtures complying with requirements specified in this Section for similar materials in concrete.
      b. Proportion and mix grout fill as follows:
         1) Minimum Cement Content: 564 pounds per cubic yard.
         2) Maximum Water-Cement Ratio: 0.45.
         3) Maximum Coarse Aggregate size: 1/2-inch, unless otherwise indicated.
         4) Minimum 28-day Compressive Strength: 4,000 psi.

I. Rapid-Curing Epoxy Grout:
   1. Manufacturers:
      a. Epoxy Grout
         1) Epoxy grout shall be "Sikadur 32 Hi-Mod" by Sika Corporation
         2) Duralcrete LV by Tamms Industries.
         3) Or equal. As specified in Section 01 60 00 – Product Requirements.
         4) Epoxy grout shall be modified as required for each application with aggregate per manufacturer's instructions.
   2. Description:
      a. High-strength, three-component epoxy grout formulated with thermosetting resins and inert fillers.
      b. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids, and alkalis.
   3. Performance and Design Criteria:
      a. As specified in the Contract Documents.

J. REINFORCING MATERIALS
   1. Reinforcing Bars: ASTM A615, Grade 60 deformed bars.
   2. Welded Wire Fabric: ASTM A185.

3. Steel Wire: ASTM A82.
4. Provide supports for reinforcing including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing in place.
    a. Use wire bar-type supports complying with CRSI MSP-1 recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
    b. For slabs on grade, use precast concrete blocks, four inches square minimum with compressive strength equal to or greater than the surrounding concrete, or supports with sand plates or horizontal runners where base materials will not support chair legs.
    c. For all concrete surfaces where legs of supports are in contact with forms, provide supports having either hot-dip galvanized, plastic-protected, or stainless-steel legs in accordance with CRSI MSP-1.
    d. Provide precast concrete supports over waterproof membranes.
5. Adhesive Dowels:
    a. Dowels:
        1) Dowel reinforcing bars shall comply with ASTM A615, Grade 60.
    b. Adhesive:
        1) Adhesive requirements in accordance with ICC-ES AC308.

2.2 CONCRETE MIX

A. General:
1. Normal weight: 145 pounds per cubic foot.
2. Use air-entraining admixture in all concrete. Provide not less than four percent, nor more than eight percent, entrained air for concrete exposed to freezing and thawing, and provide from three to five percent entrained air for other concrete.

B. Proportioning and Design of Class “A” Concrete Mix:
1. Minimum compressive strength at 28 days: 4,500 psi.
2. Maximum water-cement ratio by weight: 0.42.
3. Minimum cement content: 564 pounds per cubic yard.

C. Proportioning and Design of Class “B” Concrete Mix:
1. Minimum compressive strength at 28 days: 3,000 psi.
2. Maximum water-cement ratio by weight: 0.50.
3. Minimum cement content: 517 pounds per cubic yard.

D. Slump Limits:
1. Proportion and design mixes to result in concrete slump at point of placement of not less than one inch and not more than four inches.
2. When using high-range water reducers, slump prior to addition of admixture shall not exceed three inches. Slump after adding admixture shall not exceed eight inches at point of placement.

E. Adjustment of Concrete Mixes:
1. Concrete mix design adjustments may be requested by Contractor when warranted by characteristics of materials, Site conditions, weather, test results, or other, similar circumstances.

2. Submit for Engineer's approval laboratory test data for adjusted concrete mix designs, including compressive strength test results.
3. Implement adjusted mix designs only after Engineer's approval.
4. Adjustments to concrete mix designs shall not result in additional costs to Owner.

2.3 FORM MATERIALS

A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection. Contractor shall be responsible for designing the formwork system to resist all applied loads including pressures from fluid concrete and construction loads.

B. Smooth Form Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces in accordance with ACI 301.

C. Unexposed Concrete Surfaces: Material to suit project conditions.

D. Provide 3/4-inch chamfer at all external corners. Chamfer is not required at re-entrant corners unless otherwise shown or indicated.

E. Form Ties:
1. Provide factory-fabricated, removable, or snap-off metal form ties, that prevent form deflection and prevent spalling of concrete surfaces upon removal. Materials used for tying forms are subject to approval of Engineer.
2. Unless otherwise shown or indicated, provide ties so that portion remaining within concrete after removal of exterior parts is at least 1.5 inches from outer surface of concrete. Unless otherwise shown or indicated, provide form ties that, upon removal, will leave a uniform, circular hole not larger than one-inch diameter in the concrete surface.
3. Ties for exterior walls, below-grade walls, and walls subject to hydrostatic pressure shall be provided with water stops.
4. Wire ties are unacceptable.

2.4 RELATED MATERIALS

A. Water stops:
1. All water stops shall comply with ACI 350-06.
2. Polyvinyl Chloride (PVC) Water stops:
   a. Manufacturers: Provide products of one of the following:
      1) BoMetals, Inc.
      2) DuraJoint Concrete Accessories.
      3) Sika Greenstreak.
      4) Or equal. As specified in Section 01 60 00 – Product Requirements.
   b. Water stops shall comply with CRD-C 572. Water stop material shall have an off-white, milky color. Water stops shall be manufactured from virgin PVC. Do not use reclaimed or scrap material.
   c. Minimum Thickness: 3/8-inch.

d. Provide water stops with minimum of seven ribs equally spaced at each end on each side with the first rib located at the edge. Each rib shall be minimum 1/8-inch in height.
e. Construction Joints: Water stops shall be six-inch wide flat-strip type.
f. Expansion Joints: Water stops shall be nine-inch wide, ribbed with a center bulb. The center bulb shall have a minimum outside diameter of one-inch and a minimum inside diameter of 1/2-inch.
g. The required minimum physical characteristics for this material are:
    1) Tensile strength - 1,750 psi (ASTM D-638).
    2) Ultimate elongation - not less than 280% (ASTM D-638).
h. Contractor shall furnish certification that the proposed water stops meet the above requirements.
i. All water stop intersections, both vertical and horizontal, shall be made from factory fabricated corners and transitions. Only straight butt joint splices shall be made in field.

3. Expanding Rubber Water stops:
    a. Expanding rubber shall be designed to expand under hydrostatic conditions. Water stops shall be Adeka Ultra Seal MC-2010M by Adeka Ultra Seal/OCM, Inc., or Hydrotite CJ-1020-2K by Sika Greenstreak, for concrete thickness greater than nine inches. For thicknesses less than nine inches, Adeka Ultra Seal KBA-1510FF or Hydrotite CJ-1020-2K shall be used.
    b. Water stop shall be a chemically modified natural rubber product with a hydrophilic agent.
    c. Water stop has a stainless-steel mesh or coextrusion of non-hydrophilic rubber to direct expansion in the thickness direction and restrict the expansion in the longitudinal direction.
4. Hydrophilic Water stops:
    a. Products and Manufacturers:
        1) Duroseal Gasket, by BBZ USA, Inc.
        2) Adeka Ultraseal MC-2010M, by Asahi Denka Kogyo K.K.
        3) Hydrotite, by Greenstreak Plastic Products Company.
        4) Or equal. As specified in Section 01 60 00 – Product Requirements.
    b. Hydrophilic water stop materials shall be bentonite-free and shall expand by minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast.
    c. Water stop material shall be composed of resins and polymers that absorb water and cause a completely reversible and repeatable increase in volume.
    d. Water stop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.
    e. Select material in accordance with manufacturer’s recommendations for type of liquid to be contained.
    f. Minimum cross-sectional dimensions: 3/16-inch by 3/4-inch.
    g. Location of hydrophilic water stops shall be as shown or indicated on the Drawings, or where approved by Engineer.
    h. Hydrophilic Sealant: Shall adhere firmly to concrete, metal, and PVC in dry or damp condition and be indefinitely elastic when cured.
        1) Products and Manufacturers:
            i) Duroseal Paste, by BBZ USA, Inc.
            ii) Adeka Ultraseal P-201, by Asahi Denka Kogyo K.K.
            iii) Hydrotite, by Greenstreak Plastic Products Company.

iv) Or equal. As specified in Section 01 60 00 – Product Requirements.

5. Water stop Adhesive:
   a. Adhesive between water stops and existing concrete.
      1) Products and Manufacturers:
         i) 20+F Contact Cement by Miracle Adhesives Corporation
         ii) Neoprene Adhesive 77-198 by JGF Adhesives
         iii) Sikadur 31 Hi-Mod Gel by Sika Corporation
         iv) DP-605 NS Urethane Adhesive by 3M Adhesive Systems.
         v) Or equal. As specified in Section 01 60 00 – Product Requirements.
   b. Hydrophilic, non-bentonite water swelling elastic sealant shall be used to bond expanding rubber water stops to rough surfaces.
      1) Products and Manufacturers:
         i) P-201 by Adeka Ultra Seal/OCM, Inc.
         ii) Leakmaster LV-1 by Sika Greenstreak.
         iii) Or equal. As specified in Section 01 60 00 – Product Requirements.
6. Vapor Retarder:
   a. Products and Manufacturers:
      1) Stego Wrap 10-mil Vapor Retarder, by Stego Industries LLC.
      2) Griffolyn 10-mil, by Reef Industries.
      3) Moistop Ultra, by Fortifiber Industries.
      4) Or equal. As specified in Section 01 60 00 – Product Requirements.
   b. Vapor retarder membrane shall comply with the following.
      1) Water Vapor Transmission Rate, ASTM E96: 0.04 perms or lower.
      2) Water Vapor Retarder, ASTM E1745: Meets or exceeds Class C.
      3) Thickness of Retarder (plastic), ACI 302 1R: Not less than 10 mils.
      4) Provide accessories by same manufacturer as vapor retarder.
7. Membrane-Forming Curing Compound: ASTM C309, Type I.
8. Epoxy Bonding Agent:
   a. Two-component epoxy resin bonding agent.
   b. Products and Manufacturers:
      1) Sikadur 32, Hi-Mod LPL, by Sika Corporation.
      2) Eucopoxy LPL, by the Euclid Chemical Company.
      3) Or equal. As specified in Section 01 60 00 – Product Requirements.
9. Epoxy-Cement Bonding Agent:
   a. Three-component blended epoxy resin-cement bonding agent.
   b. Products and Manufacturers:
      1) Sika Armatec 110 EpoCem, by Sika Corporation.
      2) Duralprep A.C., by Euclid Chemical Company.
      3) Or equal. As specified in Section 01 60 00 – Product Requirements.
10. Preformed Expansion Joint Filler:
    a. Provide preformed expansion joint filler complying with ASTM D1752, Type I (sponge rubber) or Type II (cork).

PART 3 EXECUTION

3.1 INSPECTION

A. Contractor shall examine the substrate and the conditions under which the Work will be performed and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 FORMWORK

A. Construct formwork in accordance with ACI 347 such that concrete members and structures are of correct size, shape, alignment, elevation, and position.

B. Provide openings in formwork to accommodate the Work of other trades. Accurately place and securely support items required to be built into formwork.

C. Clean and adjust forms prior to placing concrete. Apply form release agents or wet forms as required. Re-tighten forms during and after concrete placing, when required, to eliminate cement paste leaks.

D. Removing Formwork:
   1. Comply with ACI 301 and ACI 347, except as otherwise indicated in the Contract Documents.
   2. Do not remove formwork and shoring until supported concrete members have acquired minimum of 90 percent of specified compressive strength. Results of suitable quality control tests of field-cured specimens may be submitted to Engineer for review as evidence that concrete has attained sufficient strength for removal of supporting formwork and shoring prior to removal times indicated in the Contract Documents.
   3. Removal time for formwork is subject to Engineer's acceptance.
   4. Repair form tie-holes following in accordance with ACI 301.

3.3 REINFORCING, JOINTS, AND EMBEDDED ITEMS

A. Comply with the applicable recommendations of Laws and Regulations and standards referenced in this Section, including CRSI MSP-1, for details and methods of placing and supporting reinforcing.

B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials which act to reduce or destroy bond between reinforcing material and concrete.

C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by means of metal chairs, runners, bolsters, spacers, and hangers, as required.
   1. Place reinforcing to obtain minimum concrete coverages as shown on the Drawings and as required in ACI 318. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
   2. Do not secure reinforcing to formwork using wire, nails, or other ferrous metal. Metal supports subject to corrosion shall not be in contact with formed or exposed concrete surfaces.

D. Provide sufficient quantity of supports of strength required to carry reinforcing. Do not place reinforcing more than two inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

E. Splices: Provide standard reinforcing splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown or indicated for minimum lap of spliced bars, as shown on the Drawings or in accordance with the requirements of ACI 318.

F. Install welded wire fabric in lengths as long as practical, lapping adjoining sections a minimum of one full mesh.

G. Do not place concrete until reinforcing is inspected and Engineer indicates that conditions are acceptable for placing concrete. Concrete placed in violation of this paragraph will be rejected. Notify Engineer in writing at least two working days prior to proposed concrete placement.

H. Joints:
   1. Provide construction, isolation, expansion, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs-on-grade to stabilize differential settlement and random cracking.
   2. In mats and structural slabs and beams, locate joints in compliance with ACI 224R.
   3. Locations of joints shall be in accordance with the Contract Documents and as approved by Engineer in the Shop Drawings.
   4. Where construction joints are indicated to be roughened, intentionally roughen surfaces of previously placed concrete to amplitude of 1/4-inch.

I. Installation of Embedded Items:
   1. Sleeves, pipe stubs, inserts, anchors, expansion joint material, water stops, and other embedded items shall be positioned accurately and supported against displacement prior to concreting. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.
   2. Set and build into the Work anchorage devices and embedded items required for other Work that is attached to, or supported by, cast-in-place concrete. Use setting diagrams, templates, and instructions provided under other Sections and, when applicable, other contracts for locating and setting. Refer to Paragraph 1.1.B of this Section. Do not embed in concrete uncoated aluminum items. Where aluminum items are in contact with concrete surfaces, coat aluminum to prevent direct contact with concrete.

J. Adhesive Dowels:
   1. Where shown on the Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's instructions.
   2. Determine location of existing reinforcing steel in vicinity of proposed holes prior to drilling. Adjust location of holes to be drilled to avoid drilling through or damaging existing reinforcing bars only when approved by Engineer.

3. All holes shall be drilled in accordance with the manufacturer's instructions except that core drilled holes shall not be permitted unless specifically allowed by the Engineer. Cored holes, if allowed by the manufacturer and approved by the Engineer, shall be roughened in accordance with manufacturer's requirements.
4. Thoroughly clean drill holes of all debris, drill dust, and water in accordance with manufacturer's instructions with compressed air and a wire brush prior to installation of adhesive and reinforcing bar.
5. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Installation conditions shall be either dry or water saturated. Water filled or submerged shall not be permitted unless specifically approved by the Engineer.
6. Twist dowels during insertion into partially filled hole to guarantee full wetting of bar surface with adhesive. Injection of adhesive into the hole shall be performed in a manner to minimize the formation of air pockets in accordance with the manufacturer's instructions.
7. Embedment Depth:
    a. The embedment depth of the bar shall be as shown on the Drawings. Although all manufacturers listed below are permitted, the embedment depth shown on the Drawings is based on "PE 1000+" by Powers Fasteners. If the Contractor submits one of the other named dowel adhesives from the list below, the Engineer shall evaluate the required embedment and the Contractor shall provide the required embedment depth stipulated by the Engineer specific to the approved dowel adhesive.
    b. Where the embedment depth is not shown on the Drawings, the embedment depth shall be determined to provide the minimum allowable bond strength equal to the tensile strength of the rebar according to the manufacturer's ICC-ES ESR.
    c. The embedment depth shall be determined using the actual concrete compressive strength, a cracked concrete state, maximum long-term temperature of 110 degrees F, maximum short-term temperature of 140 degrees F, continuous special inspection of all horizontal and overhead installations, and periodic special inspection of all other installations. In no case shall the embedment depth be less than the minimum, or more than the maximum, embedment depths stated in the manufacturer's ICC-ES ESR.
8. Engineer's approval is required for use of this system in locations other than those shown on the Drawings.
9. The adhesive system shall be IBC compliant for use in both cracked and uncracked concrete in all Seismic Design Categories and shall be:
    a. Epcon C6+ Adhesive Anchoring System as manufactured by ITW Redhead
    b. HIT-HY 200 Adhesive Anchoring System as manufactured by Hilti, Inc.
    c. SET-XP Epoxy Adhesive Anchors as manufactured by Simpson Strong-Tie Co.
    d. PE-1000+ Epoxy Adhesive Anchor System" by Powers Fasteners.
    e. Fast-set epoxy formulations shall not be acceptable.
    f. Or equal. As specified in Section 01 60 00 – Product Requirements.
10. All individuals installing dowel adhesive system shall be certified as an Adhesive Anchor Installer in accordance with the ACI-CRSI Anchor Installation Certification Program.

3.4 CONCRETE PLACING

A. Site Mixing: Use drum-type batch machine mixer, mixing not less than 1.5 minutes for one cubic yard or smaller capacity. Increase required mixing time by minimum of 15 seconds for each additional cubic yard or fraction thereof.

B. Ready-Mixed Concrete: Comply with ASTM C94.

C. Concrete Placing:
   1. Prior to placement, all reinforcement shall be secured.
   2. Place concrete in a continuous operation within planned joints or sections in accordance with ACI 304R.
   3. Do not begin placing concrete until work of other trades affecting concrete is completed.
   4. Wet concrete and subgrade surfaces to saturated surface dry condition immediately prior to placing concrete.
   5. Deposit concrete as near its final location as practical to avoid segregation due to re-handling or flowing.
   6. Avoid separation of the concrete mixture during transportation and placing. Concrete shall not free-fall for distance greater than four feet during placing.
   7. Complete concrete placing within 90 minutes of addition of water to the dry ingredients.

D. Consolidate placed concrete in accordance with ACI 309R using mechanical vibrating equipment supplemented with hand rodding and tamping, such that concrete is worked around placing and other embedded items and into all parts of formwork. Insert and withdraw vibrators vertically at uniformly spaced locations. Do not use vibrators to transport concrete within the formwork. Vibration of formwork or placing is not allowed.

E. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.
   1. In hot weather comply with ACI 305R.
   2. In cold weather comply with ACI 306R.

3.5 QUALITY OF CONCRETE WORK

A. Make concrete solid, compact, smooth, and free of laitance, cracks, and cold joints.

B. Concrete for liquid-retaining structures and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.

C. Cut out and properly replace to extent directed by Engineer, or repair to satisfaction of Engineer, surfaces that contain cracks or voids, are unduly rough, or are in defective in any way. Patches or plastering are unacceptable.

D. Repair, removal, and replacement of defective concrete directed by Engineer shall be at no additional cost to Owner.

3.6 CONCRETE CURING

A. Use of curing compound:
   1. Curing compound should be applied as per manufacturer’s recommendations.

2. Curing compound shall be used only where specifically approved by the Engineer. Curing compound shall never be used for curing exposed walls with fluid or earth backfill on the opposite side. A continuous wet cure for a minimum of five days is required for these applications. Curing compound shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.
3. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time period, and the subsequent appearance of the concrete surface shall not be affected.
4. The compound shall be applied in accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. Maximum coverage for the curing and sealing compound shall be 300 square feet per gallon for trowel finishes and 200 square feet per gallon for floated or broom surfaces. Maximum coverage for compounds placed where subsequent finishes will be applied shall be 200 square feet per gallon. For rough surfaces, apply in two directions at right angles to each other.

B. Protection and Curing.
1. All freshly placed concrete shall be protected from the elements, flowing water and from defacement of any nature during construction operations.
2. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provision shall be made for maintaining the concrete in a moist condition for at least a 5-day period thereafter except for high early strength concrete, for which the period shall be at least the first three days after placement. Horizontal surfaces shall be kept covered, and intermittent, localized drying will not be permitted.
    a. Walls that will be exposed on one side with either fluid or earth backfill on the opposite side shall be continuously wet cured for a minimum of five days. Use of a curing compound will not be acceptable for applications of this type.
3. The Contractor shall use one of the following methods to ensure that the concrete remains in a moist condition for the minimum period stated above.
    a. Ponding or continuous fogging or sprinkling.
    b. Application of mats or fabric kept continuously wet.
    c. Continuous application of steam (under 150°F).
    d. Application of sheet materials conforming to ASTM C171.
    e. Other means as approved by the Engineer.
4. The Contractor shall keep absorbent wood forms wet until they are removed. After form removal, the concrete shall be cured by one of the methods in paragraph D.
5. Any of the curing procedures used in Article 3.6 may be replaced by one of the other curing procedures listed in Article 3.6 after the concrete is one-day old. However, the concrete surface shall not be permitted to become dry at any time.

C. Curing Concrete Under Cold Weather Conditions
1. Suitable means shall be provided for a minimum of 72 hours after placing concrete to maintain it at or above the minimum as placed temperatures specified in this Section, for concrete work in cold weather. During the 72-hour period, the concrete surface shall not be exposed to air more than 20°F above the minimum as placed temperatures.
2. Stripping time for forms and supports shall be increased as necessary to allow for retardation in concrete strength caused by colder temperatures. This retardation is

magnified when using concrete made with blended cements or containing fly ash or ground granulated blast furnace slag. Therefore, curing times and stripping times shall be further increased as necessary when using these types of concrete.

3. The methods of protecting the concrete shall be approved by the Engineer and shall be such as will prevent local drying. Equipment and materials approved for this purpose shall be on the site in sufficient quantity before the work begins. The Contractor shall assist the Engineer by providing holes in the forms and the concrete in which thermometers can be placed to determine the adequacy of heating and protection. All such thermometers shall be furnished by the Contractor in quantity and type which the Engineer directs.
4. Curing procedures during cold weather conditions shall conform to the requirements of ACI 306.

D. Curing Concrete Under Hot Weather Conditions.
   1. When air temperatures exceed 85°F, the Contractor shall take extra care in placing and finishing techniques to avoid formation of cold joints and plastic shrinkage cracking. If ordered by the Engineer, temporary sunshades and/or windbreakers shall be erected to guard against such developments, including generous use of wet burlap coverings and fog sprays to prevent drying out of the exposed concrete surfaces.
   2. Immediately after screeding, horizontal surfaces shall receive an application of evaporation reducer. Apply in accordance with manufacturer's instructions. Final finish work shall begin as soon as the mix has stiffened sufficiently to support the workmen.
   3. Curing and protection of the concrete shall begin immediately after completion of the finishing operation. Continuous moist curing consisting of method a or b listed in paragraph 3.6.A.3 is mandatory for at least the first 24 hours. Method 2 may be used only if the finished surface is not marred or blemished during contact with the coverings.
   4. At the end of the initial 24-hour period, curing and protection of the concrete shall continue for at least six (6) additional days using one of the following methods:
      a. Ponding or continuous fogging or sprinkling.
      b. Application of mats or fabric kept continuously wet.
      c. Continuous application of steam (under 150°F).
      d. Application of sheet materials conforming to ASTM C171.
      e. Other means as approved by the Engineer.
   5. Curing procedures during hot weather conditions shall conform to the requirements of ACI 305.

E. Use of Curing Compound
   1. Curing compound shall be used only where specifically approved by the Engineer. Curing compound shall never be used for curing exposed walls with fluid or earth backfill on the opposite side. A continuous wet cure for a minimum of five days is required for these applications. Curing compound shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.
   2. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time period, and the subsequent appearance of the concrete surface shall not be affected.

3. The compound shall be applied in accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. Maximum coverage for the curing and sealing compound shall be 300 square feet per gallon for trowel finishes and 200 square feet per gallon for floated or broom surfaces. Maximum coverage for compounds placed where subsequent finishes will be applied shall be 200 square feet per gallon. For rough surfaces, apply in two directions at right angles to each other.

F. Early Termination of Curing
   1. Moisture retention measures may be terminated earlier than the specified times only when at least one of the following conditions is met:
      a. The strength of the concrete reaches 85 percent of the specified 28-day compressive strength in laboratory-cured cylinders representative of the concrete in place, and the temperature of the in-place concrete has been constantly maintained at 50 degrees Fahrenheit or higher.
      b. The strength of concrete reaches the specified 28-day compressive strength as determined by accepted nondestructive methods or laboratory-cured cylinder test results.

3.7 FINISHING

A. Finishes on Formed Concrete Surfaces:
   1. After removal of forms, the finishes described below shall be applied in accordance with this Article. Unless the finish schedule specifies otherwise, all surfaces shall receive at least a Type I finish. The Engineer shall be the sole judge of acceptability of all concrete finish work.
      a. Type I - Rough: All fins, burrs, offsets, marks, and all other projections left by the forms shall be removed. Projections, depressions, etc. below finished grade required to be removed will only be those greater than 1/4-inch. All holes left by removal of ends of ties, and all other holes, depressions, bug holes, air/blow holes or voids shall be filled solid with cement grout after first being thoroughly wetted and then struck off flush. The only holes below grade to be filled will be tie holes and any other holes larger than 1/4-inch in any dimension. Honeycombs shall be chipped back to solid concrete and repaired as directed by the Engineer. All holes shall be filled with tools, such as sponge floats and trowels, that will permit packing the hole solidly with cement grout. Cement grout shall consist of one-part cement to three parts sand, epoxy bonding agent (for tie holes only) and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall match the adjacent wall surface.
      b. Type II - Grout Cleaned: Where this finish is required, it shall be applied after completion of Type I finish. After the concrete has been predampened, a slurry consisting of one-part cement (including an appropriate quantity of white cement in order to produce a color matching the surrounding concrete) and 1-1/2 parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Mix proportions shall be submitted to the Engineer after a sample of the work is established and accepted. Any surplus shall be removed by scraping and then rubbing with clean burlap.

c. Type III - Smooth Rubbed: Where this finish is required, it shall be applied after the completion of the Type II finish. No rubbing shall be done before the concrete is thoroughly hardened and the mortar used for patching is firmly set. A smooth, uniform surface shall be obtained by wetting the surface and rubbing it with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities requires it, the general surface of the concrete shall not be cut into. Corners and edges shall be slightly rounded by the use of the carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted. A 100 square foot example shall be established at the beginning of the project to establish acceptability. Apply chemical floor hardener to exposed interior concrete floor areas when cured and dry, in accordance with hardener manufacturer's instructions.

B. Slab and Floor Finishes:
   1. The finishes described below shall be applied to floors, slabs, flow channels and top of walls in accordance with this Article. The Engineer shall be the sole judge of acceptability of all such finish work.
      a. Type "A" – Screeded: This finish shall be obtained by placing screeds at frequent intervals and striking off to the surface elevation required. When a Type "F" finish is subsequently to be applied, the surface of the screeded concrete shall be roughened with a concrete rake to 1/2" minimum deep grooves prior to final set.
      b. Type "B" – Wood or Magnesium Floated: This finish shall be obtained after completion of a Type "A" finish by working a previously screeded surface with a wood or magnesium float or until the desired texture is reached. Floating shall begin when the water sheen has disappeared and when the concrete has sufficiently hardened so that a person's foot leaves only a slight imprint. If wet spots occur, water shall be removed with a squeegee. Care shall be taken to prevent the formation of laitance and excess water on the finished surface. All edges shall be edged with a 1/8-inch tool as directed by the Engineer. The finished surface shall be true, even, and free from blemishes and any other irregularities.
      c. Type "C" – Cork Floated: This finish shall be similar to Type "B" but slightly smoother than that obtained with a wood float. It shall be obtained by power or band floating with cork floats.
      d. Type "D" – Steel Troweled: This finish shall be obtained after completion of a Type "B" finish. When the concrete has hardened sufficiently to prevent excess fine material from working to the surface, the surface shall be compacted and smoothed with not less than two thorough and complete steel troweling operations. In areas which are to receive a floor covering such as tile, resilient flooring, or carpeting, the applicable Specification Sections and Contract Drawings shall be reviewed for the required finishes and degree of flatness. In areas that are intermittently wet such as pump rooms, only one troweling operation is required to provide some trowel marks for slip resistance. All edges shall be edged with a 1/8-inch tool as directed by the Engineer. The finish shall be brought to a smooth, dense surface, free from defects and blemishes.
      e. Type "E" – Broom or Belt: This finish shall provide the surface with a transverse scored texture by drawing a broom or burlap belt across the surface immediately after completion of a Type "B" finish. All edges shall be

edged with a ⅛-inch tool as directed by the Engineer. Type "F" - Swept in Grout Topping: This finish shall be applied after a completion of a Type "A" finish. The concrete surface shall be properly cleaned, washed, and coated with a mixture of water and Portland Cement. Cement grout in accordance with this Section shall then be plowed and swept into neat conformance with the blades or arms of the apparatus by turning or rotating the previously positioned mechanical equipment. Special attention shall be paid to true grades, shapes and tolerances as specified by the manufacturer of the equipment. Before beginning this finish, the Contractor shall notify the Engineer and the equipment manufacturer of the details of the operation and obtain approval and recommendations.

f. Type "F" – Swept in Grout Topping: This finish shall be applied after a completion of a Type "A" finish. The concrete surface shall be properly cleaned, washed, and coated with a mixture of water and Portland Cement. Cement grout in accordance with this Section shall then be plowed and swept into neat conformance with the blades or arms of the apparatus by turning or rotating the previously positioned mechanical equipment. Special attention shall be paid to true grades, shapes and tolerances as specified by the manufacturer of the equipment. Before beginning this finish, the Contractor shall notify the Engineer and the equipment manufacturer of the details of the operation and obtain approval and recommendations.

g. Type “G” – Hardened Finish: This finish shall be applied after completion of a Type “B” or Type “C” finish and prior to application of a Type “D” finish. Hardeners shall be applied in strict accordance with the manufacturer’s requirements. Hardeners shall be applied using a mechanical spreader. The hardener shall be applied in two shakes with the first shake comprising 2/3 of the total amount. Type “D” finish shall be applied following completion of application of the hardener.
   1) Non-metallic floor hardener shall be applied where specifically required on the Contract Drawings at the rate of 1.0 pounds/ft^2.
   2) Non-oxidizing heavy duty metallic floor hardener shall be applied at the loading docks and where specifically required on the Contract Drawings or specified herein at the rate of 1.5 pounds/ft^2.

h. Type "H" – Non-Slip Finish: This finish shall be provided by applying a non-slip flooring additive concurrently with the application of a Type "D" finish and/or installation of floor sealants. Application procedure shall be in accordance with manufacturer's instructions. Finish shall be applied where specifically required on the Contract Drawings or specified herein

i. Type "J" – Raked Finish: This finish shall be provided by raking the surface as soon as the condition of the concrete permits by making depressions of ± ¼ inch.

C. Concrete Sealers:
   1. Concrete sealers shall be applied where specifically required on the Contract Drawings or specified herein.
   2. Sealers shall be applied after installation of all equipment, piping, etc. and after completion of any other related construction activities. Application of sealers shall be in strict accordance with manufacturer’s requirements.
   3. Sealers shall be applied to all floor slabs not painted and not intended to be immersed.

4. Floor slabs subjected to vehicular traffic shall be sealed with the concrete liquid densifier and sealer.
5. All other floor slabs to receive sealer shall be sealed with concrete floor sealer.

D. Finishes on Equipment Pads:
1. Formed surfaces of equipment pads shall receive a Type III finish.
2. Top surfaces of equipment pads, except those surfaces subsequently required to receive grout and support equipment bases, shall receive a Type "D" finish, unless otherwise noted. Surfaces which will later receive grout shall, before the concrete takes its final set, be made rough by removing the sand and cement that accumulates on the top to the extent that the aggregate will be exposed with irregular indentations in the surface up to 1/2 inch deep.

3.8 GROUT PLACING

A. General:
1. The different types of grout shall be used for the applications stated below unless noted otherwise in the Contract Documents. Where grout is called for in the Contract Documents which does not fall under any of the applications stated below, non-shrink grout shall be used unless another type is specifically referenced.
   a. Cement grout shall be used for grout toppings and for patching of fresh concrete.
   b. Non-shrink grout shall be used for grouting beneath base plates of structural metal framing. Dry packing is not allowed, unless otherwise indicated.
   c. Epoxy grout shall be used for bonding new concrete to hardened concrete.
   d. Epoxy base plate grout shall be used for precision seating of base plates including base plates for all equipment such as engines, mixers, pumps, vibratory and heavy impact machinery, etc.
2. New concrete surfaces to receive cement grout shall be as specified in this Section and shall be cleaned of all dirt, grease, and oil-like films. Existing concrete surfaces shall likewise be cleaned of all similar contamination and debris, including chipping, or roughening the surface if a laitance or poor concrete is evident. The finish of the grout surface shall match that of the adjacent concrete.
3. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
4. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

B. Consistency:
1. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

C. Measurement of Ingredients:
1. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.

2. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

D. Grout Installation:
   1. General:
      a. The different types of grout shall be used for the applications stated below unless noted otherwise in the Contract Documents. Where grout is called for in the Contract Documents which does not fall under any of the applications stated below, non-shrink grout shall be used unless another type is specifically referenced.
         1) Cement grout shall be used for grout toppings and for patching of fresh concrete.
         2) Non-shrink grout shall be used for grouting beneath base plates of structural metal framing.
         3) Epoxy grout shall be used for bonding new concrete to hardened concrete.
         4) Epoxy base plate grout shall be used for precision seating of base plates including base plates for all equipment such as engines, mixers, pumps, vibratory and heavy impact machinery, etc.
      b. New concrete surfaces to receive cement grout shall be as specified in this Section and shall be cleaned of all dirt, grease, and oil-like films. Existing concrete surfaces shall likewise be cleaned of all similar contamination and debris, including chipping, or roughening the surface if a laitance or poor concrete is evident. The finish of the grout surface shall match that of the adjacent concrete. Curing and protection of cement grout shall be as specified in this Section.
      c. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
      d. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.
   2. Formwork:
      a. Construct leakproof forms anchored and shored to withstand grout pressures.
      b. Install formwork with clearances to permit proper placement of grout.
      c. As specified in this Section.
   3. Mixing:
      a. All mixing, surface preparation, handling, placing, and consolidation shall be completed according to the manufacturer’s recommendations.
   4. Placing of Grout:
      a. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets.
      b. The grout may be poured in place, pressure grouted by gravity, or pumped.
      c. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer.
      d. For grouting beneath base plates, grout shall be poured from one side only and thence flow across to the open side to avoid air-entrapment.
   5. Curing:
      a. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or by using wet burlap method.

b. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
c. After grout has attained its initial set, keep damp for minimum three days.

3.9 FIELD QUALITY CONTROL

A. Site Testing Services:
1. Owner shall employ independent testing laboratory to perform field quality control testing for concrete. Engineer will direct where samples are obtained.
2. Testing laboratory will provide all labor, material, and equipment required for sampling and testing concrete, including scale, glass tray, cones, rods, molds, air tester, thermometer, and other incidentals required.

B. Inspection and Testing of Grout:
1. Comply with ACI 318 and as specified in Section 01 40 00 – Quality Requirements.
2. Tests of grout components may be performed to ensure compliance with specified requirements.

C. Quality Control Testing During Construction:
1. Field Testing of Concrete
   a. The Contractor shall coordinate with the Engineer's project representative the on-site scheduling of the materials testing consultant personnel as required for concrete testing.
   b. Concrete for testing shall be supplied by the Contractor at no additional cost to the Owner, and the Contractor shall provide assistance to the materials testing consultant in obtaining samples. The Contractor shall dispose of and clean up all excess material.
2. Consistency
   a. The consistency of the concrete will be checked by the materials testing consultant by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer and/or the materials testing consultant may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material, or labor costs due to such eventualities.
   b. Slump tests shall be made in accordance with ASTM C143. Slump tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.
   c. Concrete with a specified nominal slump shall be placed having a slump within 1” (higher or lower) of the specified slump. Concrete with a specified maximum slump shall be placed having a slump less than the specified slump.
3. Unit Weight
   a. Samples of freshly mixed concrete shall be tested for unit weight by the materials testing consultant in accordance with ASTM C138.
   b. Unit weight tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.
4. Air Content
   a. Samples of freshly mixed concrete will be tested for entrained air content by the materials testing consultant in accordance with ASTM C231.

b. Air content tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.
c. In the event test results are outside the limits specified, additional testing shall occur. Admixture quantity adjustments shall be made immediately upon discovery of incorrect air entrainment.

5. Compressive Strength
   a. Samples of freshly mixed concrete will be taken by the materials testing consultant and tested for compressive strength in accordance with ASTM C172, C31, and C39, except as modified herein.
   b. In general, one sampling shall be taken for each placement in excess of five (5) cubic yards, with a minimum of one (1) sampling for each day of concrete placement operations, or for each one hundred (100) cubic yards of concrete, or for each 5,000 square feet of surface area for slabs or walls, whichever is greater.
   c. Each sampling shall consist of at least five (5) 6x12 cylinders or (8) 4x8 cylinders. Each cylinder shall be identified by a tag, which shall be hooked or wired to the side of the container. The materials testing consultant will fill out the required information on the tag, and the Contractor shall satisfy himself that such information shown is correct.
   d. The Contractor shall be required to furnish labor to the Owner for assisting in preparing test cylinders for testing. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the specimens made in any four consecutive working days and to protect the specimens from falling over, being jarred, or otherwise disturbed during the period of initial curing. The box shall be erected, furnished, and maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C31. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds and such that all specimens are shielded from direct sunlight and/or radiant heating sources. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Specimens shall remain undisturbed in the curing box until ready for delivery to the testing laboratory but not less than sixteen hours.
   e. The Contractor shall be responsible for maintaining the temperatures of the curing box during the initial curing of test specimens with the temperature preserved between 60°F and 80°F as measured by a maximum-minimum thermometer. The Contractor shall maintain a written record of curing box temperatures for each day curing box contains test specimens. Temperature shall be recorded a minimum of three times a day with one recording at the start of the workday and one recording at the end of the work day.
   f. When transported, the cylinders shall not be thrown, dropped, allowed to roll, or be damaged in any way.
   g. Compression tests shall be performed in accordance with ASTM C39. For 6x12 cylinders, two test cylinders will be tested at seven days and two at 28 days. For 4x8 cylinders, three test cylinders will be tested at seven days, three at 28 days. The remaining cylinders will be held to verify test results, if needed.

6. When ordered by the Engineer, additional tests shall be provided and paid for by the Contractor.

END OF SECTION

SECTION 31 23 34.01

EXCAVATING, TRENCHING, DEWATERING AND BACKFILLING FOR UTILITY WORK

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, equipment, supplies and materials, and perform all operations in connection with the following:
   1. Clearing, grubbing, and preparation of the site; removal and disposal of all debris.
   2. Pipeline and utility structure excavations including trenching, subgrade preparation, embedment, backfilling, pumping, and dewatering
   3. Tunneled (trenchless construction) crossings.
   4. Sheeting, shoring, and protection of work.
   5. Borrow, transportation, handling, storage, and disposal of suitable and unsuitable materials for pipelines, utility structures, site fills, curb and gutters, sidewalks, driveways, and pavements
   6. Subgrade preparation, grading, wetting, rolling, surfacing and other operations pertaining to the site work
   7. Protection of adjacent property.

B. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.

C. Related Requirements:
   1. Section 03 05 00 - Concrete
   2. Section 32 92 01 - Seeding and Sodding
   3. Section 33 14 13 - Water Distribution Piping, Valves, Hydrants, and Appurtenances
   4. Section 31 31 11 - Sanitary Sewer Gravity Mains
   5. Section 33 31 23 - Sanitary Sewer Force Mains, Valves, and Appurtenances
   6. Section 33 32 11 - Wastewater Pumping Stations

1.2 REFERENCES

A. Definitions:
   1. "Subgrade" is the uppermost surface of native soil material unmoved from cuts, the bottom of excavation.

B. Reference Standards:
   1. OSHA - Safety and Health Regulations for Construction, Chapter XVII of Title 29, CFR, Part 126
   2. NCDOT Positive Shoring Plan - issued with Right-of-Way Encroachment Agreement
   3. AASHTO T99/T180 - Standard Method of Test for Moisture-Density Relations of Soils.
   4. ASTM C136 - Sieve analysis of fine and coarse aggregates.
   5. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

6. ASTM D698 - Tests for moisture-density relations of soils and soil-aggregate mixture using 5.5 lb (2.49 kg) rammer and 12 inch (305 mm) drop.
7. ASTM D2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
8. ASTM D2487 - Classification of Soils for Engineering Purposes.
9. ASTM D4253 - Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
10. ASTM D4254 - Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
11. ASTM D4318 - Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
12. ASTM D4832 - Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
13. ASTM D6023 - Test Method for Density (Unit Weight), Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low-Strength Material (CLSM).
14. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Contractor Excavation Protection Plans or NCDOT Positive Shoring Plans:
   1. Provide sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.
   2. At least 30 days before starting construction on sheeting and shoring, and in accordance with the OSHA and NCDOT requirements, the Contractor shall ensure the sheeting and shoring design engineer complete and submit the Protective System Design Certificate(s) for the sheeting and shoring systems that the Contractor will install.
   3. If required by the OSHA regulations to protect existing facilities, the Contractor shall submit separate certificates for each unique design. The certificate(s) shall be signed and sealed by the registered professional engineer that designed the protection system.

B. Geotextile Fabrics: Samples, manufacturer’s product data, installation instructions

C. Embedment and Backfills Materials:
   1. Name and location of proposed material suppliers.
   2. Standard test results for materials proposed by independent materials testing firm.

D. Trench Shields: Fabricator/manufacturer certifications

1.4 QUALITY ASSURANCE

A. Contractor to provide experienced on-site Safety Officer and Superintendent to comply with OSHA regulations for site excavations and engineered shoring plans.

B. Safety Officer and Superintendent shall hold OSHA 30-Hour Construction Certifications and classified as the competent person.

1.5 EXISTING SITE CONDITIONS

A. Every reasonable effort has been made to provide accurate information on existing site conditions. The Contractor should become familiar with the site and satisfy himself as to the scope of the work involved and the materials to be encountered. Any significant change in conditions should be immediately brought to the attention of the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A. Geotextile Fabric. The fabric shall be provided in rolls wrapped with covering for protection from mud, dirt, dust, and debris.

1. Geotextile Fabric Type A. Geotextile fabric Type A shall be provided for installation at locations indicated on the Drawings and as specified herein. Geotextile Fabric Type A shall be a nonwoven fabric consisting of only continuous chains of polymeric filaments or yarns of polyester formed into a stable network by needle punching. The fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents; and shall have the indicated properties:

Property	Test Method	Unit	Minimum Average Roll Value *
Fabric Weight	ASTM D3776	oz/yd2	5.7
Grab Strength	ASTM D4632	lb	155
Grab Elongation	ASTM D4632	percent	50
Mullen Burst Strength	ASTM D3786	psi	190
Apparent Opening Size	CW-02215	U.S. Std. Sieve Size	70

* Minimum average roll value in weakest principal direction.

B. Polyethylene Film: Polyethylene film beneath concrete slabs or slab base course material shall be Product Standard PS17, 6 mil minimum thickness.

C. Granular Materials and Soils: Five classes defined according to properties and characteristics as follows.

a. **Class I** - Angular, 25 mm (1-in.) to No.4 (3/16 in.) in size, #57 or #67 graded stone or equivalent regional material from crushed rock, slag, and/or coral.
b. **Class II** - Coarse sands and gravels with maximum size of 25 mm (1-in.), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.
c. **Class III** - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM, and SC are included in this class.

d. **Class IV** - Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH, and CL are included in this class. These materials are not acceptable for bedding, haunching, or initial backfill.
e. **Class V** - This class includes the organic soil, OL, OH, PT as well as soils containing frozen earth, debris, rocks, larger than 37.5 mm (1-1/2 in.) in diameter, and other foreign materials. These materials are not acceptable for bedding, haunching, initial backfill, or final backfill.

D. General Fill:
1. Use soils free of organic matter, refuse, rocks and lumps greater than 4 inches in diameter and other deleterious matter.
2. Fill shall have a liquid limit not greater than 45, and plasticity index not greater than 25.
3. Previously excavated materials complying with the Contract Documents requirements for general fill may be used for general fill.
4. When on-site materials are found unsuitable for use as general fill, provide approved off-site general fill materials. Prior to using off-site material as general fill, furnish submittal for and obtain Engineer's approval of the material proposed for use.
5. General fill material not otherwise specified shall be Class II or III.

E. Granular Fill: Granular fill under floor slabs shall be Class I material.

F. Structural Fill: Fill material placed inside the line of the building foundation or slab shall be Class I or II.

G. Fill Under Pavement: Fill material used beneath pavement and for road shoulders shall be Class II or III.

H. Topsoil: Natural, friable soil free of subsoil, stumps, rocks larger than 2 inches in diameter, weeds, and other material detrimental to plant growth.

I. Concrete: Concrete placed for cradles, thrust blocks, or encasement shall be Class B concrete as specified in Section 03 05 00 - Concrete.

J. Subbase Material:
1. Material shall be naturally- or artificially graded mixture of natural or crushed gravel, crushed stone, or natural or crushed sand. Crushed slag is unacceptable.

K. Drainage Fill:
1. Material shall be washed, uniformly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing 1-1/2-inch sieve and not more than 10 percent passing a No. 4 sieve (#57 or #67 stone).

L. Controlled Low Strength Material (CLSM):
1. CLSM shall be self-leveling and self-compacting cementitious material.
a. Cement: Type I or Type II Portland cement complying with ASTM C150/C150M.
b. Fly Ash Mineral Admixture: Comply with ASTM C618, Class F.

c. Water: Clean, potable.
d. Admixtures: Provide admixtures in accordance with product manufacturer's published instructions. Admixtures shall be compatible with each other. Do not use calcium chloride or admixtures containing chloride ions. Use only admixtures that have been tested and approved in the mix designs.
e. Fine Aggregates: ASTM C33/C33M.

2. CLSM Mix:
   a. Cement Content: 50 pounds per cubic yard.
   b. Fly Ash Mineral Admixture: 250 pounds per cubic yard.
   c. Fine Aggregate Content: 2910 pounds per cubic yard.
   d. Water Content: 500 pounds per cubic yard.
   e. Admixtures shall comply with manufacturer's recommendations for use with CLSM.
   f. Unconfined compressive strength shall be not more than 100 psi.
   g. Adjustment of Mixes.
      1) Mix design adjustments may be requested by Contractor when warranted by characteristics of materials, Site conditions, weather, test results, or other, similar circumstances.
      2) Submit for Engineer's approval laboratory test data for adjusted mix designs, including compressive strength test results.
      3) Implement adjusted mix designs only after Engineer's approval.
      4) Adjustments to mix designs shall not result in additional costs to Owner.

2.2 SOURCE QUALITY CONTROL

A. Perform quality assurance testing, and submit results to Engineer, in accordance with the 'Submittals" Article in Part 1 of this Section.

PART 3 EXECUTION

3.1 INSPECTION

A. Familiarization: Prior to commencement of the Work, become thoroughly familiar with the site, the site conditions, and all portions of the work specified in this Section.

B. Provide Engineer with sufficient notice and with means to examine areas and conditions under which excavating, filling, and grading will be performed. Do not proceed with the Work until unsatisfactory conditions are corrected.

C. Approvals: Backfilling and grading operations near foundations, walls, pipes and other portions of the work to be covered shall not commence until the Engineer has completed all required inspections, tests and approvals. Work covered prior to inspection shall be uncovered for inspection purposes and backfilled.

3.2 SUBSURFACE UTILITY LOCATION AND EXPLORATION

A. Existing Utilities Location:

1. Prior to excavation, Contractor shall contact local underground alert hotlines, “North Carolina 811” and/or individual utility owners for marking underground utilities. A survey shall be made of the utility size, material, location, and elevation prior to trench excavation and information shall be recorded on the record Drawings maintained by the Contractor.
2. Once utilities are marked and recorded, Contractor shall excavate to expose the existing utilities in advance of the construction.
3. Perform all work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, filling, and replacing pavement for utility location pits.
4. Contractor shall be responsible for the definite location of each existing underground utility involved within the area of excavation for the Work and exercise care during such location work to avoid damaging and disrupting the affected underground facilities or structures. Contractor shall be responsible for repairing, at his expense, damage to underground facility or structures caused during exploratory Work.

3.3 PREPARATION

A. Surface Preparation
   1. Clearing: Areas designated for clearing and required for construction operations shall be cleared of trees, brush, structures and other materials within the defined rights-of-way, easements, and limits of disturbance indicated. Trees which are to remain shall be protected during clearing operations and subsequent work.
   2. Grubbing: Roots, stumps and other materials shall be grubbed from the cleared areas to a depth of at least 18 inches. Tree stumps shall be grubbed in their entirety, including tap roots where applicable.
   3. Topsoil: Strip existing topsoil to a depth of 4 inches from areas to be excavated or graded. Stockpile the topsoil in a suitable area for use during final grading operations. Protect the topsoil from excessive erosion.
   4. Unsuitable Material: Remove sod, muck, or other unsuitable material to firm subsoil in areas designated for filling or grading operations.
   5. Disposal: Trees, stumps, roots, rubbish, unsuitable soil, or other material resulting from surface preparation shall be remove from the site by the Contractor and disposed of.

B. Prohibited Work:
   1. Burning or blasting and use of explosives is not allowed.

C. Dust Control:
   1. Control objectionable dust caused by Contractor’s operation of vehicles and equipment, clearing and other actions. To minimize airborne dust, apply water or use methods subject to approval of authorities having jurisdiction.

3.4 EXCESS WATER CONTROL

A. General Dewatering:
   1. Grade and maintain all areas of the site to preclude surface runoff into excavations and prevent ponding of water.
   2. Remove all soil softened or eroded by the presence of water and replace with suitable backfill material.

3. Provide and maintain drainage and dewatering equipment to remove and dispose of all surface water and ground water entering excavations, or other parts of the Work areas. Keep excavations dry during execution of Work, subgrade preparation, and continually thereafter until the pipeline or structure to be built therein is acceptable to Engineer and backfilling operations are completed and acceptable to Engineer.
4. Provide temporary drainage ditches and temporary dikes and provide required temporary pumping and other work necessary for diverting or removing rainfall and all other accumulations of surface water from excavations and fill areas. Perform diversion and removal of surface water in manner that prevents accumulation of water behind permanent or temporary structures and at any other locations in the construction area where such accumulations may be detrimental.
5. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the surface water or groundwater downstream of the point of discharge, shall not be directly discharged. Divert such waters through temporary settling basin or filter before discharging to surface water, groundwater, or drainage routes.
6. Contractor shall be responsible for condition of piping, conduits, and channels used for drainage and such piping, conduits, and channels shall be clean and free of sediment.

B. Temporary Dewatering Systems:
1. Contractor shall design, provide, and operate dewatering system to include sufficient trenches, sumps, pumps, hose, piping, well points, deep wells, and similar facilities, necessary to depress and maintain groundwater level below the base of each excavation during all stages of construction operations.
2. Design and operate dewatering system to avoid settlement and damage to existing structures and underground facilities.
3. Groundwater table shall be lowered in advance of excavation for a sufficient period of time to allow dewatering of fine grain soils.
4. Maintain groundwater level at excavations 2-feet below lowest subgrade excavation until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural groundwater.
5. Operate dewatering system continuously, 24-hours per day, 7-days per week. Provide standby pumping facilities and personnel to maintain the continued effectiveness of the system. Do not discontinue dewatering operations without first obtaining Engineer's acceptance for such discontinuation.
6. Locate elements of temporary dewatering system to allow continuous dewatering operation without interfering with the Work to the extent practicable.
7. Where portions of dewatering system are located in the area of permanent construction, submit to and obtain Engineer's acceptance of details of proposed methods of constructing the Work at such location. Control of ground water shall continue until the permanent construction provides sufficient dead load to withstand hydrostatic uplift of the normal groundwater, until concrete has attained sufficient strength to withstand earth and hydrostatic loads, and until waterproofing Work is completed.
8. Perform pumping of water from excavations in a manner that prevents carrying away of unsolidified concrete materials, and that avoids damaging the subgrade.

C. Disposal of Water Removed by Dewatering System:

1. Contractor's dewatering system shall discharge to in accordance with the NC Sedimentation Pollution Control Act, NCDEQ Erosion Control Permit, and NC Stormwater Permit for Construction Activities.
2. Convey water from excavations in closed conduits. Do not use trench excavations as temporary drainage ditches.
3. Dispose of water removed from excavations in a manner that does not endanger health and safety, property, the Work, and other portions of the Project.
4. Dispose of water in manner that causes no inconvenience to Owner, others involved in the Project, and adjacent and downstream properties.

3.5 SHEETING, SHORING AND BRACING

A. General:
   1. Design and provide sheeting, shoring, bracing, cofferdams, and similar excavation supports as shown, specified, and required for the Work. Where sheeting, shoring, bracing, or trench boxes are used, they must be designed and sealed by a professional engineer licensed to practice in the State of North Carolina.
   2. Clearances and types of temporary sheeting, shoring, bracing, and similar excavation supports, insofar as they may affect the finished character of the Work and the design of sheeting to be left in place, will be subject to the Engineer's approval; but Contractor is responsible for adequacy of all sheeting, shoring, bracing, cofferdams, and similar excavation supports.
   3. Materials:
      a. Previously used materials shall be in good condition and shall not be damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary sheeting, shoring, and bracing.
      b. All steel work for sheeting, shoring, bracing, cofferdams, and other excavation supports, shall be in accordance with ANSI/AISC 360, except that field welding will be allowed.
      c. When required, provide permanent steel sheet piling or treated timber sheet piling where subsequent removal of sheet piling might allow lateral movement of soil under adjacent structures
   4. As excavation progresses, carry down shoring, bracing, cofferdams, and similar excavation supports to required elevation at bottom of excavation.
   5. Maintain sheeting, shoring, bracing, bracing, and other excavation supports in excavations regardless of time-period excavations will be open.
   6. Unless otherwise shown, specified, or directed, remove materials used for temporary construction when the Work is completed. Perform such removal in manner not injurious to the structures and underground facilities, their appearance, and adjacent construction.

B. Removal of Shoring, Sheeting and Bracing:
   1. Remove sheeting and bracing from excavations, unless otherwise directed by Engineer in writing. Perform removal to avoid damaging the Work and adjacent construction. Removal shall be equal on both sides of excavation to ensure no unequal loads on structures and underground facilities.
   2. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete, until the following conditions are satisfied:
      a. Concrete has cured for not less than 7 days.

b. Wall and floor framing, up to and including grade level floors, is in place.

3. When shoring is installed that does not extend below the invert of the underground structure, the shoring shall be removed. Backfill and compaction shall be executed in conformance with the specifications.

C. Shoring Left in Place:
   1. Only shoring authorized by the Engineer and approved by the Engineer shall be left in place.
   2. When shoring is installed to extend below the underground structure, the shoring shall remain with the top edge 4-feet below the finished grade.

D. Sheeting Left in Place:
   1. Materials: Steel sheeting shown or indicated to be left in place shall consist of rolled sections of continuous interlocking type. Steel sheeting material designated to be left in place shall be new. Type and design of the sheeting and bracing shall comply with the above requirements for steel work for all sheeting and bracing.
   2. Installation:
      a. Steel sheeting to be left in place shall be driven straight to lines and grades as shown, indicated, or directed. Piles shall penetrate into firm materials with secure interlocking throughout pile's entire length. Damaged piling having faulty alignment shall be pulled and replaced by new piling.
      b. Type of guide structure used and method of driving steel sheeting to be left in place shall be determined by Contractor's professional engineer.
   3. Cut off at elevations shown, indicated, or directed by Engineer sheeting left in place and remove cut off pilings from the Site.
   4. Clean wales, braces, and all other items to be embedded in the permanent structure and ensure that concrete surrounding the embedded element is sound and free of air pockets and harmful inclusions. Provisions shall include the cutting of holes in the webs and flanges of wale and bracing members, and welding of steel diaphragm water stops perpendicular to the centerline of brace ends that are to be embedded.

3.6 TRENCH EXCAVATION

A. Cutting Existing Surface Pavements.
   1. Cuts in concrete pavement and concrete base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances.
   2. Cutting shall be started with a concrete saw in a manner which will provide a clean groove at least 1-½ inches deep along each side of the trench and along the perimeter of cuts for structures.
   3. Concrete pavement and concrete base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 12-inches in width at any point is left between the cut edge of the pavement and the top edge of the trench.
   4. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the center line of the trench.
   5. Pavement removal for connections to existing lines or structures shall not exceed the extent necessary for the installation.

6. Where the trench parallels the length of concrete walks, and the trench location is all or partially under the walk, the entire walk shall be removed and replaced.
7. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and subsequently replaced between existing joints or between saw cuts as specified for pavement.

B. Trench Width: Trenches shall be excavated to a width which will provide adequate working space and sidewall clearance for proper installation, jointing, and embedment haunching. Trench banks from the top of the pipe to trench bottom shall be as vertical as practicable.

C. Over-Excavation: Over-depth excavation carried below required grade, unless authorized by the Engineer, shall be backfilled with Class I material, and compacted as embedment at no additional cost to Owner.

D. Alignment and Depth: Trench to the lines and grades shown on the drawings. Where elevations are not shown, trench to a depth sufficient to provide at least 36-inches of cover above the top of pipe, unless otherwise specified. Grade trenches to provide a constant slope free of sags and high spots.

E. Dewatering: Keep trenches free of water.

F. Trench Bracing: Properly brace, sheet and support trench walls as soil conditions indicate and in conformance OSHA regulations. Provide adequate bracing and shoring to protect adjacent improvements according to contractor submitted excavation plan or NCDOT positive shoring plan. Contractor shall provide certification for all premanufactured trench bracing devices prior to any excavation activities.

G. Bedding, Haunching and Backfill: Tamp to provide firm, even bedding. Excavate bedding material to match the shape of the bottom of the pipe and bell, as detailed in the drawings. Shovel slice haunching material to provide full bearing around the bottom of the pipe.

H. Method of Compaction Density Testing: ASTM D698 Standard Proctor

I. Pipe Trench Construction: (Depth measured from top of pipe to final grade)
1. Bedding requirements for sewer force mains and water mains listed in Section 3.6.I below shall be followed, if it has been determined that unsuitable soils exist within the excavated trench. Otherwise bedding for sewer force mains and water mains may be Class I or Class II. All other backfill for sewer force mains and water mains shall be as shown below.
2. <u>Type A – Sewer mains 12-feet and deeper</u>
   a. Bedding, Haunching, and Initial Backfill – Class I bedding material, 4-inch minimum depth or 1/8 pipe diameter from stable subgrade to pipe invert; Class I haunching and initial backfill from invert to 6-inces above top of pipe; compact all zones to 95% standard density.
   b. Final Backfill – Class II material from top of initial backfill to ground surface; compact to 95% standard density.
3. Type B – <u>Sewer mains between 6-feet and 12-feet deep (occasional water and sewer force mains)</u>

a. Bedding and Haunching – Class I bedding material, 4-inch minimum depth or 1/8 pipe diameter from stable subgrade to pipe invert; Class I haunching to spring-line of pipe; compact both zones to 95% standard density.
b. Initial Backfill – Class II material from spring-line of pipe to 6-inches above top of pipe; compact to 95% standard density.
c. Final Backfill – Class II or III material from top of initial backfill to ground surface; compact to 95% standard density.

4. Type C – Sewer, water, and sewer force mains 3-feet to 6-feet deep
   a. Bedding and Haunching – Class I material 4-inch minimum depth or 1/8 pipe diameter from stable subgrade to 1/6 pipe outside diameter above invert; compact to 95% standard density.
   b. Initial Backfill – Class II or III material from top of pipe to a minimum of 6-inches above top of pipe; compact to 95 standard density.
   c. Final Backfill – Class II or III material from top of initial backfill to ground surface; compact to 95% standard density.
5. Type S – Water and sewer service lines 3-feet to 6-feet deep
   a. Bedding, Haunching, and Initial Backfill – Class I or II material 3-inch minimum depth from stable subgrade to 3-inch minimum above top of pipe; compact to 95% standard density.
   b. Final Backfill – Class II or III material from top of initial backfill to ground surface; compact to 95 percent standard density.

J. Trench Compaction Lifts:
   1. Embedment and initial backfill zones – 6-inch lifts
   2. Final backfill zone – 8-inch lifts

K. Subgrade Stabilization: Wet, yielding, and mucky trench bottoms shall be stabilized by removal of the material and replacement with sufficient Class I embedment material to correct the instability.

L. Backfilling Under NCDOT or City Pavements
   1. As indicated on standard detail drawings
      a. Top 12-inches of final backfill for road or street subbase shall be compacted to 98% standard density.
      b. CLSM trench embedment and backfill.

M. Trench Shields:
   1. When using a shield for installing pipe, bottom of the shield shall not extend below pipe spring-line and haunching embedment.
   2. When using a shield for installing structures, bottom of the shield shall not extend below the top of the bedding for the structures.
   3. When removing the shield or moving the shield ahead, exercise extreme care to prevent moving piping, structures, and other underground facilities, and prevent disturbance of bedding material for piping, structures, and other underground facilities. When piping, structures, or underground facilities are disturbed, remove, and reinstall the disturbed items.

3.7 SITE AND STRUCTURE EXCAVATION

A. Perform all excavation required to complete the Work as shown, specified, and required. Excavation shall include the removal and replacement of all asphalt, concrete, curb, rock, earth, fences, trees, shrubs, and other materials as applicable within the defined rights-of-way, easements, and limits of disturbance indicated.

B. Excavation Protection:
   1. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.
   2. Provide and maintain excavation protection system(s) in accordance with submittals accepted by Engineer.

C. All areas of the site shall be graded and maintained at all times to prevent surface runoff from draining into the excavations, and to prevent ponding of water therein.

D. Excavation shall be accomplished in accordance with the grades and lines as established by the Engineer and as required by the work to be performed. Exercise care to prevent undercutting lower than the required subgrades. When excavations are made below required grades without written order of Engineer, fill such excavations with compacted select fill material, as directed by Engineer, at Contractor's expense.

E. Extend excavations sufficiently on each side of foundation slabs, wet wells, manholes, valve vaults, and similar construction to allow setting of forms, installation of shoring and bracing, and the safe sloping of banks, as necessary.

F. General Site Subgrades:
   1. Subgrades shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations. Subgrades that are otherwise solid but become soft or mucky on top due to construction operations shall be reinforced with select fill. Finished elevation of stabilized subgrades shall not be above subgrade elevations shown.
   2. If, in Engineer's opinion, subgrade becomes softened or mucky because of construction delays, failure to dewater properly, or other cause within Contractor's control, subgrade shall be excavated to firm material, trimmed, and backfilled with select fill material at Contractor's expense.
   3. Upon completion of site preparation and excavation, scarify to a depth of 12-inches and compact as specified. For areas to receive fill, the compacted subgrade shall be scarified to a depth of 4-inches prior to placing the fill.

G. Proof-rolling Subgrades:
   1. Prior to placing fill or constructing pavements or slabs-on-grade, proof-roll the subgrade surface with sufficient proof-rolling apparatus. Before starting proof-rolling, submit to and obtain acceptance from Engineer of proof-rolling apparatus and procedure to be used.
   2. Proof-rolling operations shall be made in the presence of Engineer. Notify Engineer in advance of start of proof-rolling operations.
   3. Subgrades displaying pronounced elasticity or deformation, deflection, cracking, or rutting shall be stabilized as directed by Engineer. Unsuitable materials shall be undercut to the depth directed by Engineer and replaced with select fill material. Other suitable stabilization methods may be directed by Engineer.

H. Excavated Materials to be Used as Fill:
   1. All materials from excavation, considered as suitable by the Engineer, shall be used as fill wherever required, and the Contractor shall arrange his work so that this usage of excavated materials will be possible.
   2. Stockpile excavated materials that are acceptable for use as fill.
   3. As excavation proceeds, keep stockpiles of excavated materials suitable for use as fill separate from unsuitable materials and waste materials.
   4. Place, grade, and shape stockpiles for proper drainage.
   5. Locate and retain soil materials away from edge of excavations.
   6. Dispose of excess soil material and waste materials.
   7. Stockpiled excavated soils for use as select fill or general fill shall be tested and classified by laboratory as on-Site select fill or on-Site general fill. Perform required quality assurance testing for material verification on stockpiled materials as soon as possible to demonstrate compliance of excavated materials.

3.8 SITE AND STRUCTURE FILL AND COMPACTION

A. Provide and compact all fill required for the finished grades as shown on the drawings.

B. Place fill in excavations as promptly as progress of the Work allows, but not until completing the following:
   1. Engineer's authorization after observation of construction below finish grade, including damp-proofing, waterproofing, perimeter insulation, and similar Work.
   2. Inspection, testing, approval and recording of locations of underground facilities.
   3. Removal of concrete formwork.
   4. Removal of shoring and bracing, and filling of voids with satisfactory materials.
   5. Removal of trash and debris.
   6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
   7. Field testing of tanks, underground facilities including piping and conduits, and water-retaining structures.

C. Fill that includes organic materials, debris, roots, trash, stones, or other unacceptable material shall be removed and replaced with approved fill material.

D. Borrow: The Contractor will supply all borrow necessary and will provide all labor and equipment necessary to dig and haul such borrow.

E. Placement:
   1. Place fill to the grades shown or indicated. Bring up evenly on all sides fill around structures and underground facilities.
   2. Fill shall be spread in successive layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly by motor grader or other approved device and rolled with an approved tamping or 3-wheeled power roller until thoroughly compacted to 90 percent of maximum density obtained at optimum moisture content, as determined by the AASHTO Standard Method T-180.
   3. Fill areas shall be undercut, and proof rolled as directed by Engineer.
   4. Place fill materials at moisture content and density as specified in Table 31 23 34-A of this Section and this Article's requirements on compaction density. Furnish and use equipment capable of adding measured amounts of water to the fill

materials to bring fill materials to a condition within required moisture content range. Furnish and use equipment capable of disking, aerating, and mixing the fill materials to ensure reasonable uniformity of moisture content throughout the fill materials, and to reduce moisture content of borrow materials by air drying, when necessary. When subgrade or lift of fill materials requires moisture-conditioning before compaction, fill material shall be sufficiently mixed or worked on the subgrade to ensure uniform moisture content throughout the lift of material to be compacted. Materials at moisture content in excess of specified limit shall be dried by aeration or stockpiled for drying.

5. Perform compaction with equipment suitable for the type of fill material placed. Select and use equipment capable of providing the minimum density required. Use lightweight or hand operated compaction equipment within horizontal distance of 10 feet from the wall of completed, below-grade structures. Furnish and use equipment capable of compacting in restricted areas next to structures and around piping and underground facilities. Effectiveness of the equipment selected by Contractor shall be tested at start of compacted fill Work by constructing a small section of fill within the area where fill will be placed. If tests on the test section of fill indicate that required compaction is not obtained, do one or more of the following: increase the amount of coverage, decrease the lift thicknesses, or use different compactor equipment.
6. Place fill materials in horizontal, loose lifts, not exceeding specified uncompacted thickness. Place fill in a manner ensuring uniform lift thickness after placing. Mechanically compact each lift, by not less than two complete coverages of the compactor. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of compactor's compacting surface. Compaction of fill materials by inundation with water is unacceptable.
7. Do not place fill materials when standing water is present on surface of the area where fill will be placed. Do not compact fill when standing water is present on the fill to be compacted. Do not place or compact fill in a frozen condition or on top of frozen material. Fill containing organic materials or other unacceptable material previously described shall be removed and replaced prior to compaction.
8. If required densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly-functioning compaction equipment, Contractor shall perform all work required to provide the required densities. Such work shall include, at no additional cost to Owner, complete removal of unacceptable fill areas and replacement and re-compaction until acceptable fill is provided.
9. Repair, at Contractor's expense, observed or measured settlement. Make repairs and replacements as required within 30 days after being so advised by Engineer.
10. When any portion of the fill is constructed on an old roadbed, the existing surfaces shall be scarified and manipulated as directed by the Engineer in order that, when compacted, it shall have a uniform density. Fills shall be shaped and maintained at all times during their construction to prevent an accumulation of standing water in the event of rain.

F. Fill Against Concrete:
   1. Placing fill against concrete below finished grade is not allowed until the concrete has attained its specified strength, as determined by duration of concrete curing and testing of field-cured concrete cylinders. Requirements for strength and curing time are in Section 03 05 00 – Concrete.

2. Backfill structural foundation units as soon as practicable, after concrete has gained sufficient strength to avoid damage, to avoid ponding of surface water and accumulation of debris.
3. Where fill is placed against waterproofed surface, exercise care that waterproofing material is not damaged.

G. Fill in Electrical Ductbank Trenches:
1. Provide general fill for full depth of electrical ductbank trench, below and above electrical ductbank.
2. Where one ductbank passes beneath another pipe or ductbank, provide select fill to the elevation of the bottom of upper ductbank or pipe, as applicable.
3. Placing and compacting fill in electrical ductbank trenches shall comply with Type S trench construction requirements.

H. Pavement:
1. Compact the subgrade and fill material beneath paved areas and shoulders to a minimum 98 percent ASTM D698 maximum density at optimum moisture content.
2. Place 1-½ inches of temporary asphalt concrete pavement immediately after filling excavations in paved roadways and other paved areas that will remain for permanent use.
3. Maintain surface of paved area over the fill in good and safe condition during progress of the Work, and promptly fill depressions over and adjacent to the fill area caused by settlement of fill.
4. Permanent replacement pavement shall be equal to that of the existing roadways, unless otherwise shown or specified.

I. Subbase Placement:
1. Provide subbase material where shown to the limits shown or indicated.
2. Place subbase material in compacted lifts not exceeding depth of 6-inches each.

J. Drainage Fill Placement:
1. Provide drainage fill material where shown to the limits shown or indicated.
2. Place drainage fill material in compacted layers of uniform thickness not exceeding depth of 6-inches each. Compact lifts of drainage fill using suitable compaction equipment.

K. Granular Fill Placement
1. Place granular fill on compacted subgrade.

L. Compaction Density Requirements:
1. Compaction required for all types of fills shall be in accordance with Table 31 23 34-A of this Section. Moisten material or aerate the material as necessary to provide the moisture content that will facilitate obtaining the required compaction.
2. Fill shall be wetted and thoroughly mixed to achieve optimum moisture content plus-or-minus 3-percent, with the following exceptions:
   a. On-site clayey soils: Optimum to plus 3-percent.
3. Replace natural, undisturbed soils or compacted soil subsequently disturbed or removed by construction operations with materials compacted as indicated in Table 31 23 34-A.

TABLE 31 23 34-A

REQUIRED MINIMUM DENSITY

Material	Percent Compaction (ASTM D698)	Uncompacted Lift (inches)
General Fill		
More than 5-feet below final grade	100	8
Less than 5-feet below final grade	95	8
Select Fill		
Below concrete slabs or mats	100	8
Below pavement and sidewalks	100	12
Behind concrete walls	95	8
Subbase Material		
Below pavement and sidewalks	100	12
All other locations	100	8
Drainage Fill	N/A	6
Structural Fill	98	-
Granular Fill	100	-
Landscaped Areas		
Subgrade	98	-
Topsoil	85	

4. Field quality control testing for density; to verify that specified density was obtained, will be performed during each day of compaction Work. Responsibility for field quality control testing is specified in the "Field Quality Control" Article in Part 3.
5. When field quality control testing indicates unsatisfactory compaction, provide additional compaction necessary to obtain the specified compaction. Perform additional compaction Work at no additional cost to Owner until specified compaction is obtained. Such work includes complete removal of unacceptable (as determined by Engineer) fill areas and replacement and re-compaction until acceptable fill is provided in accordance with the Contract Documents.

M. Replacement of Unacceptable Excavated Materials: In cases where over-excavation to replace unacceptable soil materials is required, backfill the excavation to required subgrade with select fill material and thoroughly compact in accordance with Table 31 23 34-A and the associated "Compaction Density Requirements" in this Article. Slope the sides of excavation in accordance with the maximum inclinations specified for each structure location

3.9 SITE GRADING

A. General:
1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Finished grades should be smooth and provide positive drainage.
   a. Rough Grade Plus or minus 0.1 foot
   b. Finish Grade Plus or minus 0.1 foot

2. Smooth subgrade surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Topsoil: The top 4-inches of soil in landscaped areas shall be topsoil.

C. Protection: Protect areas which have been graded from equipment traffic.

D. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free of irregular surface changes, and shall comply with the following:

E. Grassed Areas or Areas Covered with Gravel, Stone, Wood Chips, or Other Special Cover: Finish areas to receive topsoil or special cover to within not more than one inch above or below the required subgrade elevations.

F. Sidewalks: Shape surface of areas under sidewalks to line, grade, and cross section, with finish surface not more than 1-inch above or below the required subgrade elevation.

G. Pavements: Shape surface of areas under pavement to line, grade, and cross section, with finish surface not more than ½-inch above or below the required subgrade elevation.

H. Grading Surface of Fill Under Concrete Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½-inch when tested with a 10-foot straight edge.

I. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.10 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

A. Controlled Low Strength Materials Placement:
1. Discharge CLSM from the mixer by reasonable means into the space to be filled.
2. Bring the fill material uniformly up to the fill line indicated on drawings.
3. Placement of fill over the CLSM may proceed after a curing period of not less than 3-days.

3.11 SITE PAVEMENT SUBBASE COURSE

A. General:
1. Place subbase material, in layers of specified thickness, over ground surface to support pavement base course.
2. After completing filling and grading, shape, and compact pavement subgrade to an even, firm foundation in accordance with this Section. Remove unsuitable subgrade materials, including soft materials, boulders, vegetation, and loose stones, and replace with compacted fill material as directed by Engineer.

B. Undercutting: Undercutting, unless authorized by the Engineer, shall be replaced, and compacted at the Contractor's expense. If the material, after excavation to subgrade, is found to be soft, spongy, or unfit for use as subgrade, such unsuitable material shall be removed to a depth as directed by the Engineer and the subgrade shall be brought to proper elevation by filling with suitable material from excavation or from an approved borrow site.

C. Grade Control:
   1. During construction, maintain lines and grades including crown and cross-slope of subbase course.

D. Placing of Pavement Subbase Course:
   1. Place subbase course material on prepared subgrade in layers of uniform thickness, in accordance with indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placing operations.
   2. When indicated on the drawings, provide geotextile separation fabric over the prepared subgrade

E. Compaction and Grade Control: Comply with compaction requirements for excavation and fill in this Section, and the following requirements:
   a. Compaction with roller shall begin at the sides of the area to be paved and continue toward the center. Continue compaction until there is no movement of the course ahead of the roller.
   b. After compaction of top lift of pavement subbase, provide and uniformly spread pipe bedding material and screenings compacted, on the surface, and sweep using gang-dragged broom, followed by compaction.
   c. After rolling, check for grade with a line not less than 40-feet in length; depression over ½-inch deep shall be filled to satisfaction of Engineer.
   d. After completing compaction, other than that necessary for bringing material for the next course, do not haul or drive over the compacted subbase.
   e. Do not install pavement subbase in excess of 500-feet in length without compacting to prevent softening of the subgrade.
   f. If subgrade material becomes churned up into or mixed with the subbase material, remove the mixed material, and replace with clean, compacted subbase material.

3.12 DISPOSAL OF EXCAVATED MATERIALS

A. Unsuitable materials encountered in an excavation shall be removed by the Contractor and backfilled with suitable material and compacted. Unsuitable materials include organic soils, muck, soft and compressible silts, and clays and running sands.

B. Excavated materials not required for topsoil, fill, or backfill shall be removed from the site of the work by the Contractor, but none shall be deposited on private property without written consent of the property owner.

3.13 TEMPORARY BARRIERS

A. Provide temporary barrier surrounding excavations and excavation work areas to provide temporary protection to persons and property. Barrier shall have openings only at vehicular, equipment, and worker access points.

B. Minimum Material Requirements for Temporary Barriers:
   1. Temporary barrier shall not be less snow fence-type fencing, 4-feet high.
   2. Fence shall be constructed of vertical hardwood slats measuring not less than 1-1/2 inches by 1/4 inch interwoven with strands of horizontal wire or shall be of equivalent plastic construction.
   3. Posts:
      a. Posts shall be steel, either “U”-, “Y”-, “T”-shaped, or channel section.
      b. Posts shall have a nominal weight of not less than 0.33-pound per linear foot, exclusive of the anchor.
      c. Posts shall have tapered anchors weighing not less than 0.67 pounds, each firmly attached by means of welding, riveting, or clamping.
      d. Posts shall have corrugations, knobs, notches, or studs placed and constructed to engage a substantial number of fence line wire in the proper position.
      e. Provide each post with sufficient quantity of galvanized wire fasteners or clamps, of not less than 0.120-inch diameter, for attaching fence wire to post.

3.14 FIELD QUALITY CONTROL

A. Field inspection, sampling and testing shall be performed.

B. Site Tests: Owner will employ an independent testing laboratory to perform field quality control testing.
   1. Testing Laboratory Scope:
      a. Perform field moisture content and density tests to ensure that the specified compaction of embedment and fill materials has been obtained.
      b. Perform tests of actual unconfined compressive strength or bearing tests on structure subgrades.
      c. Report results of each test to CFPUA, Engineer, and Contractor.
   2. Authority and Duties of Testing Laboratory:
      a. Technicians representing the testing laboratory shall inspect the materials in the field, perform testing, and report findings. When materials furnished or the Work performed does not comply, technician will direct attention of CFPUA, Engineer, and Contractor to such failure.
      b. Technician will not act as foreman or perform other duties for Contractor. Work will be checked as it progresses, but failure to detect defective Work or non-complying materials shall not in any way prevent later rejection when defect is discovered. Technicians are not authorized to revoke, alter, relax, enlarge, or release requirements, or to approve any portion of the Work.
   3. Responsibilities and Duties of Contractor:
      a. To facilitate testing laboratory, Contractor shall advise testing laboratory at least 2-days in advance of excavating filling operations to allow for assignment of personnel for field quality control testing.

b. It shall be Contractor's responsibility to control construction operations to accomplish the specified compaction for fill and trench construction and confirm tests verify that Contractor has complied and is complying relative to compaction control.
c. Contractor shall demonstrate adequacy of compaction equipment and procedures before exceeding one or more of the following quantities of earthwork:
    1) 200 linear feet of trench embedment and backfill.
    2) 10 cubic yards of select fill.
    3) 100 cubic yards of general fill.
    4) 50 cubic yards of subbase material.
d. Each test location shall include tests for each layer, type, or class of fill to finish grade.

4. Testing laboratory will inspect and indicate acceptable subgrades and fill layers using the interval/units listed below as a guide. Actual inspection and testing interval/units will vary based on specific project conditions.
    a. Trenches for pipelines and underground facilities (including buried ductbanks):
        1) In Open Fields: Two locations every 1,000 linear feet.
        2) Along Dirt or Gravel Roads or Off Traveled Right-of-Way: Two locations every 500 linear feet.
        3) Crossing Paved Roads: Two locations along each crossing.
        4) Under Pavement Cuts or Within Two Feet of Pavement Edges: One location every 400 linear feet.
    b. Footing Subgrade: For each stratum of soil on which footings will be placed, perform not less than one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Engineer.
    c. For Select Fill: On 30-foot intervals on all sides of the structure for every compacted lift, but not less than one per lift on each side of the structure for structures less than 60 feet long on a side.
    d. For General Fill: One per 1,000 square feet on every compacted lift.
    e. Subbase Material: One per 1,000 square feet on every compacted lift.
5. Test reports shall be provided to Owner, Engineer and Contractor.
6. If testing laboratory reports or inspections indicate subgrade, fills, or bedding compaction below specified density, Contractor shall remove unacceptable materials as necessary and replace with specified materials and provide additional compaction at Contractor's expense until subgrades, bedding, and fill are acceptable.

END OF SECTION

TABLE 1 Classes of Embedment and Backfill Materials

Class	Type	Soil Group Symbol D 2487	Description	Percentage Passing Sieve Sizes			Atterberg Limits		Coefficients	
				1½ in. (40 mm)	No. 4 (4.75 mm)	No. 200 (0.075 mm)	LL	PI	Uniformity C_U	Curvature C_C
IA	Manufactured Aggregates; open-graded, clean.	None	Angular, crushed stone or rock, crushed gravel, broken coral, crushed slag, cinders or shells; large void content, contain little or no fines.	100 %	≤10 %	<5 %	Non Plastic			
IB	Manufactured, Processed Aggregates; dense-graded, clean.	None	Angular, crushed stone (or other Class 1A materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils; contain little or no fines (see X1.8).	100 %	≤50 %	<5 %	Non Plastic			
II	Coarse-Grained Soils, clean	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	100 %	<50 % of "Coarse Fraction"	<5 %	Non Plastic		>4	1 to 3
		GP	Poorly-graded gravels and gravel-sand mixtures; little or no fines.						<4	<1 or >3
		SW	Well-graded sands and gravelly sands; little or no fines.		>50 % of "Coarse Fraction"				>6	1 to 3
		SP	Poorly-graded sands and gravelly sands; little or no fines.						<6	<1 or >3
	Coarse-Grained Soils, borderline clean to w/fines	e.g. GW-GC, SP-SM.	Sands and gravels which are borderline between clean and with fines.	100 %	Varies	5 % to 12 %	Non Plastic		Same as for GW, GP, SW and SP	
III	Coarse-Grained Soils With Fines	GM	Silty gravels, gravel-sand-silt mixtures.	100 %	<50 % of "Coarse Fraction"	12 % to 50 %		<4 or <"A" Line		
		GC	Clayey gravels, gravel-sand-clay mixtures.					<7 and >"A" Line		
		SM	Silty sands, sand-silt mixtures.		>50 % of "Coarse Fraction"			>4 or <"A" Line		
		SC	Clayey sands, sand-clay mixtures.					>7 and >"A" Line		
IVA[A]	Fine-Grained Soils (inorganic)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity.	100 %	100 %	>50 %	<50	<4 or <"A" Line		
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.					>7 and >"A" Line		
IVB	Fine-Grained Soils (inorganic)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	100 %	100 %	>50 %	>50	<"A" Line		
		CH	Inorganic clays of high plasticity, fat clays.					>"A" Line		
V	Organic Soils	OL	Organic silts and organic silty clays of low plasticity.	100 %	100 %	>50 %	<50	<4 or <"A" Line		
		OH	Organic clays of medium to high plasticity, organic silts.				>50	<"A" Line		
	Highly Organic	PT	Peat and other high organic soils.							

[A] Includes Test Method D 2487 borderline classifications and dual symbols depending on plasticity index and liquid limits.

Note—"Coarse Fraction" as used in this table is defined as material retained on a No. 200 sieve.

SECTION 33 01 12

IDENTIFICATION FOR UTILITIES PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Underground Pipeline Detection and Warning.
      a. Tracer wire system
         1) Vinyl/PVC adhesive tape.
         2) Polyethylene adhesive tape.
         3) Direct bury wire splice kits.
      b. Tracer wire system testing
      c. Metal detectable underground warning tape.
      d. Marker posts.
   2. Above Ground Piping and Valve Identification at CFPUA Facility Sites.
      a. Tags
      b. Applied pipe markers.

B. Related Requirements:
   1. Section 09 91 00 - Painting and Protective Coating: Execution requirements for painting specified by this Section.
   2. Section 33 05 07.13 - Horizontal Directional Drilling: Materials and methods for piping and appurtenances.
   3. Section 33 05 07.23 - Jacking and Boring: Materials and methods for carrier pipes and appurtenances.
   4. Section 33 14 13 - Water Distribution Piping and Appurtenances: Materials and methods for piping and appurtenances.
   5. Section 33 14 14 - Public Water Service Connections: Materials and methods for piping, valves, and appurtenances.
   6. Section 33 31 23 - Sanitary Sewer Force Mains, Valves and Appurtenances: Materials and methods for piping, valves, and appurtenances.
   7. Section 40 71 00 - Magnetic Flow Meter
   8. Section 43 21 39.13 - Submersible End Suction Pumps: Materials and methods for piping, valves, pumps, and other station equipment.

1.2 REFERENCE STANDARDS

A. NCGS 87-8A Underground Utility and Damage Prevention Act

B. American Public Works Association: Uniform Color Code

C. American Society of Mechanical Engineers: ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog literature for each product required.

PART 2 PRODUCTS

2.1 UNDERGROUND PIPELINE DETECTION AND WARNING

1. Tracer Wire
   a. Vinyl/PVC adhesive tape.
   b. Polyethylene adhesive tape.
2. Direct bury wire splice kits.
3. Metal detectable underground warning tape.
4. Refer to CFPUA Material Specification Manual (MSM) for the following products:

MSM Section	Material
K-Miscellaneous	Warning Tape
L-Electrical	Wire and splice kits

2.2 ABOVE GROUND PIPING AND VALVE IDENTIFICATION

A. Above Grade Pipe Identification
   1. Color-Coding and Lettering Size: Conform to ASME A13.1.
   2. Applied Pipe Markers
      a. Factory-fabricated, flexible, semi-rigid plastic.
      b. Preformed to fit around pipe or pipe covering.
      c. Larger sizes may have maximum sheet size with spring fastener.
   3. Applied Tape Pipe Markers
      a. Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
   4. Stencils
      a. Clean-cut symbols.
      b. Letters:
         1) Up to 2-inch Outside Diameter of Insulation or Pipe === ½-inch high letters.
         2) 2-½- to 6-inch Outside Diameter of Insulation or Pipe == 1-inch high letters.
         3) Over 6-inch Outside Diameter of Insulation or Pipe == 1-¾-inch high letters.
         4) Stencil Paint: As specified in Section 099000 - Painting and Coating; semi-gloss enamel.

B. Valves
   1. Plastic Tags
      a. Laminated three-layer plastic with engraved letters on light, contrasting background color.
      b. Minimum Tag Size and Configuration: 1-½ inch.
   2. Metal Tags
      a. Stainless-steel construction; stamped letters.
      b. Minimum Tag Size and Configuration: 1-½ inch with finished edges.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify prescribed materials and color code for each pipeline type to be installed.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Prepare surfaces as specified in Section 09 90 00 - Painting and Protective Coating for stencil painting.

3.2 INSTALLATION

A. Buried Pipeline Detection and Warning
   1. Tracer wire system termination and access.
      a. Tracer wire systems must be installed as a single continuous wire. No looping or coiling of wire is allowed.
      b. All tracer wire termination points must be grade level/in-ground access boxes identified with “sewer” or “water” cast into the cap.
      c. A minimum of 2 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.
      d. Runs without service laterals or hydrants shall provide intermediate tracer wire access at minimum 1,000-foot intervals and must be provided utilizing a grade level/in-ground access box located at the edge of the road right-of-way and outside the roadway surface.
      e. Termination and access shall be installed as indicated on the Drawings for all pressure piping at the following locations:
         1) Cast iron boxes located at minimum 1,000-foot intervals
         2) All in-line valve boxes on water mains and services and on sewer force mains and services.
         3) At hydrant valve boxes and hydrants
         4) Water meter service boxes
   2. Tracer wire repairs
      a. Any damage occurring during installation of the tracer wire must be immediately repaired by removing the damaged wire and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
   3. Tracer wire attachment and connections
      a. Tracer wire shall be installed at the top half (11-1 o’clock position) of the pipe and secured (taped/tied) at 12-foot intervals.
      b. Mainline tracer wire shall not be connected to existing conductive pipes. Treat as a mainline dead end and ground using an anode buried at the same depth as the tracer wire.
      c. All service lateral tracer wires shall be a single wire, connected to the mainline tracer wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline tracer wire.
      d. In occurrences where an existing tracer wire is encountered on an existing utility that is being extended or tied into, the new tracer wire and existing

tracer wire shall be connected using approved splice connectors and shall be properly grounded at the splice location as specified.

e. A mainline tracer wire must be installed, with all service lateral tracer wires properly connected to the mainline tracer wire, to ensure full tracing/locating capabilities from a single connection point.
f. Lay Mainline tracer wire continuously on the North or East side of valves and fittings.
g. Tracer wire on all service laterals must terminate at an approved tracer wire access located directly above the service lateral at the edge of road right of way.
h. Connect tracer wire using direct bury splice kits in accordance with manufacturer's recommendations

4. Tracer wire testing and verification
   a. Provide locating equipment to verify tracer wire locating system in presence of CFPUA or ENGINEER construction observer.
   b. The test will take the following form:
      1) A standard 5-watt generator will be used to provide an AC current on the wire.
      2) The frequency of the signal from the generator will be initially restricted to 33 kHz or less.
      3) A standard hand-held detector will be used to trace the signal.
   c. The installed tracer wire will be deemed to pass the test if using the above set up:
      1) The tracer wire is accessible at all access points.
      2) The tracer wire can be traced from access point to access point.
      3) Widely spaced access points can be traced out in the worst-case from each end to a common meeting point between them.
      4) Depth readings are consistent and accurate to within a 15:1 depth to diameter ratio.
5. Horizontal Directional Drill and Bore/Jack Crossings
   a. Follow special tracer wire procedures identified in those specification sections.

B. Buried Pipeline Metal Detectable Warning Tape
   a. For all diameter potable water mains (excluding 1-inch service lines) and all diameter sewerage force mains
      1) Install 1'-6" deep and directly above pipeline during backfilling operation.

C. Above Ground Piping and Valve Identification at CFPUA Facility Sites:
1. Piping:
   a. Identify with plastic tape pipe markers or stenciled painting.
   b. Apply stencil painting as specified in Section 09 90 00 - Painting and Protective Coating.
   c. Identify service, flow direction, and pressure.
   d. Install in clear view and align with axis of piping.
   e. Locate identification not to exceed 20 feet on straight runs, including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
2. Valves:
   a. Install tags using corrosion-resistant chain.

b. Number tags consecutively by type and location.

END OF SECTION

SECTION 33 01 30.11
CCTV INSPECTION OF SEWERS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closed-Circuit Television inspection of sewer mains for:

a. Inspection and condition assessment.

b. Pre-rehabilitation condition confirmation (Pre-lining, Pre-bursting, Pre-grouting, etc.)

c. Post-construction quality control

B. Related Requirements:

1. Construction Specification Section 33 01 30.41, Cleaning of Sewers

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. The following is a partial list of typical abbreviations and acronyms used in this section. See Construction Specification Section 01 40 00, Quality Requirements, for additional abbreviations and acronyms used throughout the Contract Documents.

CCTV	Closed-circuit television
NASSCO	National Association of Sewer Service Companies
PACP©	Pipeline Assessment and Certification Program (by NASSCO)

B. Definitions: Not used.

C. Reference Standards: See Construction Specification Section 01 40 00, Quality Requirements, for a list of reference standards used throughout the Contract Documents.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. CCTV inspections must not proceed until the submittals have been approved by the Engineer and returned to Contractor.

B. Pre-installation Meetings:

1. Review the following:

a. Equipment Operator Qualifications.

b. Bypass Pumping Plan.

c. Format for Submittals.

d. Sequencing and Scheduling.

1.4 SUBMITTALS

A. Provide submittals in accordance with Construction Specification Section 01 33 00, Submittal Procedures.

B. Pre-CCTV submittals

1. Qualification Statements.

2. Proposed CCTV equipment with manufactures operating instructions.

3. Certifications:

a. NASSCO's PACP©

b. CCTV Equipment Manufacturer Training

4. Sample CCTV inspection video, logs, and photographs from a recent project performed by the equipment operator proposed for this project using the same equipment proposed for this project for approval of performance and quality.

C. Post-CCTV submittals

1. Submit sample CCTV inspection results for approval of performance and quality after the first inspection is completed. Sewers not inspected to the Engineer's satisfaction must be re-inspected by Contractor at no additional cost to the Owner.

2. Documentation of the CCTV Inspection Results:

a. Digital Media Recordings: Video and audio recordings of the CCTV inspection of the sewer conditions and defects. Each sewer segment must be a separate video. Each sewer segment must be provided on a single video except where a reverse setup is required. Video must indicate Owner, sewer segment (manhole to manhole or pressure main station to station), date, time, and operator, as a minimum.

b. Television Inspection Logs: Digital media recordings of the distance (to 0.1 feet) from the manhole wall or access point, in relation to an adjacent manhole or access point, of each point of significance observed during inspection. Points of significance include points of infiltration, locations of tributary sewers and service laterals, storm sewer connections, joints, roots, cracks, fractures, broken pipe, presence of scale and corrosion, unusual conditions, and other discernible features and defects, as defined in the PACP© defect codes.

c. Digital Photographs of the Pipe Condition and Defects: Photographs must be located by distance to 0.1 feet from the manhole wall or access point in relation to an adjacent manhole or access point.

3. Submit two copies of the CCTV inspection results on hard drives. The digital media recordings, television inspection logs, and digital photographs must be named and labeled to indicate the specific sewer segment, location, and contents.

4. When CCTV inspections are poor quality and are not accepted, and the Engineer must review additional inspections for a given segment, the Engineer's time will be considered additional services and the additional engineering or inspection charges incurred by the Owner will be charged to the Contractor and deducted from monies due.

5. Provide CCTV inspection submittals at least 14 days in advance of any payment request to provide the Engineer ample time to review the submittals.

1.5 QUALITY ASSURANCE

A. Comply with Construction Specification Section 01 40 00, Quality Requirements.

B. Comply with OSHA Standards, Underwriter Laboratories, and other authorities having jurisdiction.

C. Contractor Qualifications:

1. CCTV inspections must be performed by CCTV personnel who are trained and certified in the use of NASSCO's PACP©.

2. Contractor and equipment operator performing the CCTV inspection must be fully qualified, experienced, and equipped to complete this work expeditiously and in a satisfactory manner. Contractor must be trained in the use of the CCTV equipment and certified by the equipment manufacturer. Contractor must have a minimum of one years' experience with sewer main CCTV inspection with the proposed equipment.

3. Submit information to document Contractor experience and the experience of the proposed equipment operator when requested by the Engineer. Submit projects completed within the last year by both Contractor and the equipment operator to include owner name, address, telephone number, contact person, date and duration of work, location, and pipe information.

1.6 SITE CONDITIONS

A. Sewers to be inspected under this Contract are old and may be in very poor structural condition. Use caution during CCTV inspection. If Contractor's equipment becomes lodged in the sewer, Contractor is responsible for removal of the equipment and repair of the sewer. Contractor must pay costs associated with this work.

PART 2– PRODUCTS

2.1 CCTV INSPECTION EQUIPMENT

A. The equipment used for the CCTV inspection must be specifically designed and constructed for sanitary or pressure sewer inspection. Lighting for the camera must be suitable to allow a clear picture of the entire periphery of the pipe. The camera must be operative in 100% humidity conditions. The camera must be a color, pan-and-tilt model. The camera must be capable of being moved through the line in either direction at a uniform rate.

B. The camera, television monitor, and other components of the video system must be capable of producing picture quality and resolution to the satisfaction of the Engineer.

2.2 CCTV INSPECTION SOFTWARE

A. Inspections must use software that is capable of providing complete survey reports in compliance with the most current version of NASSCO PACP software.

B. All NASSCO PACP mandatory fields and any additional available fields requested by the Owner or his representative shall be populated during the inspections. Reports and/or submittals must adhere to NASSCO PACP/MACP Standards.

C. The software must maintain a database of underground pipe and manhole assets referencing the pipe and manhole structure asset identifier codes provided in GIS format by the Owner. The pipe segment information must be entered prior to the actual survey based on the numbering convention provided by the Owner. The software must also have the capability to import and export survey results in the current NASSCO PACP Exchange digital format and to manage the database to meet the specifications in Part 4 herein.

PART 3– EXECUTION

3.1 INSPECTION PRECAUTIONS

A. Take necessary precautions to avoid flooding and damage of public or private property served by the sewer being inspected. The Contractor is responsible for flooding and damage and must pay costs associated with cleanup and restoration of the property to the acceptance of the property owner and Owner.

3.2 GENERAL

A. After the sewers are completely cleaned, the sewers must be inspected by means of CCTV to verify that the sewers have been thoroughly cleaned, to locate active sewer services and other connections, to document the condition, and to locate sewer defects.

B. Flow in the sewer being inspected must be temporarily bypassed in accordance with the Bypass Pumping Plan where plugging upstream sewers will result in a sanitary sewer overflow.

C. Provide ventilation and air movement to prevent the presence of vapor or mist in the sewer.

D. CCTV inspections must be performed in accordance with PACP© standards including the specific date and time of inspection.

E. The camera must be moved through the sewer by devices that do not obstruct the camera view, or interfere with proper documentation of the sewer conditions, such as manual or power winches, TV cable, and powered rewinds.

F. When manually operated winches are used to pull the television camera through the line, two-way radios, telephones, or other suitable means of communication must be established between the two manholes or access points to ensure adequate communications between members of the crew.

G. The camera must be moved through the line in either direction at a moderate rate, stopping to permit proper documentation of the condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. The camera must be stopped at joints, defects, points of significance, tributary connections, service laterals, and other connections and must be panned, tilted, and rotated to fully view the defects and connections. Inspections must be documented.

H. Perform dye testing during the CCTV inspections to locate and confirm active service laterals.

I. Inspections must be performed from manhole to manhole or access point to access point without the need for reverse setup, unless approved by the Engineer. Reverse setups will only be allowed and accepted for payment if a blockage or defect prevents the completion of the CCTV in the initial direction. If CCTV inspection of an entire section cannot be successfully performed from one manhole or access point, the equipment must be set up on the other manhole or access point and CCTV attempted again from the opposite manhole or access point. If, again, successful CCTV cannot be performed or the equipment fails to traverse the entire section, the CCTV effort must be abandoned at the blockage or defect. The inspection must be considered complete and noted as "Survey abandoned" and no additional inspection will be required. Contractor must notify the Engineer in writing of such situations for the Engineer's review and approval. If approved, payment will be made for the length of sewer inspected. If CCTV inspection cannot be completed, measure the distance between manholes and record distance not televised on the inspection form.

J. Inspection the upstream and downstream manholes. Pan and zoom up the manhole from the invert and obtain the best possible image of the manhole including cone and corbel sections and for each pipe connection within each manhole. Zoom in on each pipe connection so the video and photos capture each pipe connection's size, location, and approximate elevation.

K. Record accurate measurements of distances. Accuracy of the distance meter must be checked by a suitable device. The accuracy must be acceptable to the Engineer.

3.3 CCTV FOR INSPECTION AND CONDITION ASSESSMENT

A. Perform CCTV for inspection and condition assessment of existing sewers.

B. Provide pre-CCTV submittals. Revise and resubmit if requested. Receive approvals.

C. Attend a Pre-installation Meeting.

D. Perform CCTV in accordance with Articles 3.1 and 3.2.

E. Provide post-CCTV submittals. Revise and resubmit if requested. Receive approvals.

3.4 CCTV FOR PRE-REHABILITATION CONDITION CONFIRMATION (PRE-LINING, PRE-BURSTING, PRE-GROUTING, ETC.)

A. Perform pre-rehabilitation CCTV to:

1. Verify the existing conditions.

2. Identify defects, obstructions, or deficiencies that prevent the pipe from being rehabilitated in accordance with the specifications. Notify Engineer immediately of problematic or changed conditions.

3. Examine the conditions under which pipe rehabilitation is to be performed and identify conditions detrimental to the proper and timely completion of the Work in accordance with the Contract Documents. Notify Engineer immediately of problematic or changed conditions.

4. Confirm the location of active service laterals.

B. If the RPR or Owner staff is available to review the CCTV as it is performed, it may be performed immediately prior to rehabilitation of each sewer segment.

3.5 CCTV FOR POST-CONSTRUCTION QUALITY CONTROL

A. Perform post-construction quality control CCTV to document as-built conditions.

B. Perform CCTV inspections in accordance with Articles 3.1 and 3.2 and special requirements identified in applicable technical specifications.

C. Provide post-CCTV submittals. Revise and resubmit if requested. Receive approvals.

3.6 DATA DELIVERY REQUIREMENTS

A. Reports and submittals must adhere to NASSCO PACP Standards.

B. Submit digital videos, digital photographs, evaluation reports, and databases in electronic format in NASSCO PACP Exchange format Version 6 to Engineer.

C. Data submittals must include a transmittal form filled out in its entirety (showing client, project number, contractor, engineer, date submitted, entity submitted to, method of delivery, and a full description of what is included, both electronically and included on the hard drive with the submittal, and in hard copy attached to the hard drive upon delivery.

D. Provide data to the Engineer monthly with the database and data on an external hard drive. Provide two hard drives on an alternating monthly basis. The submittals must be cumulative (i.e. each successive database delivery will include previous deliveries as well). Provide Owner with two final external hard drives capable of storing all data for the project on each drive upon completion. Submit he final hard drive on the first monthly submittal with the first month of data loaded. Data to be submitted shall include:

1. NASSCO PACP Database files
2. JPEG (.jpg) files (still photos)
3. .mpg or .mp4 files (videos) for each pipe segment
4. PDF of any separate inspection reports.

E. Each database submittal shall indicate the range of dates for which the database is being submitted as well as a list of new items as of the last submittal so that the Owner may separate out and review the newly delivered records from previous submittals in an Excel format.

F. Databases, video files, digital photographs and supporting documentation (PDF, spreadsheets, etc.) shall be placed in separate folders on the hard drives. Separate subfolders shall not be used to separate video files, etc. under the main folder. All videos, digital photographs, etc. of the same file type should be placed in a single folder on the hard drive to provide a single location to access the data.

G. A final, compiled version of the inspection database in PACP Exchange format shall be delivered at the end of the project to the Owner through the Engineer. The final database shall include all inspection records previously delivered in the individual inspections as well as incorporate all requested changes by the Engineer and Owner.

END OF SECTION

SECTION 33 01 30.41
CLEANING OF SEWERS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleaning of Sanitary Sewers and Force Mains for Inspection and Rehabilitation.

B. Related Requirements:

1. Construction Specification Section 33 01 30.11, CCTV Inspection of Sewers.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. The following is a partial list of typical abbreviations and acronyms used in this section. See Construction Specification Section 01 40 00, Quality Requirements, for additional abbreviations and acronyms used throughout the Contract Documents.

CCTV	Closed-circuit television
NASSCO	National Association of Sewer Service Companies
PACP©	Pipeline Assessment and Certification Program (by NASSCO)

B. Definitions:

1. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

2. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

C. Reference Standards: See Construction Specification Section 01 40 00, Quality Requirements, for a list of reference standards used throughout the Contract Documents.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Cleaning shall not proceed until the submittals have been approved by the Engineer and returned to Contractor.

2. Review the following:

a. Identify the Equipment Operator.

b. Equipment Type and Operation.

c. Bypass Pumping Plan.

d. Sequencing.

e. Scheduling.

1.4 ACTION SUBMITTALS

A. Provide submittals in accordance with Construction Specification Section 01 33 00, Submittal Procedures.

B. Qualification Statements.

C. Proposed cleaning equipment with manufactures operating instructions.

D. Bypass Pumping Plan.

E. Solids removal and disposal plan.

F. Certifications:

1. Cleaning equipment manufacturer training.

1.5 INFORMATIONAL SUBMITTALS

A. Safety Plan including confined space entry protocol to meet OSHA requirements.

1.6 CLOSEOUT SUBMITTALS

A. Record Documentation:

1. Log sheet indicating the approximate amount of material removed for each sewer segment. Note any areas where material removal was more significant by station number or length from the end of the pipe.

1.7 QUALITY ASSURANCE

A. Comply with Construction Specification Section 01 40 00, Quality Requirements.

B. Comply with OSHA Standards, Underwriter Laboratories, and other authorities having jurisdiction.

C. Qualifications:

1. Contractors:

a. All cleaning shall be performed by personnel who are trained and certified in the use of the cleaning equipment.

b. Contractor and equipment operator performing the cleaning shall be fully qualified, experienced, and equipped to complete this work expeditiously and in a satisfactory manner. Contractor shall be trained in the use of the cleaning equipment and certified by the equipment manufacturer. Contractor shall have a minimum of one years' experience with sewer main cleaning with the proposed equipment.

c. Submit information to document Contractor experience and the experience of the proposed equipment operator when requested by the Engineer. Submit projects completed within the last year by both Contractor and the equipment operator to include owner name, address, telephone number, contact person, date and duration of work, location, and pipe information.

D. Cleaning shall remove foreign materials from the mains and restore the sewer to a minimum of 98% of the original carrying capacity and as required for proper seating of internal pipe joint sealing packers.

1.8 SITE CONDITIONS

A. Existing Conditions:

1. It is acknowledged that there are some conditions, such as deflected broken pipe and major blockages, that prevent cleaning from being accomplished. There are also conditions where cleaning would likely result in additional damage if attempted or continued. Should these types of conditions be encountered, notify the Owner and RPR for review. Based on their review, Contractor may not be required to clean those specific locations.

2. Sewers to be inspected under this Contract are old and may be in very poor structural condition. Use extreme caution during cleaning. If Contractor's equipment becomes lodged in the sewer, Contractor shall be responsible for removal of the equipment and repair of the sewer. Contractor shall pay costs associated with this work.

PART 2 – PRODUCTS

2.1 SELECTION OF CLEANING EQUIPMENT

A. The designated sewer main sections shall be cleaned using high-velocity jet, mechanically powered, or hydraulically propelled equipment. Select equipment based on the conditions of lines at the time of the work. The equipment shall be specifically designed for cleaning sanitary or pressure sewers. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes. The equipment and methods selected are subject to the approval of the Engineer.

2.2 HIGH-VELOCITY JET (HYDROCLEANING) EQUIPMENT

A. High-velocity sewer cleaning equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall produce a scouring action from 15 to 45 degrees in all size lines. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel. Comply with the NASSCO Jetter Code of Practice for the selection of different type nozzles and recommended pressure applications for various cleaning requirements.

2.3 CHAIN CUTTERS

A. Chain cutters shall be designed for the removal of root ball obstructions, scaling, tuberculation, mineral deposits, grease, and other buildup and attachments to the pipeline walls. They shall be supplied with three self-sharpening chains, a cross cutter (manufactured of 300 series hardened stainless steel), scraper links designed to scrape off (not beat off) buildup, distance plates, individually changeable skids or pre-formed skid assemblies, and other accessories which rotate around a main shaft through the use of spinner nozzles. Chain cutters shall be appropriately sized for the diameter to be cleaned. They shall have an appropriate range of flows and pressures and rotate the chains at an appropriate RPM to clean the pipelines without damage.

2.4 MECHANICALLY POWERED EQUIPMENT

A. Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To ensure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

2.5 HYDRAULICALLY PROPELLED EQUIPMENT

A. Hydraulically propelled equipment shall be of the movable dam type and be constructed so that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to ensure removal of grease. If sewer cleaning balls or other equipment that cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.

PART 3 – EXECUTION

3.1 PREPARATION

A. Flow in the sewer being inspected shall be temporarily bypassed in accordance with the Bypass Pumping Plan.

3.2 CLEANING PRECAUTIONS

A. Contractor shall take precautions to avoid flooding and damage of public or private property. Contractor shall be responsible for flooding and damage and shall pay cost associated with cleanup and restoration of the property to the acceptance of the property owner and Owner.

B. Contractor shall take extra precautions not to damage older vitrified clay sewers and protect existing sewers from damage caused by improper use of the cleaning equipment.

3.3 SEWER CLEANING

A. Remove dirt, grease, rocks, sand, and other materials and obstructions from sewer mains and manholes.

B. Perform cleaning from manhole to manhole or access point to access point without the need for reverse setup, unless approved by the Engineer. Reverse setups will only be allowed and accepted for payment if a blockage or defect prevents the completion of the cleaning in the initial direction. If cleaning of an entire section cannot be successfully performed from one manhole or access point, the equipment shall be set up on the other manhole or access point and cleaning attempted again from the opposite manhole or access point. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, the cleaning effort shall be abandoned at the blockage or defect. Notify the Engineer in writing of such situations for the Engineer's review and approval. If approved, payment will be made for the length of sewer cleaned. If CCTV inspection cannot be completed, measure the distance between manholes and record distance not televised on the inspection form.

C. All solids shall be removed from the downstream manhole or force main access point of each section being cleaned. The cleaning operation shall start at the upstream end of the

reach and proceed downstream. The solids collected shall be removed from the site and disposed of at an appropriate disposal location. Reasonable quantities of water for the cleaning operation shall be provided by the Owner. Any water required for re-cleaning shall be provided by the Contractor at no additional cost to the Owner.

3.4 ROOT REMOVAL

A. Roots shall be removed. Special attention should be used during the cleaning operation to assure the removal of 98% of roots from the joints. Any roots which could prevent the seating of a packer, the proper application of chemical sealants, or affect the quality of pipe lining, shall be removed. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. Chemical root treatment may be used at the option of the Contractor.

3.5 CHEMICAL ROOT TREATMENT

A. To aid in the removal of roots and at the option of the Contractor, sewers that have root intrusion may be treated with an approved herbicide. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation. Any damaged vegetation so designated by the Engineer shall be replaced by the Contractor at no additional cost to the Owner. Adhere to safety precautions recommended by the manufacturer concerning handling and application of the herbicide.

3.6 CAST IRON PIPE CLEANING

A. The designated sewer sections shall be cleaned to remove scaling, tuberculation, mineral deposits, and other materials and obstructions from cast iron sewer mains. Cleaning shall include multiple passes to return the internal diameter of the pipe to 98% of the initial diameter and provide a surface acceptable for installation of a pipe liner as determined by the engineer.

3.7 REMOVAL OF INTRUDING SERVICE LATERALS

A. Service laterals that are intruding into the sewer main more than 1/2-inch shall be cut flush with the pipe wall during cleaning to facilitate access for cleaning and CCTV inspection. The cutting shall be accomplished using an internal robotic cutter specifically designed for this type of work. The internal cutter(s) shall be capable of cutting PVC, vitrified clay, cast iron, and ductile iron. Cut pieces of the service connection shall be removed from the sewer main.

B. Intruding laterals shall not be broken off with chain knockers or similar devices that can damage the pipe. Laterals removed in this manner will be excavated and a new connection made in accordance with Construction Specification Section, 33 31 00, Sanitary Utility Sewerage Piping, by the Contractor at no expense to the Owner.

3.8 ACCEPTANCE

A. Acceptance of the cleaning of sewer lines shall be dependent upon the results of the post-cleaning/pre-rehabilitation CCTV inspection. Sewers that are not acceptably clean to permit CCTV inspection and evaluation, or the subsequent lining installation, shall be re-cleaned and re-inspected until they are clean to the satisfaction of the Engineer. Subsequent cleaning and inspections will be at no additional cost to the Owner.

B. After the completion of the cleaning and CCTV inspection, submit documentation in accordance with Construction Specification Section 33 01 30.11, CCTV Inspection of Sewers.

END OF SECTION

SECTION 33 01 30.42
CLEANING OF MANHOLES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleaning of Manholes in Preparation for Inspection and Rehabilitation.

B. Related Requirements:

1. Construction Specification Section 33 01 30.62, Manhole Rehabilitation.

1.2 REFERENCES

A. Abbreviations and Acronyms

1. The following is a partial list of typical abbreviations and acronyms used in this section. See Construction Specification Section 01 40 00, Quality Requirements, for additional abbreviations and acronyms used throughout the Contract Documents.

CCTV Closed-circuit television

B. Definitions

1. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

2. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

C. Reference Standards: See Construction Specification Section 01 40 00, Quality Requirements, for a list of reference standards used throughout the Contract Documents.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Cleaning shall not proceed until the submittals have been approved by the Engineer and returned to Contractor and proper notification has been given to Owner.

B. Pre-installation Meetings:

1. Conduct a Pre-installation Meeting concurrently with the CCTV Inspection Pre-installation meeting if required by Engineer or Owner.

2. Review the following:

a. Identify the Equipment Operator.

b. Equipment Type and Operation.

c. Bypass Pumping Plan.

d. Sequencing.

e. Scheduling.

1.4 ACTION SUBMITTALS

A. Provide submittals in accordance with Construction Specification Section 01 33 00, Submittal Procedures.

B. Manufacturer's Affidavits: Manufacturers shall furnish a performance affidavit stating that material, and other products provided have been manufactured and tested in accordance with the requirements of the applicable referenced Standards.

C. Product Data: Submit product data for cleaning equipment and products. Provide Material Safety Data Sheets (MSDS) for cleaning products.

1.5 INFORMATIONAL SUBMITTALS

A. Safety Plan including confined space entry protocol to meet OSHA requirements.

1.6 CLOSEOUT SUBMITTALS

A. Record Documentation: Video or photographs of cleaned manhole immediately prior to rehabilitation.

1.7 QUALITY ASSURANCE

A. Comply with Construction Specification Section 01 40 00, Quality Requirements.

B. Qualifications:

1. Provide operators that can demonstrate experience with cleaning manholes and structures.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with Construction Specification Section 01 60 00, Product Requirements, for transporting, handling, storing, and protecting products.

1.9 FIELD CONDITIONS

A. Existing Conditions:

1. Manholes to be rehabilitated under this Contract are old and may be in very poor structural condition. Use extreme caution during cleaning of manholes. If cleaning operations begin to damage manhole, stop cleaning that manhole and report the condition to the RPR immediately.

PART 2 – PRODUCTS

2.1 CLEANING PRODUCTS

A. Dispose of cleaning products as recommended by the MSDS.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that the size, location, and invert of the existing sanitary sewer manholes are as indicated on the Drawings.

3.2 PREPARATION

A. Protect in-place conditions in accordance with Construction Specification Section 02 01 00, Maintenance of Existing Conditions.

B. Bypass wastewater flow from pipes entering the manhole in accordance with the Bypass Pumping Plan where the manhole cannot be completely cleaned and inspected when directed by the Engineer or Owner.

C. Remove manhole steps by cutting flush with the inside wall of the manhole.

3.3 CLEANING

A. Clean the interior surfaces of the manhole of debris, dirt, oil, grease, remains of old coating materials, and any other extraneous materials.

B. Pressure wash manhole walls with high-pressure water blasting at approximately 2,000 to 5,000 psi to remove loose mortar, concrete, debris, and grease and oil residues and to prepare the surface to ensure a reliable mechanical bond with the coating system.

C. Remove debris from the manhole and incoming sewer connections. Do not discharge debris downstream through the sanitary sewer system.

D. Wastewater from cleaning operations can be discharged to the Owner's sewer provided solids have been removed and the wastewater has been filtered through a de-silting device.

E. Properly dispose of debris and residue from cleaning operations at a suitable landfill in accordance with local, state, and federal requirements.

3.4 REPAIR AND RESTORATION

A. Repair manholes or structures damaged by cleaning operations.

3.5 FIELD QUALITY CONTROL

A. Make provisions for the RPR to enter the manhole in accordance with OSHA requirements to observe the condition of the cleaned manhole.

END OF SECTION

SECTION 33 01 30.81
MANHOLE AND WETWELL REHABILITATION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rehabilitation of Sanitary Sewer Manholes and Wastewater Pumping Station Wetwells. Requirements for wetwells are as stated for manholes.

B. Related Requirements:

1. Construction Specification Section 33 01 30.42, Cleaning of Manholes.

1.2 REFERENCES

A. Abbreviations and Acronyms: See Construction Specification Section 01 40 00, Quality Requirements, for additional abbreviations and acronyms used throughout the Contract Documents.

B. Definitions:

1. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

2. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

C. Reference Standards: Below is a partial list of referenced Standards. See Construction Specification Section 01 40 00, Quality Requirements, for a list of reference standards used throughout the Contract Documents.

1. ASTM F2551: Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes

2. ASTM C150: Standard Specification for Portland Cement Type I

3. ASTM C33: Standard Specification for Concrete Aggregates

4. ASTM C78: Standard Test Method for Flexural Strength of Concrete; Using Simple Beam with Third Point Loading

5. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

6. ASTM C157: Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

7. ASTM C267: Test Methods for Chemical Resistance of Mortars, Grouts and Monolithic Surfacings and Polymer Concretes

8. ASTM C293: Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)

9. ASTM C309: Specification for Liquid Membrane-Forming Compounds for Curing Concrete

10. ASTM C321: Standard Test Method for Bond Strength of Chemical-Resistant Mortars

11. ASTM C348: Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

12. ASTM C494: Standard Specification for Chemical Admixtures for Concrete

13. ASTM C496: Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

14. ASTM C666: Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

15. ASTM C882: Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Rehabilitation shall not proceed until the submittals have been approved by the Engineer and returned to Contractor.

2. Coordinate work with Owner.

3. Conduct installation operations and schedule work and cleanup in a manner that causes the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners and tenants.

B. Pre-installation Meetings:

1. Review the following:

a. Product and System Installers.

b. Equipment Type and Operation.

c. Bypass Pumping Plan.

d. Sequencing.

e. Scheduling.

1.4 ACTION SUBMITTALS

A. Provide submittals in accordance with Construction Specification Section 01 33 00, Submittal Procedures.

B. Manufacturer's Affidavits: Manufacturers shall furnish a performance affidavit for each product and system stating that the product or system is in compliance with the requirements of this specification and with applicable standards (ASTM, AASHTO, etc.) for production and testing.

C. Product Data/Shop Drawings: Submit product data/shop drawings for rehabilitation and replacement materials, products, and systems.

1. Product and system material type and manufacturer, including catalog data sheets, ASTM references, material composition, manufacturer's recommended specifications, component physical properties, and chemical resistance.

2. Manufacturer's recommended procedures for handling and storing materials, including a proposed method for monitoring temperatures of the storage location, if applicable, to the specific product or system.

3. Manufacturer's detailed description of the recommended material installation or application process, including mixing, additives, set time, cure time (return to service), and equipment required for quality product delivery.

4. Technical data sheets describing each rehabilitation component to be applied or installed, stating the expected longevity of the component in a wastewater environment. Data shall be based on independent third party tests.

5. Manufacturer's detailed description of required field testing processes and procedures.

6. Copies of independent testing performed on the rehabilitation component, indicating that the product meets the requirements of the Contract Documents and the manufacturer's design.

7. Project specific data for manhole repair materials to be used in conjunction with each rehabilitation component(s), including application cure time and surface preparation procedures.

8. Certification that backup installation equipment is available on the job site or can be delivered to the job site by the morning of the next business day.

9. Shipping information, including shipped item, manufacturer, stock and lot number, date shipped, origination and delivery locations, shipping method, and carrier.

10. All shipping, storage, and safety requirements, including MSDS documents.

11. Date delivered to project site, including name and signature of receiver.

D. Qualification Statements:

1. Submit information to document the experience of the Contractor, proposed project manager, superintendent, and other lead personnel performing work on this contract, as described in under Qualifications below. Submit ten projects completed in the last three years by both contractor and on-site superintendent to include owner name, address, telephone number, contact person, date and duration of work, location, and product information.

2. Current documentation from the product manufacturer certifying that the installer's training, personnel, and equipment comply with their product Quality Assurance requirements.

3. Certified statement from the manufacturer that the Contractor and installer are approved installers of the products and systems. Include certificates of completed training for each crew member involved in each product.

E. Delegated Design Submittals: Where structural rehabilitation is required by the Contract Documents, provide design calculations, sealed by a registered Professional Engineer, indicating that the rehabilitation product or system is designed for the existing project site conditions and conditions the structure will be exposed to during the service life. Design calculations shall be supported by third party material testing. Structural rehabilitation consists of application of build-back materials or liners that support a portion or all of the earth, hydrostatic, and dynamic loadings.

F. Test and Evaluation Reports: Provide testing data that documents product service life.

G. Bypass Pumping Plan: In accordance with Construction Specification Section 01 51 00 Bypass Pumping as applicable.

H. Installation Plan:

1. Describe procedures for cleaning and preparing the manhole structure prior to application or installation, pre-inspections, substrate testing, verification of acceptability of the products and systems to be applied, sewage flow maintenance, traffic control, installation procedures, and quality control.

2. Indicate tools and equipment required for a complete application or installation. Identify which tools and equipment will be redundant on the job site in the event of equipment breakdown. Outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process.

I. Installation Schedule: A detailed installation schedule that includes components of the installation plan.

J. Quality Control Plan (QCP): A detailed plan including the following:

1. Detailed descriptions of the proposed quality controls to be performed by the Contractor.

2. Defined responsibilities of each of the Contractor’s personnel for assuring that quality control requirements are met.

3. Proposed procedures for quality control, product sampling, and testing shall be defined.

4. Proposed methods for product performance controls, including method of and frequency of product sampling and testing both in raw material form and cured product form, as applicable.

5. Schedule for performance and product test result reviews at progress meetings.

6. Inspection forms and guidelines for quality control inspections prepared in accordance with these specifications.

7. A checklist containing key elements of the product or system criteria, represented in the QCP, for the Owner’s representative to ensure that quality control and testing requirements are performed in accordance with the Contract Documents.

8. Proposed methods and procedures for product or system repair or replacement in the event of product defects or total failure.

K. Product or System Repair or Replacement:

1. Manufacturer shall outline specific repair or replacement procedures for potential issues and defects that may occur during the application of the products and systems. Repair or replacement procedures shall be as recommended by the product or system manufacturer, subject to the approval of the Engineer.

2. A detailed step-by-step repair procedure, resulting in a finished product meeting the projected service life of the product or system and requirements of these Contract Documents, shall be provided by the manufacturer

3. Issues and defects that will not affect the operation and long-term life of the product shall be identified and defined by the manufacturer and subject to the approval of the Engineer.

4. Un-repairable issues or defects shall result in the removal and replacement of the product or system.

5. Contractor shall receive no additional compensation for the repair or replacement of products or systems deemed non-conforming to the requirements of the Contract Documents by Engineer and unacceptable by Owner.

L. Installation Records: For each manhole rehabilitation, a complete and accurate record of products and systems installed or applied. The record shall include identifying manhole number, location, and quantities of rehabilitation components installed.

M. Field Quality Control Submittals: Submit quality assurance documentation and test reports for products and systems installed or applied.

1.5 INFORMATIONAL SUBMITTALS

A. Safety Plan:

1. Submit a Safety Plan to Engineer prior to beginning any work. Engineer will forward it to Owner without review.

2. Plan shall identify competent persons, equipment, operating procedures, and emergency procedures to be implemented in the event of a safety incident. The Plan shall provide a description of a daily safety program and regular safety meeting for the project. Work shall be conducted in accordance with the Contractor's submitted Safety Plan.

3. Conform to work safety requirements of pertinent regulatory agencies and secure the site for working conditions in compliance with the same. Erect signs and other devices as necessary for the safety of the work site.

4. Perform Work in accordance with applicable OSHA safety standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for manhole rehabilitation components.

5. Maintain on the project site at all times the following minimum safety equipment:

a. Gas monitor capable of testing and detecting for combustible gas, oxygen deficiency, and hydrogen sulfide.

b. Confined space access and retrieval winch system.

c. Ventilating fans with large diameter ventilating hose.

d. Supplied air respirator, MSHA/NIOSH-approved type.

e. Safety harness and life lines.

f. Other equipment as required for a specific project.

6. All equipment shall be available for use in sufficient quantity by Contractor, Engineer, and Owner for the duration of the project.

7. All entries into or work within confined spaces shall be conducted in accordance with the U.S. Department of Health and Human Services/National Institute for Occupational Safety and Health [DHHS (NIOSH)] Publication No. 87-113, A Guide to Safety in Confined Spaces.

1.6 CLOSEOUT SUBMITTALS

A. Record Documentation: Installation records.

1.7 QUALITY ASSURANCE

A. Comply with Construction Specification Section 01 40 00, Quality Requirements.

B. Manhole rehabilitation shall be accomplished by the application or installation of rehabilitation components either individually or together as a system. When installed, the rehabilitation component or system shall seal the manhole from infiltration and inflow, rebuild it structurally where structural integrity has been lost, and provide chemical resistance and protection from damage during the specified service life.

C. Rehabilitation shall eliminate water infiltration into the manhole and prevent water or vapors to leak out of the manhole through pin-holes or other defects. If leakage occurs through a rehabilitation product, the product shall be repaired or removed and replaced as required by the Engineer. Repair materials shall have the same estimated life expectancy as the initial installed product.

D. Rehabilitation systems shall be completely integrated and compatible.

E. Rehabilitation products and systems shall be designed for a 30-year service life unless otherwise specified. Products and systems shall be free of defects that will affect the service life and operation of the manhole.

F. Manhole rehabilitation shall cause no adverse effects to Owner’s facilities and processes either during or after application. Product installation shall not result in the formation or production of detrimental compounds or by-products in the wastewater collection system and treatment system. Notify Owner if by-products are produced as a result of installers operations. Identify by-products, test and monitor levels, and comply with Owner requirements to rectify the situation. Comply with local waste discharge requirements.

G. Qualifications:

1. Products:

a. For a manhole coating or lining product to be accepted, a minimum of 5,000 vertical feet of installation shall be documented in the previous 3-year period.

b. For products other than coatings or linings, a minimum of 3 years of successful installation shall be documented.

2. Contractors / Installers / Applicators:

a. Fully qualified, trained, experienced, and equipped to complete the installation expeditiously and in a satisfactory manner.

b. Certified and licensed by the product manufacturer to install the product.

c. A minimum of 10 project references indicating the successful application of the rehabilitation products and systems shall be provided. For a project to be accepted as a reference, it shall include the same products proposed for this project applied in a similar project environment.

H. Certifications:

I. Field Samples:

1. Field samples shall be taken and maintained in accordance with manufacturer requirements and in an environment that best replicates the installed product.

2. Failure to properly take and maintain field samples will not be an acceptable excuse for failed testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with Construction Specification Section 01 60 00, Product Requirements, for transporting, handling, storing, and protecting products.

B. Delivery and Acceptance Requirements:

1. Deliver materials to job site in undamaged, unopened containers bearing manufacturer's original labels.

C. Handling and Storage Requirements:

1. Handle and store materials in accordance with manufacturer recommendations and their material safety data sheets.

2. Keep rehabilitation component materials dry. Protect from weather. Store under cover.

3. Store polymer and cementitious protective coating materials at temperatures as recommended by the manufacturer. Do not store near flame, heat or strong oxidants.

1.9 FIELD CONDITIONS

A. Existing Conditions:

1. Manholes to be rehabilitated under this Contract are old and may be in very poor structural condition. Use extreme caution during rehabilitation. If a manhole begins to deteriorate during rehabilitation, stop rehabilitation of that manhole and notify the RPR immediately.

1.10 WARRANTY

A. Special Warranty:

B. The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the products and systems to be free from

defects in raw materials for one year after installation and from the date of acceptance by the Owner.

C. Warrant the installation of the products and systems for a period of one year. During the one-year warranty period, if the products and systems fail, delaminate, peel, or show any defect which may materially affect the integrity, strength, function, and/or operation of the manhole structure, it shall be repaired at the Contractor's expense. Repairs shall be made in accordance with the procedures included in Product or System Repair or Replacement found in Part 1 of this construction specification.

D. Visual warranty inspections shall be performed by the Owner and Contractor to determine integrity of product and system materials and water-tightness three months before the expiration of the guarantee period. If possible, inspections should be performed in the spring during high groundwater and frequent rainfall events. Twenty-five percent of the manholes renewed shall be inspected at locations randomly selected by the Owner. No infiltration or inflow shall be visible in the renewed manhole. If any product or system fails the warranty inspection, clean and inspect all product and systems installed with Owner.

PART 2 – PRODUCTS

2.1 GENERAL

A. Products shall be designed for exposure to typical chemicals found in or released from domestic sewage and the project conditions.

2.2 CHEMICAL GROUTS:

A. In accordance with ASTM F2414, Standard Practice for Sealing Sewer Manholes Using Chemical Grouting.

B. Specifically define the type(s) of chemical grout proposed for the project with justification for use. Furnish either acrylic or urethane (hydrophobic or hydrophilic) based grout depending on the specific application and project conditions. The type(s) of grout shall be in accordance with the manufacturer's recommendation for the specific application subject to the approval of the Engineer.

C. Provide a chemical sealant solution containing principal chemical sealant constituent, initiator (trigger), and catalyst specifically recommended for the purpose of sealing leaks in manholes. Chemical sealant constituent, initiator, and catalyst shall be compatible when mixed. The solution shall have ability to tolerate dilution and react in moving water. After final reaction, it shall be a stiff, impermeable, yet flexible gel. The grout proportions shall be such that dilute aqueous solutions, when properly catalyzed, will form stiff gels. Materials provided shall gel in a predetermined time period when exposed to normal groundwater pH ranges and be capable of formula adjustments to compensate for changing conditions. Final reaction shall produce a continuous, irreversible, impermeable stiff gel and shall not be rigid or brittle.

D. Grout shall exhibit the following properties:

1. Controllable reaction times and shrinkage through the use of chemicals supplied by the same manufacturer. The minimum set time shall be established so that adequate grout travel is achieved.

2. Resistance to chemicals, most organic solvents, mild acids, and alkali.

3. Non-toxic in its cured form.

4. Sealing material shall not become rigid or brittle when subjected to a dry environment. The material shall be able to withstand freeze/thaw and moving load conditions as verified by third-party testing.

E. Identify additives to be used and furnish references of successful use in similar applications. Select grout and additives based on the chemical and physical properties and depending on the specific application, project conditions, and requirements of the Contract Documents.

F. Adjust grout conditions for catalyzing the reaction, inhibiting the reaction, lowering the freezing temperature of the grout solution, adding fillers, providing strength, and inhibiting root growth in accordance with the grout manufacturer's recommendations.

G. Mix and handle chemical grout in a manner that minimizes hazards to personnel and in accordance with the manufacturer's recommendations. Provide appropriate protective measures to ensure that chemicals are handled only by trained, authorized personnel. Equipment used to install the grout shall be as recommended by the manufacturer. Only personnel thoroughly familiar with the grouting material and meeting the qualification requirements specified herein, shall perform the actual grouting operation.

2.3 CEMENTITIOUS RESTORATION AND COATING MATERIALS

A. General:

1. Cementitious restoration material designed for structural build-back, infiltration and inflow abatement, corrosion resistance, and repair of inverts.

2. Materials applied to a structure shall be compatible.

3. Mix and apply in accordance with manufacturer's recommendations.

B. Infiltration Control – Cementitious Material:

1. Fast-setting materials, designed specifically for leak control in manholes or related structures, applied in dry powder form directly to active leaks under hydrostatic pressure with no prior mixing of water.

2. Minimum Physical Properties:

a. Compressive Strength (ASTM C109):

i. 1 day: 2,500 psi
ii. 28 days: 5,000 psi
iii. Standard Test Method for Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel

b. Pull-out Strength (ASTM C1583): 14,000 lbs

c. Shrinkage (ASTM C596): 0 % @ 90% RH

d. Freeze Thaw Resistance (ASTM C666): 100 cycles, no loss

e. Set Time at 70 degrees F: 90 seconds maximum

C. Infiltration Control - Oakum Water Plugs:

1. Rapid-setting, oil-free oakum meeting Federal Specification HH-P-117 and hydrophilic grout to seal active water leaks prior to application of other rehabilitation materials.

2. Two-part Urethane Resin.

3. Initial Set Time: 5 – 10 minutes

D. Invert Repair and Patching Materials:

1. Designed to fill large voids in manhole walls and repair or reconstruct inverts where no hydrostatic pressure exists. Materials shall consist of rapid-setting cements, monocrystalline quartz aggregates, and accelerating agents, and contain no chlorides or metallic particles.

2. Minimum Physical Properties:

a. Compressive Strength (ASTM C109)

i. 1 day: 3,500 psi
ii. 28 days: 5,000 psi

b. Bond Strength (ASTM C321)

i. 1 day: 140 psi
ii. 28 days: 2,000 psi

c. Shrinkage (ASTM C596): 0 % @ 90% RH

E. Cementitious Coating (Liner) Materials for Manhole Walls and Benches:

1. Cement-based, poly-fiber reinforced, shrinkage-compensated, and enhanced with chemical admixtures and siliceous aggregates, designed for rehabilitation of manholes and other wastewater structures.

2. Apply with equipment specifically designed for either low-pressure spraying or centrifugal spin casting of cement mortars.

3. Capable of placement in 1/2-inch to 2-inch thickness in one monolithic application. Provide 1-inch thickness on manholes.

4. Minimum Physical Properties:

a. Compressive Strength (ASTM C109), 28-day: 9,000 psi

b. Tensile Strength (ASTM C496/C496M): 800 psi

c. Flexural Strength (ASTM C293): 1,500 psi

d. Bond Strength (ASTM C1583/C1583M), 28-day: 2,000 psi

e. Shrinkage (ASTM C596): 0 % @ 90% RH

f. Freeze-Thaw Resistance (ASTM C666): 300 cycles, no loss

g. Permeability (AASHTO T-277): Not to exceed 400 coulombs

h. Material Wet Density: Minimum 122 pcf

5. Suitable for the Following Conditions as Specified on the Drawings:

a. Low to Mild Hydrogen Sulfide Environments (pH > 2.0): Manufactured from Type II Portland cement, and enhanced with silica fume, containing poly-fiber reinforcement, chemical admixtures, and siliceous aggregates.

b. Harsh Hydrogen Sulfide Environments (pH < 2.0): Manufactured from 100% pure calcium aluminates or Microsilica-based cements and enhanced with high-density chemically stable aggregates, containing poly-fiber reinforcement, and chemical admixtures.

2.4 CHIMNEY FRAME SEALS

A. General:

1. Manhole frame sealing includes the sealing of the frame joint area and the chimney above the cone of the manhole with either a manufactured or applied internal flexible seal.

2. The seal shall be designed to prevent leakage of water into the manhole.

B. Mechanical Frame Seal:

1. The flexible sleeve portion of the seal shall be extruded or molded from a high-quality rubber compound, which conforms to the resilient material properties prescribed in ASTM C 923, Table 1.

2. The sleeve shall have an unexpanded vertical height sufficient to seal the entire grade adjustment area and be corrugated or pleated to allow for vertical and horizontal movement.

3. The upper and lower sections of the sleeve that compress against the frame casting and manhole chimney or cone shall have an expansion band recess capable of restraining the band during expansion and after installation.

4. Extensions used in conjunction with the sleeve to increase chimney coverage shall be manufactured of the same material in conformance with ASTM C923, Table 1, and be designed with an extension flap that fits into or behind the expansion band recess allowing for joining the components with an expansion band.

5. The expansion bands used for compressing the sleeve and extensions against the manhole shall be fabricated stainless steel, conforming to the applicable Section 4.2 of ASTM C 923. The manufacturer’s mechanism used to expand the bands shall have the capacity to develop sufficient pressure to create a watertight seal. The bands shall be permanently held in the expanded position with a positive locking mechanism that conforms to the applicable Section 4.2 of ASTM C 923.

6. The installed internal seal nor its appurtenances shall extend far enough into the manhole opening to prevent or unduly restrict manhole entry. If the seal is constructed of another flexible material, it shall have both tensile and tear strength equal to or greater than that of the natural or synthetic rubber when tested in accordance with the applicable ASTM procedures.

7. Physical Properties: Extruded or molded from a high-grade rubber compound per ASTM C923.

8. The installed seal shall remain flexible to allow for repeated vertical movements of the frame due to frost lift, ground movement, or other causes and repeated horizontal movement of the frame due to thermal movement of pavement or other causes.

C. Polymer Chimney Seal:

1. Polymer manhole chimney seals shall be designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including extensions to the chimney area. Extensions shall include, but are not limited to, lifting rings, brick, and/or block material that may have been used to achieve grade.

2. The polymer chimney seal material shall be corrosion resistant.

3. Mil thickness shall be determined by the manufacturer.

4. The polymer chimney seal may require a primer resin applied to the entire surface before application. The sealing system shall line the interior of the adjustment area from the cone/top of the manhole and onto the inside of the casting. If the manhole has been relined prior to the seal installation, the seal shall cover a minimum of 6 vertical inches to cover casting cone interface.

2.5 MANHOLE LINING:

A. All interceptor/outfall manholes on sewers 12 inches and larger, or manholes receiving force main discharge, shall be internally lined with an approved coating to prevent deterioration resulting from hydrogen sulfide.

B. Interior surfaces shall be coated with a multi-coat, ultra high-build hydrogen sulfide corrosion resistant liner free of pinholes. Surface shall be prepared and product shall be installed in strict accordance with manufacturer's written instructions.

C. The following coatings systems are acceptable:

Product	Surface Prep	Prime/Build back	Intermediate	Finish
Duramer 1030 Series (Two component coating system)	Physically remove loose particulates, acid etch smooth surfaces, power wash all surfaces	1.5 mil DFT	45 mil DFT	10 mil DFT
Raven 405 (ultra high-build epoxy system)	SSPC-SP13/ NACE 6	Raven 755 reinforced cementitious build-back as required for proper finish coat, ½" minimum thickness	n/a	Raven 405 ultra high-build epoxy, 150 mil DFT
TNEMEC 218/435 Series (ultra high-build epoxy system)	SSPC-SP13/ NACE 6	TNEMEC Series 218 Epoxy Cementitious Resurfacer, thickness as required to fill all voids and pinholes, ¼-inch minimum thickness	TNEMEC Series 434 Perma-Shield Aggregate Reinforced Epoxy Lining, 125 mil DFT	TNEMEC Series 435 Perma-Glaze, 15 mil DFT
Spectrashield (polyurethane/ polymetric foam and modified polymer corrosion barrier)	SSPC-SP13/ NACE 6	Spectrashield modified polymer moisture barrier, 40 mil DFT	Spectrashield polyurethane/ polymetric blend foam, 400 mil DFT	Spectrashield modified polymer corrosion barrier, 60 mil DFT

2.6 MANHOLE ADJUSTMENT MATERIALS

A. Adjusting Collars: Designed and manufactured in accordance with ASTM C478, "Standard Specification for Precast Reinforced Concrete Manhole Sections," and AASHTO M199, "Standard Specification for Precast Reinforced Concrete Manhole Sections." Design for H20-44 loading in road right-of-ways.

B. In roadways, manhole adjustment materials shall be in accordance with NCDOT Standard Specification Section 858, Adjustment of Catch Basins, Manholes, Drop Inlets, Meter Boxes and Valve Boxes.

2.7 MANHOLE FRAMES AND COVERS

A. Comply with ASTM A48 Standard Specification for Gray Iron Castings, Class 35B, traffic frame and cover. They shall be free from holes, shrinkage cracks, or other defects. The bearing surface of the frames and covers shall be machined and the cover shall seat

firmly into the frame without rocking. Cover shall be solid without vent holes except at locations of air release or combination valves. Standard cover shall include two non-penetrating pick holes. Cover shall read “SANITARY SEWER”. Cast iron manhole frames and covers shall be given one shop coat of asphalt or coal tar varnish, unless otherwise specified.

B. The minimum clear opening shall be 24 inches.

C. The minimum average frame weight shall be 190 pounds. Weights shall not vary more than 5% +/- from the weight shown on the Drawings.

D. Watertight Frames and Covers:

1. Provide watertight bolt-down frames and covers where manhole tops are set lower than 1-foot above the 100-year base flood elevation. Watertight bolt-down frames and covers shall have 4 stainless steel bolts at 90 degrees from one another and one polyvinyl gasket between cover and frame seat.

2. For watertight frames and covers on flat top manholes, frame shall be cast into the top.

E. Acceptable manufacturers and models are:

Manufacturer	Standard	Watertight
Capitol Foundry		
US Foundry		
East Jordan Iron Works		
Sigma Corporation		

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Verify that the size, location, and invert of the existing sanitary sewer manholes are as indicated on the Drawings.

B. Evaluation and Assessment:

1. Inspect and evaluate the condition of the manhole prior to rehabilitation and notify the Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work where unsatisfactory conditions have been identified until a plan has been developed to resolve the unsatisfactory conditions.

3.2 PREPARATION

A. Bypass wastewater flow around the manhole in accordance with the Bypass Pumping Plan. Plug pipes entering manhole to prevent debris from entering pipes. If work inside of a manhole is approved without bypassing flow, install a straining device or catch bucket, acceptable to the Engineer, prior to performing any work to prevent construction debris from entering down-stream pipes.

B. Clean manhole in accordance with Construction Specification Section 33 01 30.42, Cleaning of Manholes.

C. Demolish irregularities in walls and invert. Remove invert where indicated on the Drawings.

D. Remove manhole steps.

E. Re-inspect manhole to determine methods of stopping leaks and applying patch repairs. Notify the RPR immediately if proposed methods differ from the Drawings.

F. Confirm that materials proposed for the rehabilitation of the manhole are compatible with each other. Do not use materials that have not been verified for compatibility.

3.3 GENERAL

A. Install rehabilitation products and systems with equipment recommended by manufacturer and in strict accordance with manufacturer's installation procedures.

3.4 CHEMICAL GROUTING

A. Install chemical grouts in accordance with ASTM F2414, Standard Practice for Sealing Sewer Manholes Using Chemical Grouting.

B. Grouting operations shall be performed in the manner prescribed in the manufacturer's published data during periods with acceptable temperatures.

C. Grouting shall only be performed on a structurally sound manhole unless the grout is used to prevent water from entering the manhole during application of a lining or coating system. Structural repairs, adjustments to the frame and cover, and installation of grade rings shall be completed prior to beginning the grouting operation.

D. Seal manhole from individual points of infiltration/inflow or curtain grout to seal the entire manhole structure. If the entire manhole is to be sealed, grouting shall include corbel, wall, pipe seals, bench, and invert.

E. Drill grout injection holes in the manhole in strategic locations to re-direct flow coming through cracks and other defects in the wall, or to seal the entire exterior surface of the manhole, in accordance with the recommendations of the grout manufacturer.

F. Inject grout through the drilled holes using the recommended probe and application pressures that will effectively inject the grout, but not damage the manhole structure or the surrounding area.

G. Typically, inject grout through the lowest holes first, working the grout higher until the manhole is externally sealed with grout. Additional holes may be required to verify that the grout has encompassed the entire outside of the manhole.

H. Clean and patch the injection holes as recommended by the grout manufacturer.

I. Testing and Acceptance:

1. Visually inspect manhole for signs of infiltration. Eliminate infiltration into the manhole.

2. Vacuum test manholes that have been entirely sealed by curtain grouting.

3.5 CEMENTITIOUS RESTORATION

A. Sealing Active Leaks:

1. Cementitious sealing of active leaks consists of hand applying a dry quick-setting cementitious mix designed to instantly stop running water or seepage in concrete and masonry structures.

2. The area to be repaired shall be clean and free of debris.

3. Prepare crack or hole by chipping out loose material to the minimum depth recommended by the manufacturer.

4. Place a generous amount of the dry quick-setting cementitious material to the active leak, with a smooth fast motion, maintaining external pressure for 30 seconds, repeat until leak is stopped. Apply material in accordance with manufacturer's recommendations.

5. Proper application shall not require special mixing of product or special curing requirements after application.

6. Use of Oil-free Oakum Water Plugs:

a. Saturate oakum with resin, place, and cure in accordance with manufacturer's recommendations.

b. Use additives as required.

B. Wall and Invert Patch Repair:

1. Wall and invert patch repair consists of hand-mixing and applying a rapid-setting, high early strength, non-shrink patching material to fill large voids and repair manhole channels prior to spray lining of the manhole. For invert repairs, flow must be temporarily restricted by inflatable or mechanical plugs prior to cleaning.

2. The area to be repaired shall be clean and free of debris.

3. Mix water shall be clean and potable and require no additives or admixtures for use with cementitious patching materials.

4. Cementitious material shall be mixed with water in a mortar tub or five gallon pail per manufacturer's recommendations. Material should be mixed in small quantities to avoid setting prior to placement in voids or channels.

5. Once mixed to the proper consistency, the materials shall be applied to the invert or wall void areas by hand or trowel. In invert applications, care should be taken to not apply excessive material in the channel, which could restrict flow. Once applied, materials should be smoothed either by hand or trowel in order to facilitate flow.

6. Flows in channels shall be re-established when material has cured enough to withstand the flow as determined by the manufacturer.

C. Application of Cementitious Manhole Liner:

1. Application of cementitious manhole liner consists of troweling, spray applying, or centrifugally spin casting a cementitious-based liner to the inside of the existing

manhole. Follow manufacturer's recommendations for equipment and application methods to apply the cementitious-based liner materials.

2. Material shall be mixed with water in accordance with manufacturer's specifications. Once mixed to proper consistency, the materials shall be pumped via a rotor-stator style progressive cavity pump through a material plaster hose for delivery to the appropriate application device.

3. Where chimney seals are required in conjunction with the lining technology, contact the chimney seal manufacturer to determine the proper preparation required for effectively installing the chimney seal after the coating has been applied and has cured.

4. Material shall not be applied during freezing weather conditions. Material shall not be placed when the ambient temperature is 37 degrees Fahrenheit and falling or when the temperature is anticipated to fall below 32 degrees Fahrenheit during 24 hours.

5. Curing will take place once the manhole cover has been replaced. It is important that the manhole cover be replaced no more than 10-20 minutes after troweling is complete to avoid moisture loss in the material due to sunlight and wind.

6. Spray Application of Cementitious Material:

    a. Hose shall be coupled to a low-velocity spray application nozzle. The mortar shall be atomized by the introduction of air at the nozzle, creating a low-velocity spray pattern for material application.

    b. Spray application shall start at the manhole invert and progressing up the wall to the corbel and chimney areas.

    c. Material shall be applied to a specified uniform minimum thickness as required by the manufacturer and as necessary for proper curing and application with a minimum thickness of 1 inch. Material shall be applied to the bench area in such a manner as to provide for proper drainage.

    d. Material shall be troweled smooth to compact material into voids. A brush or broom finish may be applied when a top coating is desired.

7. Spin Cast Application of Cementitious Material:

    a. Hose shall be coupled to a high-speed rotating applicator device. The rotating casting applicator shall be positioned within the center of the manhole at either the top of the manhole chimney or the lowest point elevation corresponding to the junction of the manhole bench and walls.

    b. The high-speed rotating applicator shall then be initialized and pumping of the material shall commence. As the mortar begins to be centrifugally cast evenly around the interior of the manhole, the rotating applicator head shall be raised and lowered at a controlled speed that is conducive to providing a uniform material thickness on the manhole walls.

    c. Controlled multiple passes shall be made until the specified minimum finished thickness is attained. If the procedure is interrupted, stop the retrieval of the applicator head until flows return.

d. Material thickness may be verified with a depth gauge and shall be no less than a uniform 1 inch. If additional material is required at a particular level, the rotating applicator head shall be placed at that level and application shall continue until that area is thickened.

e. Material shall be applied only when manhole is in a saturated surface dry (SSD) state, with no visible water dripping or running over the manhole walls.

f. The low-velocity spray nozzle and the centrifugal spin casting head may be used in conjunction to facilitate uniform application of the mortar material to irregularities in the contour of the manhole walls and bench areas.

g. Troweling of materials shall begin immediately following the spray application. Initial troweling shall be in an upward motion, to compress the material into voids and solidify manhole wall. A brush or broom finish may be applied if top coating is desired.

8. Testing and Acceptance:

a. Visual inspection: Verify no infiltration, cracks, or loose material.

b. Vacuum Testing.

c. Cementitious Material Physical Property Testing.

3.6 CHIMNEY FRAME SEALS

A. Mechanical Frame Seal:

1. The contact surfaces for the sleeve and/or extensions shall be reasonably clean and smooth, circular, and free from excessive voids or defects. If the masonry surface is rough or irregular and will not provide an effective sealing surface, it shall be smoothed with a single component, non-shrink, quick set repair mortar designed for vertical and overhead use. Realign manhole frame and cover if offset is greater than 3 inches between the frame and top of the manhole structure.

2. After surface preparation is complete, and the rubber sleeve has been placed in the proper position, position the lower band in the band recess and expand as required to provide a water tight seal. If an extension or extensions are being used, place the extension in the proper position, insert the band into the lower band recess, and expand as required to provide a watertight seal.

3. Extension flap shall be placed into or behind the expansion band recess to allow for the compression of both the extension flap and sleeve against the manhole surface by the expansion band. Continue by placing the upper band or bands in the recess, insuring the seal is properly placed on the manhole cone, chimney, and frame and expand as required to provide an effective seal.

4. Install in accordance with the manufacturer’s recommendations.

5. Testing and Acceptance:

a. Visual Inspection.

b. Leakage Test: Following the expansion of the lower band, a quality assurance test shall be performed to ensure effective sealing by pulling the upper section of the seal or extension inward to create a recess behind the seal where water can be poured. Pour the water behind the seal and observe the lower sealing area for visible leaks. The sealing shall be considered effective if no water leaks from behind the seal at the lower sealing area.

B. Polymer Chimney Seal:

1. Loose and protruding mortar and brick that would interfere with the polymer chimney seal's performance shall be removed. Lips for gravel pan supports shall be cut off flush with the manhole casting. Loose material or excessive voids shall be repaired using a cementitious non-shrink patching material. Obtain from the polymer chimney seal manufacturer, in writing, the material compatibility and the recommended time required for the patching cement to properly cure prior to installing the polymer chimney seal.

2. Preparation of the chimney surface and casting may include high pressure water, sandblasting, wire brushing, or other methods as described by the manufacturer to ensure a clean surface. Active leaks shall be sealed by a method as recommended by the polymer chimney seal manufacturer prior to installing the chimney seal. After water or sandblasting, pressure wash the entire area to remove loose sand that may have been deposited. The substrate surface must be free of sand, loose debris, latencies, dust, oil, grease, and chemical contamination. A blower may be required to completely dry the substrate surface or as recommended by manufacturer.

3. The polymer chimney seal shall require the proper mixing of several components as recommended by the manufacturer. If a primer is required, ensure that surfaces are clean and dry before applying. After proper curing of the primer, the polymer chimney seal may be applied evenly by brushing over the entire chimney area, including the frame joint area and the area above the manhole cone, including extensions to the chimney area.

4. Installation procedures shall be in accordance with the manufacturer's recommended instructions.

5. Testing and Acceptance:

a. Visual Inspection: Final liner system shall be completely free of pinholes or voids.

b. Holiday Detection Test

c. Adhesion Testing

3.7 MANHOLE LINING

A. Surface Preparation and Interior Lining:

1. The concrete surface shall be clean, dry, free of oil, grease, or other contaminants, as required by the manufacturer of the lining. Any air pockets over 1/4-inch in diameter and 1/8-inch deep appearing on the concrete surface after cleaning shall be filled with an epoxy sand patching material. The epoxy sand patch shall be troweled and dry prior to the application of the lining. Any steel surfaces to be painted shall be solvent cleaned, or wire brushed prior to painting.

2. Perform manhole vacuum testing prior to installing liner.

3. Application of the lining and coating shall be by brush, roller, or spray system using equipment recommended by the manufacturer. The temperature during application and curing of lining and coating shall be as recommended by the manufacturer. Time between coats shall be as recommended by the manufacturer.

4. If the inside joint recess will be mortared and painted with a lining in the field, the manhole supplier shall not paint the inside vertical surfaces at the ends of the manhole. When the inside joints will not be mortared in the field, the manhole supplier shall paint the inside vertical concrete surfaces at each end of the manhole section. The paint shall be extended continuously over the front lip of the spigot and onto the sealing surface of the bell so that all interior joint surfaces that can be exposed to the fluid inside the manhole are coated.

3.8 MANHOLE ADJUSTMENT IN ROADWAYS

A. Where manholes are not flush with the existing pavement, raise or lower manholes to match the elevation of the existing pavement.

B. Adjust manholes in accordance with NCDOT Standard Specification Section 858, Adjustment of Catch Basins, Manholes, Drop Inlets, Meter Boxes and Valve Boxes.

C. Cut the existing road around the frame and cover in a square to an adequate depth that will allow the desired adjustments to be accomplished. Exercise care to not over-cut the corners.

D. The frame shall be positioned by placement on the correct number of adjusting collars. Adjusting collars shall be as shown on the Drawings. A maximum of two adjusting collars will be allowed to bring the frame and cover to finished grade. If additional height is required, a riser must be installed. Adjusting collars shall not be used on watertight manholes.

E. Final adjustments shall be made so that the manhole frame and cover will be smooth and flush with the finished grade of the adjacent surface, or as otherwise indicated on the Drawings for manholes shown above grade.

F. Install manhole frames and covers in accordance with manufacturer’s recommendations and the details provided on the Drawings.

G. Frames shall be well bedded in mortar or a bituminous base sealant shall be placed between the frame and concrete casting or grade adjustment ring. Frames shall be bolted down with at least four 1/2-inch diameter (minimum) Type 304 stainless steel anchor bolts.

H. Once the frame is properly positioned and secured, backfill, compact, and prepare subgrade around the manhole as specified in Construction Specification Section 31 23 33, Trenching and Backfilling, and Construction Specification Section 31 23 00, Excavation and Fill.

I. Where directed by NCDOT, backfill excavated areas in existing pavement with Class B Portland Cement Concrete. High early strength concrete may be used. Wait at least 72 hours after the placement of the concrete before placing surfacing or resurfacing material over the concrete. This time period will not be required where the strength of the concrete is at least 2,500 psi as evidenced by nondestructive tests made in place by a rebound hammer in accordance with ASTM C805.

J. In areas to be opened to traffic, construct a temporary ramp of asphalt plant mix 360 degrees around the adjusted structures within one calendar day after completing the adjustment. Construct the ramp with a tapered slope of not less than one foot per inch of height in traffic sections with a speed limit of less than 35 mph and 1.5 foot per inch of height to a maximum of three feet from the structure in traffic sections with a speed limit of 35 mph or higher. Construct the ramp using any type of asphalt surface course plant mix meeting the requirements of any job mix formula issued by NCDOT for a NCDOT project. Compact to an approved density.

3.9 REPLACE MANHOLE FRAMES AND COVERS

A. Remove the existing manhole frame and cover and dispose of in an approved manner.

B. Install manhole frames and covers in accordance with manufacturer recommendations and the details provided on the Drawings.

C. Frames shall be well bedded in mortar or a bituminous base sealant shall be placed between the frame and concrete casting or grade adjustment ring. Frames shall be bolted down with at least four 1/2-inch diameter (minimum) Type 304 stainless steel anchor bolts.

D. Frames shall be cast directly into the pre-cast concrete when shown on the Drawings.

E. The interior of cast iron manhole frames and covers shall be coated with the same interior lining material as the manhole.

F. Manhole frames and covers shall be located in such a manner that there is ready access to the manhole steps, if installed.

3.10 FIELD QUALITY CONTROL

A. General:

1. Upon completion of manhole restoration, the Owner or Engineer shall inspect the work and observe testing to verify that the work has been completed in accordance with the Contract Documents.

2. Inspection and final testing shall be performed in the presence of the Owner or Engineer. The Owner shall be notified at least 48 hours in advance of testing.

3. Provide the labor, equipment, and materials necessary to perform inspections and tests. Equipment and materials shall be checked and approved by the Owner or Engineer prior to their use.

4. Repair defects and damage and perform work necessary to bring the manholes into conformance with the Contract Documents at no additional cost to the Owner.

B. Preparation:

1. Upon completion of the installation, sewer manholes shall be cleaned with appropriate tools to remove dirt, rock, excess grout, debris, and other items from the manholes. None of these items shall be allowed to enter the existing sanitary sewer system.

2. Keep manholes and structures clean and free of debris.

C. Visual Inspection:

1. Visual inspections shall be performed by the Owner or Engineer.

2. Repair leaks or weeping visible from the inside of the manhole to provide a watertight installation. Where leaks indicate exterior defects and directed by the Owner or Engineer, excavate around the manhole and repair the exterior of the manhole. The extent and type of repairs shall be approved by the Owner or Engineer.

D. Manhole Vacuum Testing:

1. Manholes shall be tested by vacuum test after the manhole is rehabilitated and the cover frame castings are grouted in place.

2. Plug pipes with suitably sized and rated pneumatic or mechanical pipeline plugs. Place plugs a minimum of 6 inches beyond the manhole wall, taking care to securely brace the plugs and pipe. Stub-outs, manhole boots, and pipe plugs shall be secured to prevent movement during testing.

3. Manholes shall be tested from the top of the casting, including the casting-to-cone or adjusting collar joint.

4. Testing devices shall be installed on the iron manhole frame. Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer recommendations.

5. After the testing equipment is in place, a measured vacuum of 10 inches of mercury (Hg) shall be established in the manhole. The time for the vacuum to drop to 9 inches of mercury shall be 90 seconds or more.

6. If the manhole fails the test, locate the leakage, make the proper repairs, and repeat the vacuum test until the manhole passes the test.

7. If a manhole joint mastic material is completely pulled out during the vacuum test, the manhole shall be disassembled, the mastic replaced, and the manhole reassembled.

E. High Voltage Holiday Testing:

1. Perform high voltage holiday testing on pump station wetwells. Voltage shall be per manufacturer’s instructions for system installed. Identify defects and repair per manufacturer’s instructions to required minimum thickness.

3.11 PROTECTION

A. Protect manholes and appurtenances from damage until accepted into service by Owner.

END OF SECTION

SECTION 33 05 05.31

HYDROSTATIC TESTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Hydrostatic testing of pressure piping.

B. Related Requirements:
   1. Section 33 31 23 - Sanitary Sewer Force Mains, Valves and Appurtenances: Pipe materials and accessories normally encountered with municipal sanitary sewage force mains.
   2. Section 33 14 13 - Water Distribution Piping: Pipe materials and accessories normally encountered with pressurized water distribution systems.

1.2 REFERENCE STANDARDS

A. American Water Works Association:
   1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   2. AWWA C605 - Underground Installation of PVC

1.3 ADMINISTRATIVE REQUIREMENTS

A. The foreman of the contracting crew must speak fluent English.

B. Any event requiring a CFPUA representative to be present will require a minimum of two (2) business day notice to schedule the event.

C. No valves are to be operated unless a CFPUA representative is present. Any valves operated without a CFPUA representative present, or a directive may be subject to penalties in accordance with CFPUA's Ordinance.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittals.

B. Submit following items prior to start of testing upon request:
   1. Testing procedures.
   2. List of test equipment.
   3. Testing sequence schedule.
   4. Provisions for disposal of flushing and test water.
   5. Certification of test gage calibration.

C. Test and Evaluation Reports: Indicate results of piping tests.

D. Qualifications Statement:
   1. Submit qualifications for applicator upon request.

PART 2 PRODUCTS

2.1 HYDROSTATIC TESTING

A. Equipment:
   1. Pressure pump.
   2. Pressure hose.
   3. Water meter.
   4. Test connections.
   5. Pressure relief valve.
   6. Pressure Gage: Calibrated to 0.1 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping and appurtenances are installed and ready for testing.

C. Verify that trenches are backfilled.

D. Verify that pressure piping thrust restraints have been installed. Where any section of piping is provided with concrete thrust blocking, the hydrostatic test shall not be made until at least 5 days after installation of the concrete thrust blocking unless otherwise approved.

3.2 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Testing of Pressure Piping to be performed according to AWWA C600 (DIP), AWWA C605 (PVC) and the following as applicable:
   1. Hydrostatic testing procedure:
      a. Testing shall be performed in the presence of the CFPUA representative. Testing shall be scheduled with CFPUA a minimum of two business days in advance and shall not proceed until granted approval by CFPUA. The contractor will pre-test the lines prior to the CFPUA representative arrival. The contractor is to cancel the test if the lines will not pass the required test, correct all visible leakage, and locate and repair leakage in lines which exceeds the specified amounts. When completed, the contractor will re-schedule the test.
      b. Slowly fill with clean potable water portion of piping to be tested, expelling air from piping. Fill and test mains and services.
      c. Close air vents after air is expelled.

d. Raise pressure to specified test pressure. For purposes of testing, working pressure shall be 100 psi and test pressure shall be 150 psi. The pressure gauge must be liquid filled with 2 psi increments maximum. The gauge must be a minimum of three feet above grade. No more than 3 psi can be lost during the two-hour test. The gauge must return to 0 psi when the test is completed. There will be no allowable leakage. Air testing will not be accepted on mains and services, but will be accepted for tapping sleeves, 40 psi for 15 minutes or hydrostatic testing @150 psi for 15 min with zero pressure loss for both.
e. Observe joints, fittings, and valves undergoing testing.

2. Hydrostatic Testing Requirements for Pipe Burst Installations
   a. Subject pipe burst installations to a pressure test before connecting to direct bury mains. Testing shall be performed in the presence of the CFPUA representative. Testing shall be scheduled with CFPUA a minimum of two business days in advance and shall not proceed until granted approval by CFPUA.
   b. The pipe shall be filled with clean potable water and pressurized to 1.5 times the working pressure at the point of testing with a minimum of 150 psi, for a period of no less than 24 hours and then subjected to the specified test pressure.
   c. Pretest pipe burst installations for a period of 2 hours before notifying CFPUA that the main is ready for a final pressure test. No final pressure test shall begin after 2:00 pm.
   d. Perform testing as follows:
      1) Test pressure shall be at least 1.5 times the working pressure at the point of testing with a minimum of 150 psi. Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section. Test pressure shall not exceed the pipe or thrust restraint design pressure. Test pressure shall not vary by more than +/- 5 psi for the duration of the test.
      2) The pressure test duration shall be 2 hours.
      3) Ensure that the pipe is full of water and that the air has been removed before testing.
   e. Pressure testing is the responsibility of the Contractor, who shall provide materials, labor, and equipment.
3. If testing of piping and appurtenances indicates leakage greater than that allowed, locate source of leakage, make corrections, and retest until leakage is within acceptable limits.
4. Correct visible leaks regardless of quantity of leakage.

END OF SECTION

SECTION 33 05 13

PRECAST CONCRETE MANHOLES AND UTILITY STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Modular precast concrete manholes and structures with tongue-and-groove joints and masonry transition to cover frame, covers, anchorage, and accessories.

B. Related Sections:
   1. CFPUA Material Specification Manual (MSM)
   2. Section 01 51 00 – Bypass Pumping.
   3. Section 03 05 00 – Concrete.
   4. Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.
   5. Section 33 01 30.86 – Manhole Rim Adjustment.
   6. Section 33 14 22 – Testing of Sanitary Sewer Mains and Manholes.
   7. Section 33 31 11 – Sanitary Sewer Gravity Mains.
   8. Section 33 31 23 – Sanitary Sewer Force Mains, Valves and Appurtenances.

1.2 REFERENCE STANDARDS

A. American Association of State Highway Transportation Officials:
   1. AASHTO M91 – Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
   2. AASHTO M306 – Standard Specification for Drainage, Sewer, Utility, and Related Castings.

B. American Concrete Institute:
   1. ACI 530 – Building Code Requirements and Specification for Masonry Structures.

C. ASTM International:
   1. ASTM A48 – Standard Specification for Gray Iron Castings.
   2. ASTM A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM C32 – Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
   4. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
   5. ASTM C497 – Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
   6. ASTM C877 – Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
   7. ASTM C913 – Standard Specification for Precast Concrete Water and Wastewater Structures.
   8. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

1.3 QUALITY ASSURANCE

A. Perform Work according to ASTM and AASHTO standards and manufacturer's instructions.

1.4 WARRANTY

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Furnish a one-year manufacturer's warranty for concrete manholes and structures.

1.5 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures.

B. Submittals:
   1. Section 01 70 00 – Execution and Closeout Requirements.
   2. Product Data: Submit manufacturer information for manhole covers, component construction, features, configuration, and dimensions.
   3. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
   4. Shop Drawings:
      a. Indicate structure locations and elevations.
      b. Indicate sizes and elevations of piping, conduit, and penetrations.
   5. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
   6. Qualifications Statement: Submit qualifications for manufacturer.
   7. Project Record Documents: Record actual locations of manholes and connections, and record invert elevations.

1.6 SITE CONDITIONS

A. DELIVERY, STORAGE, AND HANDLING
   1. Section 01 60 00 – Product Requirements.
   2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
   3. Handling: Comply with precast concrete manufacturer instructions and ASTM C913 for unloading and moving precast manholes and drainage structures.
   4. Bent Reinforcing steel bars are not permitted for use as lifting devices.
   5. Lifting devices shall be evaluated and approved by the Engineer.
   6. Storage:
      a. Store materials according to manufacturer instructions.
      b. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.
      c. Repair property damaged from materials storage.
   7. Protection:
      a. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
      b. Provide additional protection according to manufacturer instructions.

B. EXISTING CONDITIONS
   1. Field Measurements:
      a. Verify field measurements prior to fabrication.
      b. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 MATERIAL SPECIFICATION MANUAL

A. Refer to CFPUA Material Specification Manual (MSM) for the following products:

MSM Section	Product
I	Castings and Access Covers
M	Coatings and Sealants
O	Structures

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements: Requirements for testing, inspection, and analysis.

B. Provide shop inspection and testing of completed assembly.

C. Verify that items provided have met factory testing requirements and are inspected upon delivery.

D. Certificate of Compliance:
   1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

2.3 MATERIALS AND ACCESSORIES

A. Lining Systems
   1. MSM Section M – Coatings and Sealants

B. Grouts
   1. MSM Section N - Concrete
   2. Section 03 05 00 - Concrete

C. Sewer Guards
   1. Stainless steel straps, anchors and sewer guards required at all Manholes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that items provided by other Sections of Work are properly sized and located.

C. Verify that built-in items are in proper location and are ready for roughing into Work.

D. Verify that excavation base is ready to receive Work and excavation dimensions and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.

B. Coordinate placement of inlet and outlet pipe or duct sleeves as required by other Sections.

C. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.

D. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.

B. Correct over-excavation with Class 1 aggregate.

C. Remove large stones or other hard matter impeding consistent backfilling or compaction.

D. Protect manhole and structures from damage or displacement while backfilling operation is in progress.

E. Excavating:
   1. As specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling and in indicated locations and depths.
   2. Provide clearance around sidewalls of manhole or structure for construction operations.
   3. If ground water is encountered, prevent accumulation of water in excavations, place manhole or structure in dry trench.
   4. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Engineer.

F. Base and Alignment:
   1. Install manholes and structures supported at proper grade and alignment on compacted crushed-stone bedding or piles as indicated on Drawings.
   2. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour to form continuous drainage channel.
   3. Form and place manhole or structure cylinders plumb and level, to correct dimensions and elevations.

G. Polymer Concrete / Coatings:
   1. Install polymer concrete manholes in applications involving force main discharges and in other designated locations as specified by CFPUA. These manholes shall come with a minimum warranty of 50 years. Grinder pump force mains and low-capacity force main discharge manholes may be coated with an approved lining system, contingent upon prior approval from CFPUA.
   2. Manholes 12-feet in depth and greater shall be polymer concrete.

H. Precast Concrete Manholes:
   1. Lift precast components at lifting points designated by manufacturer.
   2. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
   3. Assembly:
      a. Assemble multi-section manholes and structures by lowering each section into excavation.
      b. Install rubber gasket joints between precast sections according to manufacturer recommendations.
      c. Lower, set level, and firmly position base section before placing additional sections.
   4. Remove foreign materials from joint surfaces and verify that sealing materials are placed properly.
   5. Maintain alignment between sections by using guide devices affixed to lower section.
   6. Joint sealing materials may be installed on Site or at manufacturer's plant.
   7. Verify that installed manholes and structures meet required alignment and grade.
   8. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
   9. Cut pipe flush with interior of structure.
   10. Shape inverts through manhole and structures as indicated on Drawings.

I. Grouting:
   1. Section 03 05 00 – Concrete
   2. Verify all surfaces have been inspected and prepared for application. All surfaces shall be free of dirt, oil, grease, and other contaminants.
   3. Surface shall be clean, sound and roughened to ensure a sufficient bond.
   4. Surface shall be saturated up to 24 hours prior to application but free of standing water at the time of application.
   5. Provide sufficient support for items to be embedded into the work. Diagrams, templates, and other forms can be used to properly locate such items.
   6. Refer to Manufacturer’s instructions for proper grouting application and installation.
   7. Application shall be inspected immediately after and any defects repaired or removed for re-installation if directed by the Engineer.

J. Castings:
   1. Set frame and cover at finished grade for manholes and other structures with covers located within unpaved areas and graded away from cover.
   2. Set frames using mortar and masonry as indicated on Drawings.
   3. Lay concrete brick in full bed of mortar and completely fill joints.
   4. If more than one course of concrete brick is required, stagger vertical joints.

K. Backfilling: As specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.
   1. All structures shall be leak tested prior to backfilling.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements.

B. Testing:
   1. Perform testing in accordance with ASTM C497.
   2. Concrete Manhole Sections: As specified in Section 33 14 22 – Testing of Sanitary Sewer Mains and Manholes.
   3. Conduct a visual inspection of concrete structures.
   4. Repair all visible and detectable leaks.
   5. Leakage testing for structures shall be performed prior to backfilling by the following procedure:
      a. Temporarily plug all wall sleeves, piping entrances and other openings during test period.
      b. Fill structure to overflow level.
      c. Allow to stand for a minimum of four (4) hours.
      d. Refill to overflow level.
      e. Allow to stand for 24 hours.
      f. Examine exterior surfaces and joints for leakage. Measure drop in surface water. Allowable leakage is a drop of ½ inch or less during the test period and no visible signs of leakage.
      g. Repair all visible and detectable leaks. If leakage exceeds allowable limit, the structure shall be repaired by approved method per Engineer.

C. Equipment Acceptance: Contractor shall adjust, repair, modify, or replace components failing to perform as specified and rerun tests at no cost to the Owner.

3.5 ADJUSTING

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Vertical Adjustment of Existing Manholes and Structures:
   1. As specified in Section 33 01 30.86 – Manhole Rim Adjustment.

END OF SECTION

SECTION 33 14 13

WATER DISTRIBUTION PIPING, VALVES, HYDRANTS, AND APPURTENANCES

PART 1 GENERAL

1.1 DESCRIPTION

A. Section Includes Installation of:
   1. Pipe and fittings for public water mains and service connections.
   2. Valves, fire hydrants, blow offs, sampling stations, air release assemblies, and other water distributions appurtenances.

B. Related Requirements:
   1. CFPUA Material Specification Manual (MSM).
   2. Section 03 05 00 - Concrete.
   3. Section 09 91 00 - Painting and Protective Coatings.
   4. Section 31 23 34.01 - Excavating, Trenching, Dewatering and Backfilling.
   5. Section 33 01 12 - Identification for Utilities Piping.
   6. Section 33 05 05.31 - Hydrostatic Testing.
   7. Section 33 05 09.33 - Thrust Restraint for Utility Piping.
   8. Section 33 05 13 - Precast Concrete Manholes and Utility Structures.
   9. Section 33 14 14 - Public Water Service Connections.
   10. Section 33 14 20 - Disinfection of Water Pipelines, Facilities and Appurtenances.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T 180 – Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
   1. ASME B16.1 – Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

C. ASTM International:
   1. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
   2. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3).
   3. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
   4. ASTM D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   5. ASTM D2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
   6. ASTM D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
   7. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

8. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
9. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

D. American Water Works Association:
1. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray Iron Fittings.
7. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast.
8. AWWA C153 – Ductile-Iron Compact Fittings.
9. AWWA C500 – Metal-Seated Gate Valves for Water Supply Service.
10. AWWA C502 – Dry-Barrel Fire Hydrants.
11. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.
12. AWWA C512 – Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.
13. AWWA C550 – Protective Interior Coatings for Valves and Hydrants.
14. AWWA C600 – Installation of Ductile-Iron Mains and Their Appurtenances.
15. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
16. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm), for Water Transmission and Distribution.
17. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
18. AWWA C906 – Polyethylene Pressure Pipe and Fittings, 4-In. Through 65-In. for Waterworks.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 – Connecting Flange Joints between Tapping Sleeves and Tapping Valves.

F. National Fire Protection Association:
1. NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
2. NFPA 291 – Recommended Practice for Fire Flow Testing and Marking of Hydrants.

G. NSF International:
1. NSF 61 – Drinking Water System Components - Health Effects.
2. NSF 372 – Drinking Water System Components - Lead Content.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements

B. Coordination:
   1. Coordinate Work of this Section with termination of water main connection at Site boundary, connection to CFPUA, and trenching.
   2. The existing system must be kept in operation at all times. Where connections are made to existing mains or other shutdowns are necessary, permission must be obtained and arrangements must be made with the CFPUA Distribution ORC, Utility Services Division for removing from service those mains that will be affected.
   3. No valves are to be operated unless a CFPUA representative is present. Any valves operated without a CFPUA representative present, or a directive may be subject of penalties in accordance with CFPUA's ordinance.
   4. Notify CFPUA no less than two business days prior to an event requiring a CFPUA representative to be present.
   5. The Contractor shall, at least two business days in advance, notify citizens subject to interruption of service by means of door hangers or any other approved method of the starting time and duration of such interruption.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittals: Requirements for submittals.

B. Product Data/Source Quality:
   1. Manufacturer information regarding pipe, pipe fittings, valves, hydrants, and appurtenances including component material, assembly, and parts diagrams.
   2. Shop test results and inspection data, certified by manufacturer.

C. Testing Procedures:
   1. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER and CFPUA approval prior to commencing testing.

D. Manufacturer Instructions:
   1. Detailed instructions on installation requirements, including storage and handling procedures.

E. Manufacturer's Certificate:
   1. Certify that products meet or exceed specified requirements.

F. Field Quality-Control Submittals:
   1. Results of Contractor-furnished laboratory testing and field test results.

1.5 CLOSEOUT SUBMITTALS:

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Project Record Documents:
   1. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work.
   2. Record actual locations of piping mains, valves, hydrants, connections, thrust restraints, elevations, and other utilities found and not indicated on design plans.

C. Operations and Maintenance Data:
   1. Furnish in operations and maintenance manuals complete data for materials in accordance with Section 01 60 00 - Product Requirements.

1.6 QUALITY ASSURANCE

A. Qualifications: Company specializing in manufacturing products specified in the CFPUA Materials Specification Manual.
   1. Cast manufacturer's name, pressure rating, and year of fabrication into valve body.

B. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.

C. Perform Work according to AWWA and PVC Pipe Association standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:
   1. Store materials according to manufacturer instructions.
   2. Block individual and stockpiled pipe lengths to prevent moving.
   3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
   4. Store PE and PVC materials out of sunlight.

D. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection according to manufacturer instructions.

1.8 SITE CONDITIONS

A. Field Measurements:
   1. Verify field measurements prior to fabrication.
   2. Indicate field measurements on Shop Drawings.

1.9 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Furnish 10-year manufacturer's warranty for valves.

PART 2 PRODUCTS

2.1 CFPUA MATERIAL SPECIFICATION MANUAL

A. Refer to CFPUA Material Specification Manual (MSM) for the following products:

MSM Section	Material
A	Pipe
B	Fittings and Accessories
C	Joint Restraints
D	Valves and Accessories
E	Fire Hydrants
F	Service Saddles and Tapping Devices
I	Castings & Aluminum Access Covers
K	Miscellaneous
L	Electrical
M	Coatings and Sealants

2.2 MATERIALS & ACCESSORIES

A. Bedding, Cover, and Backfill:
   1. As specified in Section 31 23 34.01 - Excavating, Trenching, Dewatering and Backfilling.

B. Pipe Location Wire: As specified in Section 33 01 12 - Identification for Utilities Piping.

C. Thrust Restraints: As specified in Section 33 05 09.33 - Thrust Restraint for Utility Piping.

D. Service Connections: As specified in Section 33 14 14 - Public Water Service Connections.

E. Vaults and Utility Boxes: As specified in Section 33 05 13 - Precast Concrete Manholes and Utility Structures.

F. Fire Hydrant Drainage Gravel: Provide #57 Stone.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Identify project horizontal and vertical control points, establish easement and right-of-way lines, stakeout construction points for work and pipeline alignments, establish limits of disturbance.

C. Determine exact location and size of water mains, valves, hydrants, and appurtenances from Drawings

D. Verify location and elevation of existing facilities prior to excavation and installation of proposed interconnecting water mains, valves, and hydrants.

3.2 PREPARATION

A. Section 01 35 00 - Special Procedures.
   1. Pre-construction Site Audio/Video Inspections and Photography:
   2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.

B. Section 01 70 00 - Execution and Closeout Requirements.

C. All materials, unless otherwise directed, shall be unloaded as nearby as possible to the location of installation by the Contractor. Materials shall be handled with care to avoid damage.

D. All materials found during the progress of work to have flaws, cracks, or other defects will be rejected by the Engineer regardless of whether or not it has been installed and shall be replaced by and at the expense of the Contractor.

E. All PVC pressure pipe, upon delivery to the site and until such time as it is placed in the trench, shall be shielded from the weather and direct sunlight to prevent pipe deterioration.

F. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surfaces, interior linings, and components. If any part of the coating, lining or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer prior to attempting installation.

G. Pipe Cutting:
   1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
   2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
   3. Grind edges smooth with beveled end for push-on connections.

H. Remove scale and dirt on inside and outside before assembly.

I. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Placement: As specified in Section 31 23 34.01 - Trenching, Excavation, Dewatering and Backfilling.
   1. All mains shall be laid and maintained at the required lines and grades with fittings, valves, and appurtenances at the described locations. All pipe shall be laid to the depth as shown on the drawings, or when a depth is not indicated, with a minimum cover of thirty (30) inches and a maximum of (60) inches below finished grade. Grade lines shall be set by the Contractor. Realignments must be approved by the Engineer. The Contractor shall have suitable survey equipment on the site at all times.

2. After placement in the trench the spigot end of the pipe shall be centered in the bell and the pipe shall be driven home and then brought to the proper line and grade by tamping approved backfill material under it, except for the bell. Joint deflection shall not exceed manufacturer's limit.
3. The Work shall at all times progress with caution so as to prevent damage to underground obstructions both known and unknown. Should an obstruction not shown on the drawings be encountered, the Engineer shall be immediately notified, and he shall be responsible for alteration to the design should realignment be necessary. Notify the Engineer far enough in advance to allow the realignment to be accomplished by deflection in the pipe joints.

B. Pipe and Fittings:
1. Handle and assemble pipe according to manufacturer instructions.
2. Install pipe and fittings in strict conformance with AWWA C600 and AWWA C605.
3. Install plastic pipe in conformance with ASTM D2774 and recommended practices of the UNI-BELL Plastic Pipe Association.
4. Joint Deflection: Maximum joint deflection shall meet requirements of AWWA C600, AWWA C605, or AWWA Manual of Practice M23.
5. Prevent foreign material from entering pipe during placement. Seal pipe openings with watertight plugs during Work stoppages using plugs designed for that purpose. If trench contains standing water in joining zone, plug shall remain in place until the trench has been pumped dry before proceeding pipe laying.
6. Allow for expansion and contraction without stressing pipe or joints.
7. Install access fittings to permit disinfection of water system performed under Section 33 14 20 – Disinfection of Water Distribution Mains.
    a. Blowoffs shall be installed for pipe flushing, disinfection, and test sampling.
    b. Blowoffs shall be located as follows:
        1) Dead ends.
        2) Stub-outs greater than one pipe section in length for future interconnecting mains.
        3) Valves closed against disinfection, flushing, and sampling.
    c. Blowoff should be installed as follows:
        1) Opening pointing downward.
        2) Minimum 24-inches clearance between opening and ground for proper sampling.
8. Cover: Measure depth of cover from final surface grade to top of pipe barrel and record.
9. Jointing:
    a. Fused HDPE:
        1) HDPE Pipe shall be joined by the butt-fusion process in accordance with pipe manufacturer’s directions.
        2) Contractor shall provide butt-fusion technicians who are trained and certified by the HDPE pipe manufacturer to complete the project. The date of technician certification shall not exceed 12 months before commencing construction.
        3) Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure.

4) The internal and external beads resulting from the butt-fusion process shall be visible and examined for penetration 360 degrees around the pipe diameter.
5) DI/HDPE Mechanical Joint Adaptors shall be ductile iron mechanical joint fittings per CFPUA Material Specification Manual and shall be joined to the HDPE pipe by a heat-fused joint on one end, and connected to a ductile iron pipe valve, or fitting with a mechanical joint on the other end.
6) Solvent epoxy cementing, electro-fusion couplings, and mechanical joining with bolt on wrap around clamps or mechanical joints without an adapter shall not be used for connections.

b. Push-On Joints:
1) The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove dirt, grit, oil or excess coatings and other foreign matter. For ductile iron pipe, the gasket shall be flexed inward and inserted in the gasket recess of the bell socket.
2) A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot ends, care will be taken to avoid contact with the ground.
3) The joint shall be completed by forcing the plain end to the bottom of the socket with a forked tool or jacking device or other approved method. All pipe shall have depth mark prior to insertion. Pipe cut in the field shall be filed to resemble the spigot end of manufactured pipe.
4) When deflection is required, the joint shall be completed prior to setting the deflection. The deflection shall conform to applicable AWWA Standards or manufacturer's recommendation.

c. Mechanical Joints:
1) The inside of the socket, the outside of the spigot end and the gland shall be thoroughly cleaned and or washed with an approved solution to remove dirt, grit, oil or excess coatings and foreign matter to improve gasket seating.
2) The gland shall then be placed on the plain end of the pipe with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end of the pipe.
3) The pipe shall be inserted into the socket and the gasket pressed firmly and evenly into the gasket recess. The joint shall be kept straight during the assembly and any deflection required shall be done after the joint has been assembled but prior to tightening the bolts.

C. Valves:
1. Valves shall be set and joined to the pipe and each type of joint as specified for pipe.
2. Cast iron valve boxes shall be firmly supported, maintained centered and plumb over the operating nut of the valve. Outside of paved areas, valve boxes shall be set in a 2' diameter x 6" thick concrete collar. The box cover shall be flush with the surface of the finished pavement. All water main valve box lids shall have the word “WATER” cast in the lid.
3. All reasonable effort must be made to locate valves/valve boxes, back of curb, in grass areas and at street corners, whenever possible.
4. Valve boxes in areas that will require sod at a later date must be left one to two inches above existing grade (to allow for sod thickness).

5. All valves must be centered over the operating nut and all valves, after being fully opened, will be backed off one-quarter turn to prevent them from being jammed open. This procedure should take place only after the main has passed pressure testing and has been certified by the Engineer.
6. Should the operating nut be more than three feet below the final grade, an extension shall be supplied and installed by the Contractor. The extension shall bring the nut to within twelve (12) inches of final grade.

D. Installing Valves on Existing Mains
1. When installing valves in existing mains (cutting-in), the Contractor shall insure that the pipe is kept clean at all times and no debris, ground water, mud, oil, etc., will make their way into the pipe.

E. Installation of Tapping Sleeves and Valves
1. Install the tapping sleeve and valve and pressure test prior to making the tap.
2. If leaks are present, the Contractor shall repair them to the satisfaction of the Engineer or Resident Project Representative.
3. Complete the tapping operation and close tapping valve.
4. Tapping valve shall not be opened until new main has been tested and certified for operation.

F. Hydrants
1. Each hydrant shall be connected to the main with a 6-inch branch line.
2. Hydrants shall be set with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18 inches above the finished surrounding grade and the operating nut not more than 48 inches above the finished surrounding grade.
3. Set fire hydrants with safety flange not more than 6 inches and not less than 2 inches above grade.
4. The hydrant shall be set in a bed of # 57 stone which shall surround the barrel at least twelve (12) inches in all directions.
5. Hydrants and tees (runs and branches) shall be restrained using field-applied restraint system per CFPUA MSM.
6. Provide support blocking and drainage gravel while installing fire hydrants; do not block drain hole.
7. After main-line pressure testing, flush fire hydrants and check for proper drainage.

G. Thrust Restraints: As specified in Section 33 05 09.33 - Thrust Restraint for Utility Piping.
1. New main construction shall be restrained by means of field or factory applied systems as shown on the Engineer drawings.
2. Thrust blocks in new mains is prohibited except when directed by the Engineer.
3. Where a fitting or device is to be inserted into an existing main, thrust blocking shall be installed as directed by the Engineer or CFPUA.

H. Polyethylene (PE) encasement when indicated for ductile iron pipe and fittings:
1. Encase piping in PE as indicated on Drawings to prevent contact with surrounding soil material or insulation from adjacent cathodic protection system.
2. Comply with AWWA C105.
3. Where pipe exits ground, terminate encasement 3 to 6 inches above surface.

I. Pipe Locator Wire: Install per Section 33 01 12 - Identification for Utilities Piping.

J. Service Connections: As specified in Section 33 14 14 - Public Water Service Connections.

K. Disinfection of Potable Water Piping Systems: As specified in Section 33 14 20 - Disinfection of Water Distribution Mains.

L. Pipe Markers: According to CFPUA Details and Material Specification Manual.

3.4 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Section 33 05 05.31 - Hydrostatic Testing.
   1. Pressure test piping system according to AWWA C600 and AWWA C605.

C. Section 33 14 20 - Disinfection of Water Pipelines, Facilities, and Appurtenances.

D. Pigging – Flushing and Cleaning Alternative for Large Mains
   1. For mains where flowrates cannot be achieved to create minimum cleaning velocities of 2 feet per second or greater, cleaning of the new piping system by pigging methods shall be established for the project by the Engineer. Pigging includes the following measures:
      a. Pig launching and retrieval equipment to minimize additional valves, fittings, and auxiliary water supplies.
      b. Valves and blowoff assemblies, which are installed as part of the project, shall be used as much as possible to minimize the number of temporary ports required for pigging.
      c. Pig materials used shall be specifically manufactured for flushing and cleaning pressure pipes, bends, and valves. The pigs shall be able to go through bends, open valves, and fittings, and provide adequate cleaning of the pipe.
      d. Pigging shall be accomplished by the controlled and pressurized passage of a series of hydraulic or pneumatic polyurethane plugs of varying dimensions, coatings, and densities.
      e. Pigs shall be selected by the Contractor and approved by the Engineer.
      f. The Contractor shall provide means to enter the pig into the system, control and regulate flow, monitor flows and pressures, and to remove the pig from the system.
      g. The Contractor shall maintain constant surveillance of the pig while active in the pipe system and immediately report problems encountered or any malfunctions discovered in the piping system.

END OF SECTION

SECTION 33 14 14

PUBLIC WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe and fittings for water service connections to small commercial, light industrial, and residential homes 2” service and smaller.
   2. Corporation stop assemblies.
   3. Curb stop assemblies.
   4. Backflow preventers.
   5. Meter setting equipment.
   6. Meter boxes.
   7. Trenching, bedding, and cover.

B. Related Requirements:
   1. CFPUA Material Specification Manual (MSM).
   2. Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.
   3. Section 33 14 13 – Water Distribution Piping and Appurtenances.
   4. Section 33 14 13 – Water Distribution Valves and Fire Hydrants.
   5. Section 33 14 20 – Disinfection of Water Distribution Mains.
   6. Section 33 05 13 – Precast Concrete Manholes and Utility Structures.

C. CFPUA provides potable water service which may be interrupted for repairs, system expansion, or other general requirements. CFPUA does not guarantee adequate fire flow for protection of life or property. There shall be no domestic use taps allowed on a dedicated fire line. Some facility owners choose to utilize this interruptible potable water supply from the CFPUA system for fire protection. If facility owners choose to utilize the potable water system for fire protection flow, the service for fire protection shall be configured according to Part 3 of this Section.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
   1. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. American Society of Sanitary Engineering:
   1. ASSE 1012 – Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent.

2. ASSE 1013 – Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers.

D. ASTM International:
1. ASTM B62 – Standard Specification for Composition Bronze or Ounce Metal Castings.
2. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
3. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
4. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing.
5. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
6. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

E. American Welding Society:
1. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:
1. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.
2. AWWA C600 – Installation of Ductile-Iron Mains and Their Appurtenances.
3. AWWA C800 – Underground Service Line Valves and Fittings.
4. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
5. AWWA M6 – Water Meters – Selection, Installation, Testing, and Maintenance.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Any event requiring a CFPUA representative to be present shall require a minimum of 2 business day notice to schedule the event.

B. No valves are to be operated unless a CFPUA representative is present. Any valves operated without a CFPUA representative present, or a directive may be subject to penalties in accordance with CFPUA’s ordinance.

1.4 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures.

B. Informational Submittals:
1. Product Data: Submit manufacturer information regarding pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, meters, meter setting equipment, service saddles, backflow preventers, and accessories.
2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
3. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

C. Action Submittals:
   1. Test Reports: Submit all the results of the bacteriological tests to the CFPUA Engineering Inspector.
   2. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
   3. Qualifications Statement:
      a. Submit qualifications for manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Project Record Documents: Record actual locations of piping mains, curb stops, connections, thrust restraints, pressure-pipe centerline elevations, and gravity-pipe invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Perform Work according to CFPUA standards and details.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection according to manufacturer instructions.

PART 2 PRODUCTS

2.1 MATERIAL SPECIFICATION MANUAL

A. Refer to CFPUA Material Specification Manual (MSM) for the following products:

MSM No.	Product
A	Polyethylene Service Tubing
F	Service Saddles/ Hinged Type for 2” PVC
F	Service Saddles/ Brass Alloy/ Stainless Steel Straps for Cast, Ductile & PVC Pipe
F	Service Saddles/ Ductile Iron/ Stainless Steel Straps for Cast, Ductile & PVC Pipe
F	Service Saddles/ Ductile Iron/ Stainless Steel Straps for HDPE Pipe
F	Service Saddles/ Hinged Type for 2” HDPE
G	Inline Valves
G	Straight Couplings (3/4" X 1”)
G	Straight Couplings (1”)
G	Meter Setters (5/8" X 3/4" Meter)
G	Meter Setters (1" Meter)
G	Meter Setters (1 1/2"& 2” Meter)
G	Dual Service U-Branch (5/8" X 3/4" Meter)
G	Dual Service U-Branch (1" METER)
G	Curb Stop Assemblies
J	Meter Box (5/8”, 3/4", & 1”) Single Service Non-Traffic Areas
J	Meter Box (5/8”, 3/4", & 1”) Dual Service Non-Traffic Areas
J	Meter Box (5/8”, 3/4", & 1”) Single Service Traffic Rated
J	Meter Box (5/8”, 3/4", & 1”) Dual Service Traffic Rated
J	Meter Box (1 1/2", & 2”) Single Service Non-Traffic Areas
J	Meter Box (1 1/2", & 2”) Single Service Traffic Rated
J	Lid Details (5/8”, 3/4", & 1”) Single Service Non-Traffic Areas
J	Lid Details (5/8”, 3/4", & 1”) Dual Service Non-Traffic Areas
J	Lid Details (5/8”, 3/4", & 1”) Single Service Traffic Rated
J	Lid Details (5/8”, 3/4", & 1”) Dual Service Traffic Rated
J	Lid Details (1 1/2" & 2”) Single Service Non-Traffic Areas
J	Lid Details (1 1/2" & 2”) Single Service Traffic Rated
L	Tracer Wire (Solid Copper)
L	Direct Bury Wire Splice Kit

2.2 CURB STOP ASSEMBLIES

A. For ⅝-inch through 2-inch services provide a CTS inlet X Female iron pipe thread curb stop on CTS line 3” from inlet of meter setter.

2.3 WATER METERS SINGLE SERVICE

A. Meter box shall be installed flush with grade. Box shall be sized and centered around the meter assembly to allow for access and future maintenance.

2.4 DUAL SERVICE

A. Meter box shall be installed flush with grade. Box shall be sized and centered around the meter assembly to allow for access and future maintenance.

B. U-branch shall be installed prior to meter setter.

C. Meter setter shall be installed to allow three (3) to six (6) inches from top of meter from bottom of lid.

D. Meter setter shall be installed in the upright position.

2.5 MATERIALS

A. Bedding: As specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.

B. Cover: As specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.

C. Soil Backfill from Above Pipe to Finish Grade: As specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Verify that building service connections and municipal utility water main sizes, locations, and inverts are as indicated on Shop Drawings.

3.2 PREPARATION

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

C. Remove scale and dirt from inside and outside of piping before assembly.

3.3 INSTALLATION

A. 1-inch Service Corporation Stop Assemblies:
   1. Make connection for each different kind of water main, using suitable materials, equipment, and methods as approved by Engineer.
   2. Provide service clamps for mains constructed of materials other than cast iron or ductile iron.
   3. Location:
      a. Locate and stagger corporation stops at least 36 inches apart longitudinally.
   4. Plastic Pipe Mains:
      a. Provide full support for service clamp for full circumference of pipe, with minimum 2-inch width of bearing area.
      b. Exercise care against crushing or causing other damage to mains at time of tapping or installation of service clamp or corporation stop.

5. Use seals or other devices such that no leaks are present in mains at points of tapping.
6. Do not backfill and cover service connections until installation has been approved by Engineer and CFPUA inspector.

B. Bedding:
   1. Excavate pipe trench as specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering, and Backfilling.
   2. Placement:
      a. Place bedding material as indicated on Drawings.
      b. Level fill materials in one continuous layer not exceeding 8 inches of compacted depth.
      c. Compact to 95 percent maximum density.
   3. Place fill materials as specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.

C. Pipe and Fittings:
   1. Maintain separation of water main from **sewer piping** according to code.
   2. Group piping with other Site piping Work whenever practical.
   3. Install pipe to allow for expansion and contraction without stressing pipe or joints.
   4. Install access fittings to permit disinfection of water system.
   5. Jointing of Pipe:
      a. Connections between different types of pipe and accessories shall be made with transition fittings approved by CFPUA's representative.
      b. Service laterals shall consist of a tapping saddle, corporation stop and a length of PE pipe with no joint installed between the main service tap and the service stop. Service laterals shall be installed perpendicular to the water main. Contractor shall install all material per the CFPUA Material Specification Manual allowing for meter installation at a later date by CFPUA personnel. Locator wire shall be installed as per specifications.
   6. Thrust Restraints: Form and place concrete for thrust restraints at each elbow or change of direction of pipe.
   7. Establish elevations of buried piping with not less than three (3) feet of cover.
   8. Pipe Markers: According to CFPUA MSM.
   9. Backfill trench as specified in Section 31 23 34.01 – Excavation, Trenching, Dewatering and Backfill for Pipes.

D. Curb Stop Assemblies:
   1. Set curb stops on 95% compacted soil.

E. Water Meters: 2-inch and smaller shall be set by CFPUA.

F. Backflow Preventers:
   1. Install backflow preventers where indicated on Drawings and according to manufacturer instructions.
   2. Testing and Installation Requirements: Comply with CFPUA requirements and plumbing codes, see CFPUA's website under Departments, Environmental Management – Backflow and Cross Connections.

G. Service Connections:

1. Install water service according to as indicated on Drawings.
2. Install water service to 18” of right-of-way and connect to building water service as specified in CFPUA details and referenced in CFPUA Material Specification Manual.
3. All meters installed on lines greater than 2-inch diameter must have a strainer and be installed in an appropriately sized, approved meter vault that provides sufficient access for reading, maintenance, and protection in accordance with Water Meter Vaults specification.

H. Service Intended for Fire Protection:
1. Two taps shall be installed, one for potable water and one for fire flow. The potable water tap shall be installed and metered in accordance with this Section. The fire flow tap shall not be metered, and the fire flow system shall be fully segregated from the potable system throughout the facility. A valve will be installed at the tap and the right-of-way or easement line denoting the CFPUA owned/privately owned boundary. A privately owned, privately maintained backflow prevention device shall be installed in the line immediately after entering a structure in accordance with the North Carolina State Building Code and the CFPUA Cross Connection Control Ordinance.

I. Pipe Locator Wire: As specified in Section 33 01 12 – Identification for Utilities Piping.

J. Disinfection of Water Piping System: Flush and disinfect system as specified in Section 33 14 20 – Disinfection of Water Distribution Mains.

3.4 TOLERANCES

A. Install pipe to indicated elevation to within tolerance of 1-inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements.

B. Pressure test water distribution system according to Section 33 05 05.31– Hydrostatic Testing of Water Distribution and Sanitary Sewer Force Mains.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION

SECTION 33 14 20

DISINFECTION OF WATER PIPELINES, FACILITIES AND APPURTENANCES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Essential procedures for disinfecting new and repaired water mains. All new water mains, services, and appurtenances shall be disinfected before they are placed in service. All water mains taken out of service for inspection, repair, or other activities shall be disinfected before they are returned to service.
   2. Testing and reporting of results.

B. Each unit of constructed water main, services, and appurtenances shall be disinfected with chlorine upon successful completion of the hydrostatic test. The disinfection procedure shall be performed in strict conformance with Cape Fear Public Utility Authority (CFPUA) procedures for disinfecting water mains, as outlined in paragraphs 3.2 and 3.3 of this Section.

C. Related Requirements:
   1. CFPUA Material Specification Manual (MSM).
   2. Section 33 14 13 – Water Distribution Piping and Appurtenances.
   3. Section 33 14 14 – Public Water Service Connections.
   4. Section 33 14 13 – Water Distribution Valves and Fire Hydrants.

1.2 REFERENCE STANDARDS

A. American Water Works Association:
   1. AWWA B300 – Hypochlorites.
   2. AWWA C651 – Disinfecting Water Mains.
   3. AWWA M12 – Simplified Procedures for Water Examination.
   4. APHA, AWWA, WEF – Standard Methods for the Examination of Water and Wastewater.

B. North Carolina Public Water Supply:
   1. NCPWS Rules Governing Public Water Systems Section .1000 – Disinfection of Water Supply Systems.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Any event requiring a CFPUA representative to be present will require a two-business day notice to schedule the event.

B. No valves are to be operated unless a CFPUA representative is present. Any valves operated without a CFPUA representative present, or a directive may be subject to penalties in accordance with CFPUA's Ordinance.

C. The Contractor shall pay particular attention to the scheduling requirements outlined in the procedures. The Contractor shall be responsible for furnishing and installing all required chlorine injection and monitoring ports at no additional cost to CFPUA.

D. The mains will in no case be accepted by CFPUA for public use until the CFPUA Engineer approves the mains as having been properly disinfected.

1.4 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures.

B. Submittals:
   1. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.
   2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   3. Disinfection Procedure: Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.
   4. Certify that final water complies with disinfectant quality standards of CFPUA.
   5. Test and Evaluation Reports: Indicate testing results comparative to specified requirements. All lab reports shall be from certified lab and submitted to CFPUA representative.
   6. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Disinfection Report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and completion.
   3. Test locations.
   4. Name of person collecting samples.
   5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
   6. Date and time of flushing start and completion.
   7. Disinfectant residual after flushing in ppm for each outlet tested.

1.6 QUALITY ASSURANCE

A. Perform Work according to AWWA C651.

B. QUALIFICATIONS
   1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
   2. Applicator: Company specializing in performing Work of this Section with minimum three years' documented experience.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals:
   1. Calcium hypochlorite: Comply with AWWA B300.
   2. Sodium hypochlorite: Comply with AWWA B300.

2.2 CHLORINE RESIDUAL TEST KITS

1. Test kits shall use methodology conforming with *Standard Methods for the Examination of Water and Wastewater* or AWWA Manual M12.
2. Manufacturers:
   a. Hach Company.
   b. LaMotte.
   c. Fisher Scientific.
   d. Hellige.
   e. Or equal.

PART 3 EXECUTION

3.1 PREVENTIVE AND CORRECTIVE MEASURES DURING CONSTRUCTION

Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is, therefore, essential that the procedures of this section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination. Also, any connection of a new water main to the active distribution system prior to receipt of satisfactory samples may constitute a cross-connection. Therefore, the new main must be isolated until all bacteriological and other tests are satisfactorily completed.

A. KEEPING PIPE CLEAN AND DRY: Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize the entrance of foreign material. All openings in the pipeline shall be closed with watertight plugs when work is stopped at the end of the day or for other reasons.

B. JOINTS: Joints of all pipes in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

C. PACKING MATERIAL: All packing material shall consist of molded or tubular rubber rings, or other approved material. Lead or asbestos material in any form shall not be permitted.

D. SEALING MATERIALS: No contaminated material or any material capable of supporting prolific growth of microorganisms shall be used for sealing or lubricating joints. Sealing and lubricating material or gaskets shall be handled in a manner that avoids

contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. It shall be delivered to the job in closed containers and shall be kept clean. Soil conditions could warrant the upgrade of gasket material to a volatile resistant material.

E. CLEANING OF PIPE AND APPURTENANCES: If dirt enters the pipe, it shall be removed, and the interior pipe surface cleaned. If, in the opinion of the CFPUA representative, the dirt remaining in the pipe will not be removed by the flushing operation, then the interior shall be cleaned by mechanical means such as a hydraulically propelled foam pig or another suitable device. The cleaning method used shall not force mud or debris into the interior pipe joint spaces and shall be acceptable to CFPUA.

F. FLOODING BY STORM OR ACCIDENT DURING CONSTRUCTION: If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section of pipeline shall be flushed until water from the pipe runs clear.

3.2 EXAMINATION

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Chlorination Planning:
   1. Before calling the CFPUA office for a time to be set up for disinfection, all of the following shall be installed or supplied by the Contractor at no cost to CFPUA. This list shall be checked and/or assembled before the CFPUA Engineering personnel arrive.
      a. A valve may be required to be installed in the line to be disinfected near the CFPUA water main connection.
      b. A blowoff of a brass or approved material faucet may be required to be installed at the dead end of the line, at all closed valves, and every 1,200 feet to be disinfected for flushing purposes and bacteria sampling. The opening to this blowoff should point downward, and there should be at least twenty-four inches clearance between the opening and the ground for proper sampling.
      c. Mains connecting other mains with open valves within the system to be disinfected may cause “short circuits” resulting in improper disinfection. Valves on these connecting mains shall be checked to see if they should be closed to eliminate this problem. Blowoffs should be at both sides of valves closed to prevent “short circuits”.
      d. Successful hydrostatic testing and CFPUA acceptance of said testing of the line is required before disinfection procedures.
      e. A clean container shall be used to mix and/or dissolve the hypochlorite.
      f. A clean, new wooden mixer shall be present for mixing and dissolving the hypochlorite.
      g. A pump for pumping the chlorine solution into the line shall be present. This pump shall be gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solutions may be fed with a hand pump, for example, a hydraulic test pump. Feed lines shall be of such material and strength as to withstand safely the maximum pres-

sures that may be created by the pumps. All connections shall be checked for tightness before the hypochlorite solution is applied to the main.

h. All temporary blowoffs and injection points shall be properly abandoned and physically disconnected when directed by CFPUA prior to the line being placed into service.

C. Verify that access fittings have been installed under Section 33 14 13 – Water Distribution Piping and Appurtenances.

D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting, and balancing, and demonstration procedures, including coordination with related systems.

3.3 DISINFECTION PROCEDURE FOR NEW WATER MAINS AND FIRELINES

A. Provide required equipment to perform Work of this Section.

B. Method of Chlorination:

1. Use the continuous feed method for disinfection of all new water mains. This method must give a minimum of 10 mg/L of chlorine residual at the end of the 24-hr period.
    a. Continuous-Feed Method**:** The continuous-feed method is the process in which a concentrated solution of chlorine is injected into the water main. Caution shall be observed during the handling and injection of the chlorine solution as chlorine in any form is very toxic and any error could be harmful to the employees and to the public.
    b. Preliminary Flushing: Before chlorine solutions are injected, the main shall be filled with potable water to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall not be less than 3.0 ft/sec (preferably 3.5 ft/sec) unless the CFPUA representative determines that conditions do not permit the required flow or that the flow will cause undue problems when discharged to waste. An acceptable flushing velocity shall then be determined and used.
    c. Procedure for Chlorinating the Main:
        1) Water supplied from the existing distribution system or other Approved public water supply shall be made to flow at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated by Approved method.
        2) At a point, not more than 10 ft downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 50 mg/L and not greater than 100 mg/L free chlorine residual. To ensure that this concentration is provided, measure the chlorine concentration at regular intervals of distance and time in accordance with the procedures described in the current edition of *Standard Methods for the Examination of Water and Wastewater* or AWWA Manual M12, or by using Approved chlorine test kits.
        3) During the application of the chlorine, valves shall be adjusted by or under the supervision of the CFPUA representative to prevent the chlorine solution from entering the existing water system. The chlorine injection

shall not cease until the entire water main is filled with a chlorine concentration of not less than 50 mg/L. All appurtenances and valves shall be operated to ensure that the chlorine solution has contact with them. The chlorinated water shall be allowed to remain for a period of not less than 24-hours.

4) At the end of the 24-hour period, the chlorine residual shall be measured and shall not be less than 10 mg/L in any samples collected along the water main and at the end of said water main.

C. Final Flushing:
   1. Clearing the Main of Highly Chlorinated Water: Highly chlorinated water shall not remain in prolonged contact with pipe. At the end of the 24-hour contact period, the water shall be removed in order to prevent damage to the pipe lining or corrosion damage to the pipe itself. The highly chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system.
   2. Disposing of Highly Chlorinated Water: A neutralizing chemical shall be applied to the chlorinated water to be discharged to neutralize thoroughly the chlorine residual. Chlorine residual of water being disposed shall be neutralized by treating with one of the chemicals listed below:
      a. Ascorbic Acid
      b. Sodium Ascorbate
      c. Sulfur Dioxide
      d. Sodium Bisulfate
      e. Sodium Sulfite
      f. Sodium Thiosulfate

D. Bacteriological and Other Tests:
   1. Standard Conditions: After final flushing and before the new main is opened to the distribution system, two consecutive sets of acceptable samples, taken at least 24-hours apart, shall be collected from the new main. Samples shall be collected from every 1,200-ft of new water main, from the end of the water line, and from each branch. All samples shall be tested in accordance with *Standard Methods for the Examination of Water and Wastewater*. All samples shall show the absence of coliform organisms, and a free chlorine residual equal to the level present in the existing system and shall have no visible color or particulate matter. **Must be submitted in the form of an official report by a certified lab.**
   2. Special Conditions: If in the opinion of CFPUA, excess contamination has been allowed to enter the water main during construction or other events, bacteriological samples shall be taken at intervals of approximately 400 to 500 ft and shall be identified by location. Samples shall be taken of water that has stood in the new main for at least 16 hours after final flushing has been completed.
   3. Sampling Procedures: Sample collection shall be in accordance with *Standard Methods for the Examination of Water and Wastewater*. A copper or PVC assembly or a combination blowoff and sampling tap may be used for mains up to 8-inches diameter. Fire hydrants may not be used for sampling purposes. After samples have been collected, analyzed, and accepted, the sampling assemblies may be removed and retained for future use. All bacteriological analysis must be completed by a N.C. certified Drinking Water laboratory. The utility contractor

shall be responsible for all costs associated with the sampling and analysis of all samples required for acceptance. **All Lab Reports shall be delivered to the CFPUA Representative before any activation can proceed.**

E. Replace permanent system devices that were removed for disinfection.

3.4 DISINFECTION PROCEDURE FOR REPAIRED WATER MAINS

A. The following procedures apply primarily when mains are wholly or partially dewatered. After the appropriate repair procedures have been completed, the existing main may be returned to service prior to completion of the bacteriological testing to minimize the time customers are out of water. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure present little danger of contamination and require no disinfection.

B. The following procedure is considered as a minimum that may be used.
   1. Swabbing with Hypochlorite Solution: The interior of all pipe and fittings used in making repair (particularly couplings and tapping sleeves) shall be swabbed with a five (5) percent hypochlorite solution (300 mg/l concentration) before they are installed.
   2. Flushing: Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing toward the work location from both directions independently is recommended. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water and particulate matter are eliminated.
   3. Slug Chlorination: When practical, in addition to the procedures above, the section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated with a high concentration of chlorine (as much as 300 mg/L), and the concentration allowed to stay in contact with the main for a minimum of 15 minutes. After chlorination, flushing shall be resumed and continued until discolored water is eliminated and the water is free of noticeable high chlorine odor. A chlorine residual of no greater than 3.0 mg/L shall be acceptable.
   4. Sampling: Bacteriological samples shall be taken after repairs are completed to provide a record for determining the procedure's effectiveness. If the direction of flow is known, sample locations shall be determined. If the direction of flow is unknown, then samples shall be taken on each side of the main break. If bacteriological samples are unacceptable, the CFPUA representative shall determine corrective action. Daily sampling shall be continued until two successive daily samples are acceptable.

3.5 REPEAT DISINFECTION OF WATER MAIN

A. If the initial disinfection fails to produce satisfactory results as per specifications, the new main shall be reflushed, rechlorinated and resampled; CFPUA may also require further cleaning methods (i.e., pigging the line) if the disinfection fails twice. If check samples also fail to produce acceptable results, the new main shall be reflushed and rechlorinated by the continuous-feed method of chlorination until satisfactory results are obtained.

B. High velocities in the existing system, resulting from flushing the new main may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to also sample water entering the new main.

3.6 CONNECTION TO EXISTING SYSTEM

A. The NCPWS certifications, final acceptance, opening of valves and activation of the existing water system will only be allowed after satisfactory samples and chlorine levels have been produced. All sampling devices and blowoffs must be removed from the water main by the contractor prior to acceptance by CFPUA. The CFPUA Operations Department will activate the system when their procedures are completed.

3.7 FIELD QUALITY CONTROL

A. Section 01 70 00 – Execution and Closeout Requirements.

END OF SECTION

SECTION 33 14 22

TESTING OF SANITARY SEWER MAINS AND MANHOLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes testing and inspection of gravity sewer main, manholes, and service laterals in accordance with NCDEQ and CFPUA requirements. Location or project specific testing requirements and procedures shall be set forth by CFPUA and Engineer in approval conditions. CCTV shall be required as a minimum. Additional Testing may be requested.

B. Sewer mains, service laterals, and manholes shall be inspected and tested in accordance with the reference standards and following table with notes.

	CCTV Inspection	Low Pressure Air Test	Exfiltration Test	Deflection Test	Infiltration/Exfiltration Limit	Vacuum Test
Sewer Mains	Yes	Yes (Note 1)	Yes (Note 2)	Yes (Note 3)	100 gpdim (Note 4)	
Sewer Laterals	Yes	Yes (Note 1)			100 gpdim (Note 4)	
Manholes	Yes					Yes (Note 5)

Notes:

1. When sewer main diameters are 24-inches and smaller; unless water table is 2-feet or more above the top of pipe at upstream end of main or the calculated air test pressure is greater than 9 psi.
2. When sewer main diameters are greater than 24-inches.
3. Mandrel pull test after backfill is placed and stable at grade for 30-days. As an alternative to waiting 30-days to permit stabilization of the soil-pipe system, certified test results from an independent testing firm verifying that the backfill of the trench has been compacted to a least 95% maximum density may be accepted by CFPUA.
4. 100-gallons per nominal diameter-inch-mile for section tested and under 2-feet positive head.
5. Not applicable to existing manholes modified or rehabilitated.
6. Vertical compaction testing shall be performed at two (2) feet above the pipe and be completed in 2 ft lifts.
7. Horizontal compaction testing shall be performed at the tie-in point and every 100 ft thereafter.
8. Manhole compaction testing is to be performed in 2 ft lifts.

C. Related Requirements:
   1. Section 33 05 13 – Precast Concrete Manholes and Utility Structures.
   2. Section 33 31 11 – Sanitary Sewer Gravity Mains.

1.2 REFERENCES

A. NC-DEQ Minimum Design Criteria for the Permitting of Gravity Sewers.

B. American Water Works Association:
   1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   2. AWWA M23 – PVC Pipe – Design and Installation.

C. ASTM International:
   1. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
   2. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
   3. ASTM F1416 – Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air

D. Uni-Bell PVC Pipe Association:
   1. UNI-B-6-98 – Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Acceptance of any deviation from these testing requirements is at the sole discretion of the CFPUA.

B. All defects in the pipelines, manholes and appurtenances shall be remedied by the Contractor at no additional expense to CFPUA and will be re-inspected as outlined in this Section.

1.4 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures.

B. Submit following items prior to start of testing:
   1. Testing procedures.
   2. List of test equipment.
   3. Testing sequence schedule.
   4. Provisions for disposal of flushing and test water.
   5. Test gage calibration.
   6. Deflection mandrel drawings and calculations.

C. Test Results: Certified copies of test results shall be furnished to the Owner and CFPUA within 1 week.

D. CCTV Inspection: Submit two copies of the CCTV inspection to CFPUA on hard drives. The digital media recordings, television inspection logs, and digital photographs shall be named and labeled to indicate the specific sewer segment, location, and contents.

PART 2 PRODUCTS

2.1 CCTV INSPECTION EQUIPMENT

A. The equipment used for the CCTV inspection shall be specifically designed and constructed for sanitary or pressure sewer inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera shall be a color, pan-and-tilt model. The camera shall be capable of being moved through the line in either direction at a uniform rate. A push camera system is acceptable for sewer laterals.

B. The camera, television monitor, and other components of the video system shall be capable of producing picture quality and resolution to the satisfaction of the Engineer.

C. Inspections shall be submitted to the Engineer or Owner in electronic (digital) NASSCO format that can be imported and exported with other NASSCO PACP certified software including POSM.

2.2 DEFLECTION TESTING OF PLASTIC SEWER PIPING

1. “Go/ No Go” mandrel.
2. Pull/retrieval ropes.

2.3 EXFILTRATION TESTING

A. Equipment:
1. Plugs.
2. Pump.
3. Measuring Device.

2.4 INFILTRATION TESTING

A. Equipment:
1. V-notch weirs.

2.5 LOW-PRESSURE AIR TESTING

A. Equipment:
1. Air compressor.
2. Air supply line.
3. Shutoff valves.
4. Pressure regulator.
5. Pressure relief valve.
6. Stopwatch.
7. Plugs.
8. Pressure Gage: Calibrate to 0.1 psi.
9. Clear tubing for water table measurement.

2.6 VACUUM TESTING

A. Equipment:
1. Vacuum pump.
2. Vacuum line.
3. Vacuum Tester Base:
   a. Compression band seal.

b. Outlet port.
4. Shutoff Valve.
5. Stopwatch.
6. Plugs.
7. Vacuum Gage: Calibrated to 0.1 in. Hg.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Verify the following:
1. Piping and manholes installation methods are compatible with testing requirements.
2. Testing equipment is calibrated and functioning.
3. Test procedures and recording methods have been submitted and approved.

3.2 PREPARATION

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Plugs:
1. Plug outlets, wye branches, and laterals.
2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements

B. Section 01 70 00 – Execution and Closeout Requirements.

C. CCTV Procedures:
1. After the sewers are completely cleaned and water is introduced, the sewers shall be inspected by means of closed-circuit television to verify that the sewers have been thoroughly cleaned, to locate active sewer services and other connections, to document the condition, and to locate sewer defects.
2. Existing flow in the sewer being inspected shall be temporarily bypassed in accordance with the Bypass Pumping Plan if satisfactory images cannot be obtained with flow on the sewer. CFPUA will determine if the images are satisfactory.
3. Provide ventilation and air movement to prevent the presence of vapor or mist in the sewer.
4. CCTV inspections shall be performed in accordance with PACP© standards including the specific date and time of inspection.
5. The camera shall be moved through the sewer by devices that do not obstruct the camera view, or interfere with proper documentation of the sewer conditions, such as manual or power winches, TV cable, and powered rewinds.

6. When manually operated winches are used to pull the television camera through the line, two-way radios, telephones, or other suitable means of communication shall be established between the two manholes or access points to ensure adequate communications between members of the crew.
7. The camera shall be moved through the line in either direction at a moderate rate, stopping to permit proper documentation of the condition. In no case shall the television camera be pulled at a speed greater than 30-feet per minute. The camera shall be stopped at joints, defects, points of significance, tributary connections, service laterals, and other connections and shall be panned, tilted, and rotated to fully view the defects and connections. Inspections shall be documented.
8. Perform dye testing during the CCTV inspections to locate and confirm active service laterals when directed to by Engineer or CFPUA.
9. Inspections shall be performed from manhole centerline to manhole centerline or access point to access point.
10. Record accurate measurements of distances. Accuracy of the distance meter shall be checked above grade by a suitable device. The accuracy shall be within 1 percent.

D. Deflection Testing of Plastic Sewer Piping:
1. Perform vertical ring deflection testing on PVC sewer piping after backfilling has been in place for at least 30 days.
2. Allowable maximum deflection for installed plastic sewer pipe is no greater than five percent of original vertical internal diameter.
3. Perform deflection testing using "go, no go" mandrel.
4. Mandrel Diameter:
   a. Not less than 95 percent of base or average ID of pipe.
   b. Pipe Diameter: Comply with ASTM D2122.
5. Perform testing without mechanical pulling devices.
6. Locate, excavate, replace, and retest piping that exceeds allowable deflection.

E. Exfiltration Testing of Pipes Larger Than 24 Inches in Diameter:
1. Perform exfiltration testing not exceeding 100 gal. for each inch of pipe diameter for each mile per day for each reach of piping undergoing testing.
2. Perform testing with minimum positive head of 2 feet.

F. Infiltration Testing:
1. Maximum Allowable Infiltration: 100 gallons per nominal inch diameter of pipe for each mile per day for the reach of piping undergoing testing.
2. Include allowances for leakage from manholes.

G. Low-Pressure Air Testing:
1. Testing shall be accomplished by plugging the line at each end with pneumatic plugs.
2. Test each reach of gravity sewer piping between manholes.
3. Low-pressure air test all connected service laterals.
4. Introduce air pressure slowly to approximately 4 psig.
5. Determine ground water elevation above spring line of piping.
6. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
7. Do not increase pressure above 9 psig.

8. Allow pressure to stabilize for at least five minutes.
9. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.
10. Do not make allowance for laterals unless a test section having more than 625 square feet of lateral surface area fails to pass the air test. Adjust the time required according to UNI-B-6-98.
11. Minimum Testing Duration in Minutes:
    a. Shall be calculated by multiplying the nominal pipe size (inches) by 0.625.
12. Record drop in pressure during testing period.
13. If air pressure drops more than 1.0 psi during testing period, piping has failed.
14. If 1.0 psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
15. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.
16. If unsatisfactory testing results are achieved, make necessary repairs and retest until result meets criteria.
17. Repair visible leaks regardless of quantity of leakage.
18. UNI-B-6-98 TABLE I – MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q=0.0015

Min. Pipe Dia. (in.)	Time (min: sec)	Length For Min. Time (ft)	Time For Longer Length (sec)	Time (min:sec) for Length (L) Shown 100 ft	150 ft	200 ft	250 ft	300 ft	350 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46

H. Vacuum Testing:
1. Repair both outside and inside of joint to ensure permanent seal.
2. Test manholes prior to backfill.
3. Test manholes with manhole frame set in place.
4. Vacuum Testing:
    a. Comply with ASTM C1244.
    b. Plug pipe openings; securely brace plugs and pipe.
    c. Plug lift holes with non-shrink grout.
    d. Inflate compression band to create seal between vacuum base and structure.
    e. Connect vacuum pump to outlet port with valve open, then draw vacuum to 10 in. Hg (5 psig).
    f. Close valve.
    g. Manhole Test Duration in Seconds:
        1) Manhole Diameter of 4 Feet: 60.
        2) Manhole Diameter of 5 Feet: 75.

3) Manhole Diameter of 6 Feet: 90.

h. Record vacuum drop during test period.

i. If vacuum drop is greater than 1 in. Hg during testing period, repair and retest manhole.

j. If vacuum drop of 1.0 in. Hg does not occur during test period, manhole is acceptable; discontinue testing.

k. If vacuum test fails to meet 1.0-in. Hg drop in specified time after repair, repair and retest manhole.

5. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
6. Repair visible leaks regardless of quantity of leakage.

END OF SECTION

SECTION 33 31 11

SANITARY SEWER GRAVITY MAINS

PART 1 GENERAL

1.1 DESCRIPTION

A. Section Includes Installation of:
   1. Pipe and fittings for sewer gravity mains.
   2. Gasket materials, couplings and other gravity main appurtenances.

B. Related Requirements:
   1. CFPUA Material Specification Manual (MSM).
   2. Section 01 50 00 – Bypass Pumping.
   3. Section 03 05 00 – Concrete.
   4. Section 31 23 34 – Excavation, Trenching, Dewatering and Backfilling.
   5. Section 33 01 12 – Identification for Utilities Piping
   6. Section 33 14 22 – Testing of Gravity Sewer Mains and Manholes.
   7. Section 33 05 13 – Precast Concrete Manholes and Utility Structures.
   8. Section 33 05 07.13 – Utility Horizontal Directional Drilling.
   9. Section 33 05 07.23 – Jacking and Boring Pipe Construction.

1.2 REFERENCE STANDARDS

A. American Water Works Association:
   1. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
   2. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   3. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
   4. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray Iron Fittings.
   5. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast.
   6. AWWA C153 – Ductile-Iron Compact Fittings.
   7. AWWA C600 – Installation of Ductile Iron Mains and Their Appurtenances.
   8. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
   9. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. for Water Transmission and Distribution.
   10. AWWA C906 – Polyethylene Pressure Pipe and Fittings, 4-In. Through 65-In. for Waterworks.

B. ASTM International:
   1. ASTM D698 – 12e2 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 – 12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D1785 – Standard Specification for Poly (Vinyl Cloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

4. ASTM D2241 – Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series).
5. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
6. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Section 01 30 00 – Administrative Requirements

B. Coordination:
   1. Coordinate Work of this Section with connection to CFPUA and trenching.
   2. The existing system must be kept in operation at all times. Where connections are made to existing mains or other shutdowns are necessary, permission must be obtained and arrangements must be made with the CFPUA Wastewater Collections ORC, Utility Services Division for removing from service those mains that will be affected.
   3. Notify CFPUA no less than two business days prior to an event requiring a CFPUA representative to be present.
   4. The Contractor shall, at least two (2) business days in advance, notify citizens subject to interruption of service by means of door hangers or any other approved method of the starting time and duration of such interruption.
   5. Bypass pumping and hauling operations may be required to interrupt service. A bypass pumping plan shall be submitted in accordance with Section 01 50 00 – Bypass Pumping. Shutdowns must be held to a minimum in both number and duration.

1.4 SUBMITTALS

A. Section 01 33 00 – Submittals: Requirements for submittals.

B. Product Data/Source Quality:
   1. Manufacturer’s literature and specifications, as applicable, for products specified in this Section.
   2. Shop test results and inspection data, certified by manufacturer.

C. Testing Procedures:
   1. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER’s approval prior to commencing testing.

D. Manufacturer Instructions:
   1. Submit manufacturer's instructions for handling, storing, and installing pipes and appurtenances.

E. Manufacturer Certificates:
   1. Certificates of compliance with referenced standards, where applicable, including those of AWWA and others required by Engineer.

F. Field Quality Control Submittals:
   1. Results of Contractor furnished testing and inspections.

1.5 CLOSEOUT SUBMITTALS

A. 01 70 00 – Execution and Closeout Requirements

B. Project Record Documents:
   1. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work.

   2. Record actual locations and elevations of piping mains, valves, hydrants, manholes, service laterals, cleanouts, connections, thrust restraints, and other utilities found and not indicated on design plans.

C. Operations and Maintenance Data:
   1. Furnish in operations and maintenance manuals complete data for materials in accordance with 01 60 00 - Product Requirements.

1.6 QUALITY ASSURANCE

A. Qualifications: Company specializing in manufacturing products specified in the CFPUA Materials Specification Manual.

B. Perform Work according to AWWA and PVC Pipe Association standards.

C. The bell ends of pipe shall face the direction of laying unless otherwise directed by the Engineer, for lines on appreciable slope, the Engineer may require that bell ends face upgrade.

D. All stainless-steel fasteners shall be 316.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:
   1. Store materials according to manufacturer instructions.
   2. Block individual and stockpiled pipe lengths to prevent moving.
   3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
   4. Store PE and PVC materials out of sunlight.

D. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection according to manufacturer instructions.

1.8 SITE CONDITIONS

A. Field Measurements:
   1. Verify field measurements prior to fabrication.
   2. Indicate field measurements on Shop Drawings.
   3. A minimum of ten-foot utility easement must be provided along the frontage of all lots and as shown for new developments.

1.9 WARRANTY

1. Section 01 70 00 – Execution and Closeout Requirements.

PART 2 PRODUCTS

2.1 CFPUA MATERIALS SPECIFICATION MANUAL

A. Refer to CFPUA Material Specification Manual (MSM) for the following products:

MSM Section	Material
A	Pipe
B	Fittings and Accessories
C	Joint Restraints
I	Castings & Aluminum Access Covers
K	Miscellaneous
L	Electrical
M	Coatings and Sealants
N.	Concrete

2.2 MATERIALS & ACCESSORIES

A. Bedding, Cover, and Backfill:
   1. As specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.

B. Manholes:

   1. As specified in Section 33 05 13 – Precast Concrete Manholes and Utility Structures.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Identify required lines, levels, contours, and datum locations.

C. Determine exact location and size of water mains, valves, hydrants, and appurtenances from Drawings.

D. Verify location and elevation of existing facilities prior to excavation and installation of proposed gravity sewer mains and services.

3.2 PREPARATION

A. Section 01 35 00 – Special Procedures
   1. Pre-construction Site Audio/Video Inspections and Photography:
   2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.

B. Section 01 70 00 – Execution and Closeout Requirements.

C. All materials, unless otherwise directed, shall be unloaded as nearby as possible to the location of installation by the Contractor. Materials shall be handled with care to avoid damage.

D. All materials found during the progress of work to have flaws, cracks, or other defects will be rejected by the Engineer regardless of whether or not it has been installed and shall be replaced by and at the expense of the Contractor.

E. All PVC pipe, upon delivery to the site and until such time as it is placed in the trench, shall be shielded from the weather and direct sunlight to prevent pipe deterioration.

F. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surfaces, interior linings and components. If any part of the coating, lining or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer prior to attempting installation.

G. Pipe Cutting:
   1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
   2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
   3. Grind edges smooth with beveled end for push-on connections.

H. Remove scale and dirt on inside and outside before assembly.

3.3 INSTALLATION

A. Placement: As specified in Section 31 23 34.01 – Trenching, Excavation, Dewatering and Backfilling.
   1. All mains shall be laid and maintained at the required lines and grades with fittings and appurtenances at the described locations. All pipe shall be laid to the depth as shown on the drawings, or when a depth is not indicated, with a minimum cover of thirty-six (36) inches unless otherwise shown or approved by engineer. Grade lines shall be set by the Contractor. Realignments must be approved by the

Engineer. The Contractor shall have suitable survey equipment on the site at all times.

2. After placement in the trench the spigot end of the pipe shall be centered in the bell and the pipe shall be driven home and then brought to the proper line and grade by tamping approved backfill material under it, except for the bell. Joint deflection shall not exceed manufacturer's limit.
3. The Work shall at all times progress with caution so as to prevent damage to underground obstructions both known and unknown. Should an obstruction not shown on the drawings be encountered, the Engineer shall be immediately notified, and he shall be responsible for alteration to the design should realignment be necessary. Notify the Engineer far enough in advance to allow the realignment to be accomplished by deflection in the pipe joints.

B. Pipe and Fittings
   1. Handle and assemble pipe according to manufacturer instructions.
   2. Install pipe and fittings in strict conformance with AWWA C600 and C605.
   3. Joint Deflection: Maximum joint deflection shall meet requirements of AWWA C600, C605 or AWWA Manual of Practice M23.
   4. Prevent foreign material from entering pipe during placement and Work stoppages using plugs designed for that purpose. If trench contains standing water in joining zone, plug shall remain in place until the trench has been pumped dry before proceeding pipe laying.
   5. Allow for expansion and contraction without stressing pipe or joints.
   6. Solvent epoxy cementing, electro-fusion couplings and mechanical joining with bolt on wrap around clamps or mechanical joints without an adapter shall not be used for connections.

C. Push-On Joints
   1. The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove dirt, grit, oil or excess coatings and other foreign matter. For ductile iron pipe, the gasket shall be flexed inward and inserted in the gasket recess of the bell socket.
   2. A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot ends, care will be taken to avoid contact with the ground.
   3. The joint shall be completed by forcing the plain end to the bottom of the socket with a forked tool or jacking device or other approved method. All pipe shall have depth mark prior to insertion. Pipe cut in the field shall be filed to resemble the spigot end of manufactured pipe.
   4. When deflection is required the joint shall be completed prior to setting the deflection. The deflection shall conform to applicable AWWA Standards or manufacturer's recommendation.

D. Mechanical Joints
   1. The inside of the socket, the outside of the spigot end and the gland shall be thoroughly cleaned and or washed with an approved solution to remove dirt, grit, oil or excess coatings and foreign matter to improve gasket seating.
   2. The gland shall then be placed on the plain end of the pipe with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end of the pipe.

3. The pipe shall be inserted into the socket and the gasket pressed firmly and evenly into the gasket recess. The joint shall be kept straight during the assembly and any deflection required shall be done after the joint has been assembled but prior to tightening the bolts.

E. Polyethylene Encasement
   1. Polyethylene (PE) encasement when indicated for ductile iron pipe and fittings:
   2. Encase piping in PE as indicated on Drawings to prevent contact with surrounding soil material or insulation from adjacent cathodic protection system.
   3. Comply with AWWA C105.

F. Transition from One Type of Pipe to Another
   1. Provide necessary adapters, special, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
   2. Sewer service laterals shall be connected in accordance with Cape Fear Public Utility Authority Standard Drawing Details.
   3. No flexible couplings shall be used.

G. Pipe Restraint
   1. Provide restraint on ductile iron piping systems where shown or indicated in the Contract Documents below but not limited to:
      a. All ductile iron pipe aerial crossings and carrier pipes with any joints supported on pier or inside an encasement pipe shall require the use of a rigid joint restraint.
      b. All ductile iron pipe carrier pipes installed with joints inside an encasement pipe must utilize rigid restrained joints.

H. Service Connections
   1. In new sewer construction, PVC service connections shall be made by means of a wye, DIP service connections shall be made by means of a wye or a tee. All joints connected to the wye unit shall remain flexible.
   2. Service pipe for all properties shall be laid to the property line and plugged, as shown on the Standard Details. All sewer services shall be installed perpendicular to the main and terminate at the Right-Of-Way line. Sewer services in Cul-De-Sacs are required to be perpendicular or must originate in end of line manhole and terminate at Right-of-Way, no acute angles to downstream main.
   3. All services tying into ductile iron mains shall be constructed of class 50, DIP with Protecto 401 ceramic epoxy lining.
   4. Cleanouts shall be located a minimum of 6 feet from all property corners. Water meter boxes are to be a minimum of 5 feet from the property corner.
   5. In cases of extra depth where service pipe cannot be laid on a continuous grade to the property line, the Contractor shall construct risers as shown on the Plans. When pipe cannot be adequately supported on undisturbed earth, it shall be supported on a concrete cradle.
   6. Trench and backfill or bore to install lateral. Bore shall accommodate pipe without void around pipe. Bore shall be at least 5’ from the edge of pavement or back of curb on either side of the roadway unless approval to the contrary is given by the engineer.
   7. Connect lateral with wye.

8. Install sewer lateral with plug and one-way clean-out. Clean-out shall consist of a ¼ bend long sweep, with the necessary vertical 4" Schedule 40 PVC/DWV pipe stack. The clean-out plug shall be installed into a cast iron box and cover.

I. Service Reconnections
   1. Service reconnections require adapters for all joints that will not connect properly with ordinary factory joints. Approved pipe cutting methods shall be used to cut any pipe required for the connection. No mortar or collars shall be used on reconnections unless specifically approved by the Engineer.
   2. No flexible couplings shall be used.

J. Joining New Pipe to Old Pipe
   1. Joining PVC pipe to existing vitrified clay pipe requires an adapter approved in the Cape Fear Public Utility Authority's Materials Specification Manual for all joints that will not connect properly with ordinary factory joints. Approved pipe cutting methods must be used to cut any pipe required for the connection. No mortar or collars shall be used for such connections unless approved by the Engineer.
   2. No flexible couplings shall be used.

K. Joining Pipe to Manholes or Other Structures
   1. All manhole connection holes shall be core drilled with a maximum hole diameter not to exceed one and a half times the pipe diameter.
   2. Approved standard groutable PVC-to-manhole fitting approved in the Cape Fear Public Utility Authority's Materials Specification Manual, or a flexible rubber boot may also be used at the manhole connection. The connection at the manhole wall shall be flexible and watertight. Any annular space inside the manhole at the connection shall be filled with approved caulking material or joint filler.
   3. Pipe connections to existing manholes shall be made so that finished work will conform, as nearly as possible to the essential requirements for new manhole construction, as specified above. Drop connections on existing manholes ***shall be strengthened by use of eight #6 pins***, placed around the drop elbow and tee, or inside PVC drops may be used.
   4. Provide a minimum of six (6) inches of separation between edge of manhole core holes and manhole barrel joints. Provide a minimum six (6) inches separation between edges of core holes. Coring the manhole cone section is not allowed.

L. Sewer Manhole Inserts
   1. Sewer manhole inserts are required at all manholes. Stainless steel sewer manhole inserts are required at manholes located in traffic areas.

M. Pipe Markers: According to CFPUA Details and Material Specification Manual.

3.4 FIELD QUALITY CONTROL

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Section 33 14 22 – Testing of Sanitary Sewer Mains and Manholes.

END OF SECTION

DOWNTOWN ALLEY WATER AND SEWER IMPROVEMENTS

WILMINGTON, NC
CAPE FEAR PUBLIC UTILITY AUTHORITY

1 VICINITY MAP
SCALE: 1"=1000'

SCHEDULE OF DRAWINGS

SHEET NUMBER	SHEET TITLE
COVER	COVER
C-0.0	GENERAL NOTES, ABBREVIATIONS, LEGEND
C-1.0	QUINCE ALLEY PLAN & PROFILE
C-1.1	HENDERSON ALLEY PLAN & PROFILE
C-1.2	WILKINSON ALLEY PLAN & PROFILE
SD-1.0	CFPUA SANITARY SEWER DETAILS
SD-2.0	CFPUA WATER DETAILS
SD-3.0	CFPUA STANDARD DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 020149 ENGINEER J. CHRIS FORD
SEAL NOT VALID UNLESS SIGNED AND DATED

HIGHFILL INFRASTRUCTURE ENGINEERING, P.C.
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HIGHFILL PROJ. NO. CFA2202
CAPE FEAR PUBLIC UTILITY AUTHORITY

DOWNTOWN ALLEY WATER AND SEWER IMPROVEMENTS (HIGHFILL PROJ. NO. CFA2202)

PLOT DATE: 1/12/2026

GENERAL NOTES:

1. WORK SHALL COMPLY WITH APPLICABLE STATE, FEDERAL, AND LOCAL CODES. NECESSARY LICENSES AND PERMITS SHALL BE OBTAINED BY CONTRACTOR AT ITS EXPENSE, UNLESS PREVIOUSLY OBTAINED BY THE OWNER AND PROVIDED IN THE CONTRACT DOCUMENTS.
2. EXISTING SURVEY DATA WAS PROVIDED BY ROBERT H. GOSLE & ASSOCIATES AND THE CITY OF WILMINGTON CITY SURVEY, GEOMATICS, AND ENGINEERING DIVISION, ELEVATIONS SHOWN ARE BASED ON VERTICAL DATUM NAVD88. HORIZONTAL DATUM IS NAD83-2011
3. SANITARY SEWER CONSTRUCTION SHALL CONFORM TO NCDENR REGULATIONS AND TO CFPUA STANDARDS AND SPECIFICATIONS.
4. KEEP A COMPLETE SET OF CONTRACT DOCUMENTS AS WELL AS PERMIT APPROVALS AND EASEMENTS ON THE JOB SITE AT ALL TIMES. OWNER WILL FURNISH DESCRIPTION OF EASEMENTS UPON REQUEST.
5. NOTIFY THE ENGINEER IMMEDIATELY SHOULD ANY FIELD CONDITIONS BE ENCOUNTERED THAT VARY FROM THE INFORMATION PROVIDED IN THE CONTRACT DOCUMENTS.
6. DEVIATION FROM THE CONTRACT DOCUMENTS WITHOUT THE PRIOR WRITTEN CONSENT OF THE OWNER OR THE ENGINEER MAY BE CAUSE FOR THE WORK TO BE DEEMED UNACCEPTABLE.
7. AT LEAST FIVE BUSINESS DAYS PRIOR TO COMMENCING CONSTRUCTION, NOTIFY ENGINEER, CFPUA, THE CITY OF WILMINGTON, AND APPLICABLE REGULATORY AGENCIES THAT HE IS PREPARED TO COMMENCE.
8. COORDINATE WORK WITH THE CITY OF WILMINGTON AND CFPUA. PLAN AND CONSTRUCT THE WORK IN A MANNER THAT CAUSES MINIMUM INCONVENIENCE TO THE OWNER AND PUBLIC.
9. COORDINATE WITH UTILITY POLE OWNER FOR SUPPORT OF EXISTING UTILITY POLES AS REQUIRED FOR EXCAVATION AND INSTALLATION OF THE WORK. COSTS OF SUCH WORK SHALL BE PAID BY CONTRACTOR.
10. BURIED TELEPHONE AND CATV CABLES (FIBER OPTICS AND CONVENTIONAL) ARE KNOWN TO VARY DUE TO INSTALLATION TECHNIQUES. CONTRACTOR SHALL COORDINATE WORK WITH CONFLICTING TELEPHONE AND CATV CABLES AS NECESSARY FOR CONSTRUCTION OF THE WORK. UTILITY COORDINATION SHALL BE INCLUDED IN THE PROJECT SCHEDULE AND IT IS THE EXPLICIT RESPONSIBILITY OF CONTRACTOR TO ASSURE THAT THE PROJECT SCHEDULE INCLUDES THE NECESSARY COORDINATION. CONTRACTOR SHALL NOT BE PAID ADDITIONALLY FOR THIS COORDINATION.
11. LOCATION OF EXISTING UTILITIES IS APPROXIMATE. IT IS THE RESPONSIBILITY OF CONTRACTOR TO DETERMINE THE SIZE, DEPTH, MATERIAL, AND LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION AND TO TAKE WHATEVER STEPS ARE NECESSARY TO PROVIDE FOR THEIR PROTECTION. THE ENGINEER HAS ATTEMPTED TO LOCATE AND INDICATE EXISTING UTILITIES ON THE DRAWINGS; HOWEVER, THIS INFORMATION IS SHOWN FOR CONTRACTOR'S CONVENIENCE ONLY. THE ENGINEER AND OWNER ASSUME NO RESPONSIBILITY FOR THE LOCATIONS OF UTILITIES SHOWN OR NOT SHOWN. PRIOR TO DIGGING ON OR OFF SITE, CONTRACTOR SHALL HAVE ALL UTILITIES LOCATED BY "NC 811" (1-800-632-4949). CONTRACTOR SHALL CONTACT ANY UTILITY COMPANY WHOSE UTILITIES ARE NOT LOCATED BY "NC 811" FOR EXACT LOCATION OF THEIR UTILITIES PRIOR TO STARTING CONSTRUCTION. IT SHALL BE THE SOLE RESPONSIBILITY OF CONTRACTOR TO REPAIR OR REPLACE UTILITIES DAMAGED BY CONTRACTOR TO PRECONSTRUCTION CONDITIONS AT CONTRACTOR'S EXPENSE. REPAIR OR REPLACE UTILITIES TO THE SATISFACTION OF THE UTILITY OWNER.
12. BUILDING LOCATIONS ARE APPROXIMATE AND ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY. NOT ALL STRUCTURES ARE SHOWN.
13. LIMIT CONSTRUCTION ACTIVITY TO STREET RIGHTS-OF-WAY AND CITY EASEMENTS.
14. WHERE CONTRACTOR DETERMINES THAT ENCROACHMENT ONTO PRIVATE PROPERTY IS NECESSARY, AND AN EASEMENT HAS NOT BEEN PROVIDED, CONTACT INDIVIDUAL PROPERTY OWNERS AND OBTAIN WRITTEN APPROVAL FOR THAT ENCROACHMENT. A COPY OF THIS APPROVAL SHALL BE PROVIDED TO THE ENGINEER.
15. MAINTAIN A MEANS FOR INGRESS/EGRESS TO EACH PROPERTY AT ALL TIMES. BYPASS PIPE SHALL NOT PROHIBIT ACCESS TO PROPERTIES. PROVIDE FLOW-THROUGH ROAD RAMPS AT ROAD CROSSINGS AND DRIVEWAYS.
16. PROVIDE TRAFFIC CONTROL. ERECT AND MAINTAIN AT ALL TIMES DURING THE PROGRESS OR TEMPORARY SUSPENSION OF WORK, SUITABLE BARRIERS, FENCES, SIGNS OR OTHER ADEQUATE PROTECTION, INCLUDING FLAG MEN AND WATCHMEN AS NECESSARY TO ENSURE THE SAFETY OF THE PUBLIC AS WELL AS THOSE ENGAGED IN THE CONSTRUCTION WORK. CONSTRUCTION SIGNAGE SHALL BE IN ACCORDANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AS SUPPLEMENTED BY THE NCDOT SUPPLEMENT TO THE MUTCD.
17. NOTIFY HOME AND BUSINESS OWNERS IN WRITING AT LEAST 7 DAYS PRIOR TO CONSTRUCTION THAT CONSTRUCTION ACTIVITY WILL TAKE PLACE IN THE VICINITY OF THEIR PROPERTY.
18. MAKE EVERY EFFORT TO PRESERVE PROPERTY IRONS, MONUMENTS, OTHER PERMANENT POINTS AND LINES OF REFERENCE AND CONSTRUCTION STAKES. PROPERTY IRONS, MONUMENTS, AND OTHER PERMANENT POINTS OF REFERENCE DESTROYED BY CONTRACTOR SHALL BE REPLACED BY A PROFESSIONAL LAND SURVEYOR AT CONTRACTOR'S EXPENSE.
19. EXISTING VEGETATION OUTSIDE OF THE CLEARING LIMITS SHALL BE PROTECTED FROM DAMAGE.
20. UNLESS OTHERWISE INDICATED, EXISTING GRADE ELEVATIONS ARE SHOWN ALONG THE SEWER ALIGNMENT.
21. PIPE LENGTHS AND DISTANCES BETWEEN STRUCTURES ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE ALONG A HORIZONTAL PLANE.
22. PROVIDE STAKEOUT SURVEY. EXISTING STAKE OUT SHALL NOT BE USED BY CONTRACTOR.
23. IMMEDIATELY PRIOR TO DISTURBANCE, CONTRACTOR SHALL VIDEOTAPE SEWER ALIGNMENT INCLUDING EACH DRIVEWAY, SIDEWALK, STRUCTURE, ETC., TO BE DISTURBED. EACH SHALL BE RESTORED TO ITS PRECONSTRUCTION CONDITION OR BETTER. VIDEO SHALL BE SUBMITTED TO ENGINEER PRIOR TO WORK.
24. MATERIAL CLEARED AND GRUBBED BY CONTRACTOR IN ORDER TO CONSTRUCT THE WORK, SUCH AS TREES, VEGETATION, FENCING, ETC., SHALL BECOME THE PROPERTY OF CONTRACTOR AND SHALL BE PROPERLY DISPOSED OF OFF-SITE AT A STATE APPROVED DISPOSAL SITE. BURNING IS NOT ALLOWED.
25. PAVEMENT CUTS SHALL BE SAW CUT ALONG A STRAIGHT CONTINUOUS EDGE.
26. FURNISH AND INSTALL SHEETING REQUIRED FOR THE INSTALLATION OF THE UTILITY. EXCAVATIONS SHALL BE KEPT WITHIN THE DESIGNATED EASEMENT AND RIGHT-OF-WAY WIDTHS. EXCAVATION WITHIN PAVED AREAS SHALL BE KEPT TO A MINIMUM. SHEETING SHALL BE INSTALLED AS REQUIRED TO PROTECT EXISTING UTILITIES.
27. REMOVE AND REPLACE CONFLICTING MAIL BOXES, CULVERTS, HEADWALLS, ORNAMENTAL STRUCTURES, LANDSCAPING, ETC. WITHIN THE RIGHT-OF-WAY OR EASEMENT WHERE DIRECTED BY THE CITY OF WILMINGTON.
28. METALLIC DETECTOR TAPE IS REQUIRED FOR BURIED PIPE, SEE SPECIFICATIONS FOR REQUIREMENTS.
29. DUCTILE IRON PIPE SHALL BE LINED WITH PROTECTO 401.
30. ACCESS TO BUSINESSES AND RESIDENCES SHALL BE MAINTAINED AT ALL TIMES.

PROJECT NOTES:

1. CONTRACTOR SHALL PLAN WORK TO MINIMIZE IMPACT TO PROPERTY OWNERS RESULTING FROM SEWER FLOW RESTRICTIONS DURING THE WORK.
2. IF A DIRECT CONNECTION FROM A STORM SEWER OR PRIVATE PROPERTY STORM DRAIN TO SANITARY SEWER IS CONFIRMED, INFORM OWNER AND ENGINEER BEFORE DISCONNECTING OR RESTORING THE CONNECTION.
3. UNDERMINING OF THE PAVEMENT AND BUILDING FOUNDATIONS, RESULTING FROM MIGRATION OF SOILS AND RUNNING SANDS AT PITS, TRENCHES, AND OTHER EXCAVATIONS, SHALL BE PREVENTED BY DRIVING PLATE SHEETING BETWEEN THE TRENCH BOX AND THE BUILDING FOUNDATION, INSTALLING ACTIVE SHORING, OR OTHER MANNER APPROVED BY THE CITY OF WILMINGTON AND THE ENGINEER.
4. TRENCHES SHALL BE CLOSED DURING NON-WORK HOURS EXCEPT WHERE COVERING WITH STEEL PLATING IS SPECIFICALLY APPROVED BY THE ENGINEER.
5. PITS SHALL BE COVERED WITH STEEL PLATES DURING NON-WORK HOURS.
6. LOCATE AND CONFIRM ACTIVE SERVICE LATERALS. REPLACE ONLY ACTIVE SERVICE LATERALS AND INACTIVE SERVICE LATERALS DESIGNATED BY CFPUA.
7. WHERE EXISTING UTILITIES CONFLICT WITH SLIPLINING PITS OR TRENCHES, PROVIDE SUPPORT AND PROTECT OR REMOVE AND RESTORE THOSE UTILITIES AS DIRECTED BY UTILITY OWNER.

ALLEY TRENCHING NOTES:

1. IN THE EVENT THAT FIELD CONDITIONS DIFFER FROM THE CONSTRUCTION DRAWINGS, NOTIFY THE ENGINEER AND CFPUA PRIOR TO CONTINUING WORK.
2. AVOID DISRUPTING UTILITY SERVICES. IF A UTILITY SERVICE MUST BE DISRUPTED, PROVIDE THE CITY OF WILMINGTON 72 HOURS NOTICE PRIOR TO THE DISRUPTION.
3. IF A UTILITY LINE MUST BE RELOCATED, COORDINATE UTILITY RELOCATION WITH THE UTILITY COMPANY AND CITY OF WILMINGTON.
4. BACKFILL UP TO BASE COURSE BUT DO NOT INSTALL ASPHALT OR BRICK BASE OR SURFACE COURSE.

CONSTRUCTION SEQUENCE FOR SLIPLINING (APPLY TO EXCAVATION AND REPLACEMENT WHERE APPLICABLE)

MODIFICATIONS TO THIS SEQUENCE MAY BE ALLOWED BASED ON THE CONTRACTOR'S MEANS AND METHODS AND TO COORDINATE DIFFERENT PORTIONS OF THE WORK, PROVIDED THEY ARE APPROVED AS PART OF THE SLIPLINING PLAN OR DETERMINED TO BE NECESSARY DURING CONSTRUCTION AND ARE APPROVED BY THE CFPUA AND ENGINEER. MODIFICATIONS TO THIS SEQUENCE SHALL NOT RESULT IN THE SPILLAGE OR DISCHARGE OF WASTEWATER, THE VIOLATION OF PERMITS, UNAPPROVED TRAFFIC PATTERNS OR MAINTENANCE, UNAPPROVED SITE ACCESS, AND UNAPPROVED SERVICE INTERRUPTIONS. SOME STEPS CAN BE PERFORMED CONCURRENTLY WHERE THE NEXT STEP DOES NOT REQUIRE PROPER COMPLETION OF THE PRIOR STEP FOR INSTALLATION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

1. PRIOR TO MOBILIZATION, SUBMIT AND RECEIVE APPROVAL OF ALL SUBMITTALS RELATED TO SLIPLINING IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
2. SCHEDULE THE SLIPLINING PRE-INSTALLATION MEETING WITH THE CFPUA AND ENGINEER A MINIMUM OF ONE WEEK PRIOR TO THE MEETING. THE MEETING SHALL BE SCHEDULED A MINIMUM OF ONE WEEK PRIOR MOBILIZATION OF SLIPLINING EQUIPMENT.
3. CCTV THE EXISTING SEWER IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND CONFIRM THE SEWER IS IN ACCEPTABLE CONDITION FOR SLIPLINING.
4. IDENTIFY ACTIVE AND INACTIVE SERVICE LATERALS. CONFIRM SIZE AND LOCATION OF EXISTING SERVICE LATERALS TO BE RECONNECTED AND CONFIRM NEW SERVICE LATERALS TO BE INSTALLED WITH CFPUA.
5. ATTEND THE SLIPLINING PRE-INSTALLATION MEETING CONDUCTED BY THE ENGINEER.
6. DELIVER PIPE, COUPLINGS, SADDLES, MANHOLES, MANHOLE CONNECTION COMPONENTS, AND OTHER MATERIALS NECESSARY FOR SLIPLINING AND REESTABLISHMENT OF SEWER SERVICE AND THE SEWER SYSTEM.
7. NOTIFY THE RESIDENT PROJECT REPRESENTATIVE (RPR), THE CFPUA PROJECT MANAGER, NCDOT (WHERE APPLICABLE), BUSINESS OWNERS AND RESIDENTS IN ACCORDANCE WITH THE PROJECT NOTIFICATION PLAN A MINIMUM OF ONE WEEK IN ADVANCE OF SERVICE INTERRUPTION. PROVIDE A SECOND NOTIFICATION 24 HOURS IN ADVANCE.
8. MOBILIZE SEWER CLEANING, FLOW BYPASSING, AND SLIPLINING EQUIPMENT.
9. ESTABLISH TRAFFIC CONTROL IN ACCORDANCE WITH THE TRAFFIC MAINTENANCE PLAN AND CONTRACT DOCUMENTS.
10. ESTABLISH EROSION CONTROL IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND THE EROSION AND SEDIMENTATION CONTROL PERMIT.
11. FUSE AND STRING PIPE AT LOCATIONS AGREED UPON WITH CITY OF WILMINGTON, CFPUA, AND ENGINEER.
12. EXCAVATE PIPE INSERTION PIT.
13. DISCONNECT ACTIVE SERVICE LATERALS AND INACTIVE SERVICE LATERALS TO BE RECONNECTED TO MAINS IN ACCORDANCE WITH THE FLOW BYPASSING PLAN. ESTABLISH SEWER BYPASSING OF MAINS IN ACCORDANCE WITH THE FLOW BYPASSING PLAN.
14. MAINTAIN WASTEWATER SERVICE TO ALL TRIBUTARY SEWERS AND SERVICE LATERALS.
15. SETUP SLIPLINING EQUIPMENT IN ACCORDANCE WITH THE SLIPLINING PLAN.
16. PULL PIPE STRING TO THE INSERTION PIT IN AN APPROVED MANNER. INSPECT THE PIPE FOR DAMAGE.
17. PERFORM SLIPLINING OPERATIONS IN ACCORDANCE WITH THE SLIPLINING PLAN.
18. CONNECT NEW PIPE TO NEW OR EXISTING MANHOLES AFTER THE APPROPRIATE RELAXATION PERIOD.
19. REMOVE ENOUGH OF THE HOST PIPE TO RECONNECT SEWER LATERALS.
20. CLEAN AND PROVIDE CCTV OF COMPLETED SLIPLINING AFTER ALL CONNECTIONS TO MANHOLES AND SERVICE LATERALS HAVE BEEN COMPLETED.

ABBREVIATIONS:

AWWA – AMERICAN WATER WORKS ASSOCIATION
CFPUA – CAPE FEAR PUBLIC UTILITY AUTHORITY
CL – CENTERLINE
CB – CATCH BASIN
CMP – CORRUGATED METAL PIPE
CONC – CONCRETE
CPP – CORRUGATED PLASTIC PIPE
CT – COURT
DI – DUCTILE IRON
DIP – DUCTILE IRON PIPE
DR – DRIVE
EX – EXISTING
E.O.P – EDGE OF PAVEMENT
FM – FORCE MAIN
GV – GATE VALVE
HDPE – HIGH DENSITY POLYETHYLENE
INV – INVERT
IP – IRON PIPE
LSE – LANDSCAPE EASEMENT
LF – LINEAR FEET
MIN – MINIMUM
MH – MANHOLE
MJ – MECHANICAL JOINT
N – NEW
NIC – NOT IN CONTRACT
NTS – NOT TO SCALE
OC – ON CENTER
PE – PLAIN END
PJ – PUSH-ON JOINT
PL – PROPERTY LINE
PP – POWER POLE
PSI – POUNDS PER SQUARE INCH
PV – PLUG VALVE
PVC – POLYVINYL CHLORIDE
PVMT – PAVEMENT
R/W or ROW – RIGHT-OF-WAY
R or RAD – RADIUS
RCP – REINFORCED CONCRETE PIPE
REQ'D – REQUIRED
RD – ROAD
RJ – RESTRAINED JOINT
STA – STATION
SR – STATE ROAD
SSMH – SANITARY SEWER MANHOLE
THK – THICK
TOS – TOP OF SLAB
TS&V – TAPPING SLEEVE AND VALVE
TYP. – TYPICAL
U/G – UNDERGROUND
U.N.O. – UNLESS NOTED OTHERWISE
UNK – UNKNOWN
UT – UNDERGROUND TELEPHONE
W/ – WITH
WL – WATER LINE
WWF – WELDED WIRE FABRIC OR FENCE
or LB – POUNDS
5/SD-1 – DETAIL CROSS-REFERENCE (DETAIL 5 ON SHEET SD-1 IN THIS EXAMPLE)

LEGEND

SYMBOL (NEW)	SYMBOL (EX.)	DESCRIPTION
A	A	AIR RELEASE VALVE ASSEMBLY
		UTILITY PEDESTAL (SIZE/SHAPE VARIES)
		TREE/SHRUB (DIA & TYPE SOMETIMES NOTED)
		SEWER CLEAN-OUT
100	100	CONTOUR
+ 100	+ 100	SPOT ELEVATION
CL		WOODS LINE, CLEARING LIMIT
S	S SD	SEWER & STORMWATER MANHOLE
		CATCH BASIN / GRILL BASIN
	W	WELL
		POWER OR TELEPHONE POLE
		FIRE HYDRANT ASSEMBLY
	WV	GATE VALVE
		BALL VALVE
		BUTTERFLY VALVE
	E E	UNDERGROUND POWER
	OHE OHE	OVERHEAD POWER
	UT UT	UNDERGROUND TELEPHONE
	TEL TEL	OVERHEAD TELEPHONE
	G	GAS LINE
W	W W	WATER LINE
	SS SS	SEWER LINE
	FM FM	SEWER FORCE MAIN
		STORMWATER PIPE
	FO FO	UNDERGROUND FIBER OPTIC LINE
SF SF		SILT FENCE
		CENTERLINE OF DITCH OR CREEK
X X	X X	FENCE
		PROPERTY LINE
		PERMANENT EASEMENT OR R/W
		PIPE INLET PROTECTION
		CHECK DAM
		INLET PROTECTION
		WATTLE
		STRUCTURE OUTLINE
		TEMPORARY BENCH MARK
		WATER METER
		BORE AND JACK OR PIPE INSERTION OR RECEIVING PIT
		LIGHT POLE
		PROPERTY OR R/W MONUMENT
		GUY WIRE
		SIGN
		BORE & JACK
		MAILBOX
		TEMPORARY CONSTRUCTION EASEMENT
		WETLANDS BOUNDARY
		SUBSURFACE TEST BORE
		ITEM TO BE REMOVED
		ASPHALT/CONCRETE REMOVAL AND RESTORATION
		EROSION CONTROL MATTING
		HORIZONTAL DIRECTIONAL DRILL

BY	JDD				
	ISSUED FOR BID				
	REVISION				
	1/12/26				
	DATE				

PLOT DATE: 1/12/2026

NORTH CAROLINA PROFESSIONAL SEAL 020149 ENGINEER CHRIS FORD
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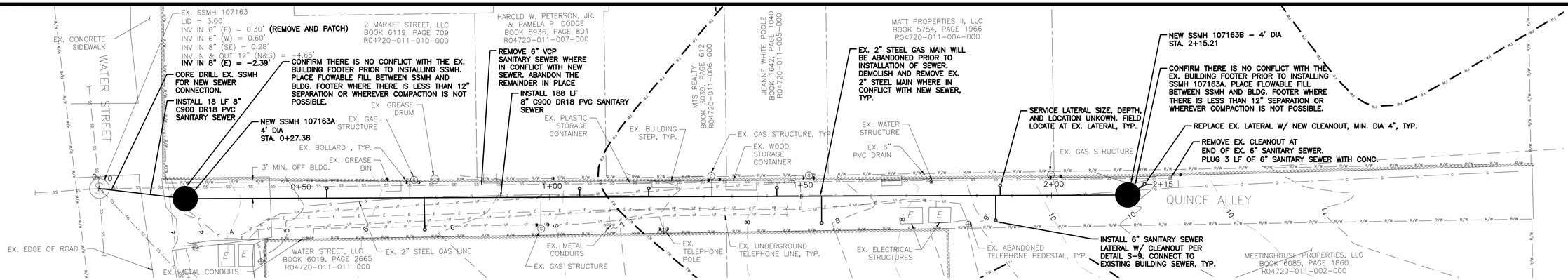
WILMINGTON, NC

GENERAL NOTES, ABBREVIATIONS, LEGEND

PROJECT NO.
CFA2202

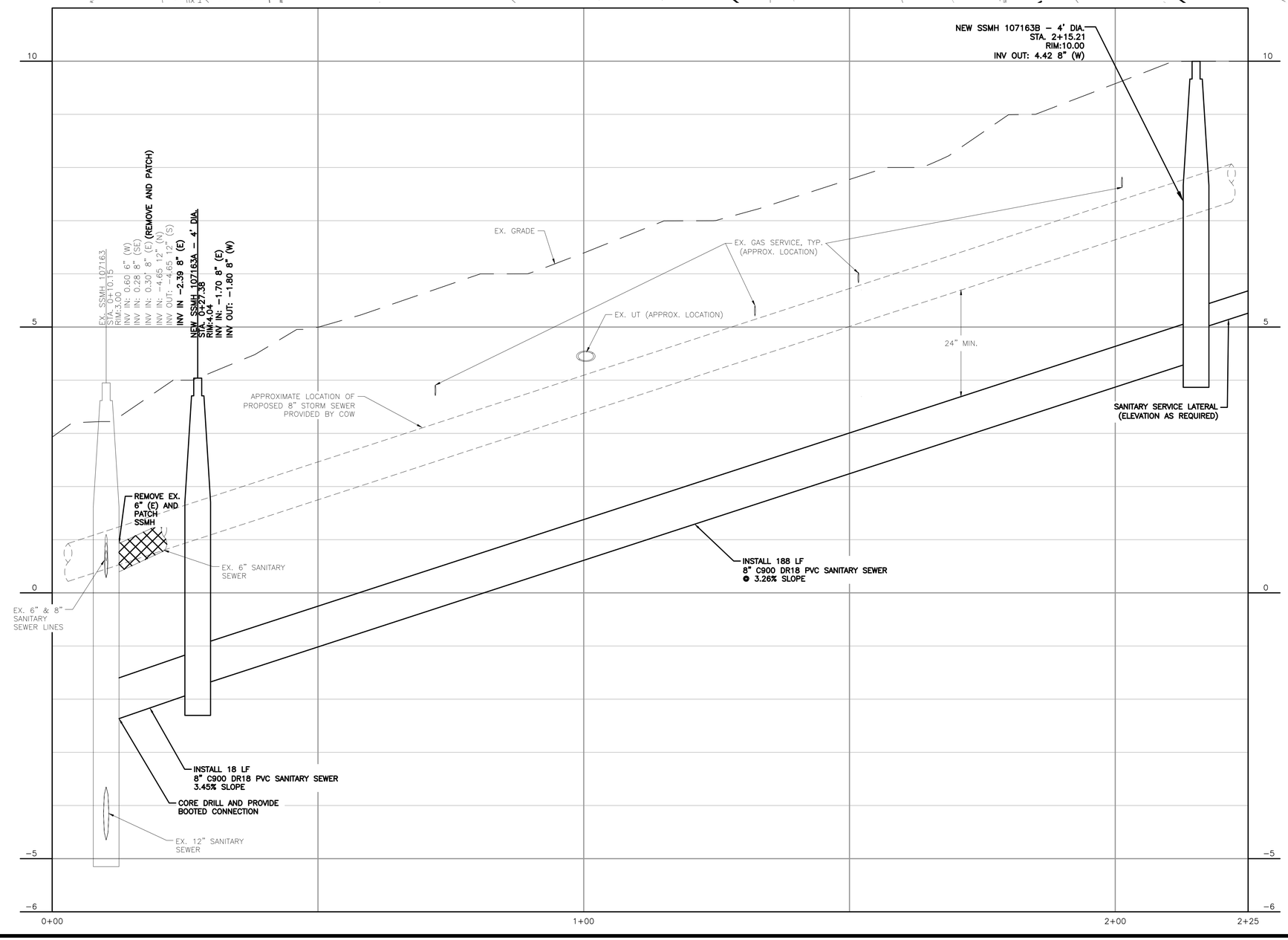
C-0.0



1 QUINCE ALLEY SITE PLAN

SCALE: 1" = 10'

NOTES:
1. DETERMINE TRIBUTARY SEWER FROM EACH PROPERTY ADJOINING THE ALLEY THROUGH DIE TESTING OR OTHER MEANS.
2. LOCATE AND POTHOLE SERVICE LATERALS THAT ARE TRIBUTARY TO THE ALLEY TO DETERMINE SIZE, MATERIAL, AND INVERT ELEVATION PRIOR TO ORDERING MANHOLES AND OTHER MATERIALS. PROVIDE LOCATION, SIZE, AND DEPTH TO ENGINEER WHO WILL EVALUATE THE PROPOSED SANITARY SEWER DEPTH AND SET THE FINAL MANHOLE DEPTH. DO NOT ORDER MANHOLES UNTIL ENGINEER HAS PROVIDED FINAL MANHOLE DEPTH.
3. SEE ALLEY TRENCHING NOTES SHEET C-0.0
4. IF EXCAVATION UNDERMINES A FOOTING OR FOUNDATION, PLACE CONCRETE TO THE TOP OF FOOTING OR FOUNDATION.
5. SANITARY SEWER INSTALLED WITHIN 12" HORIZONTALLY OF ANOTHER UTILITY SHALL BE BACKFILLED TO THE SPRINGLINE WITH FLOWABLE FILL BETWEEN UTILITIES PER HIGHFILL STANDARD DETAIL 03-13 ON SHEET C-1.2.



MANHOLE TABLE		
DESCRIPTION	NORTHING	EASTING
107163A	178170.6063	2317477.1858
107163B	178188.8480	2317664.1299

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 inch = 10 ft.

2 QUINCE ALLEY PROFILE

SCALE: 1" = 10'
VERTICAL SCALE: 1" = 1'

BY	REVISION	DATE
JDD	ISSUED FOR BID	1/12/26

PLOT DATE: 1/13/2026

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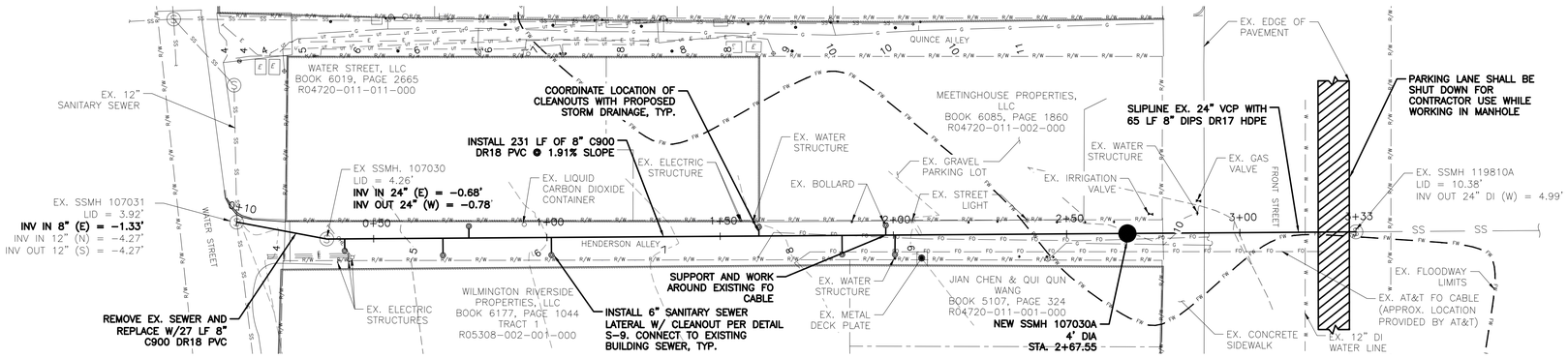
QUINCE ALLEY PLAN & PROFILE

PROJECT NO.
CFA2202

C-1.0



1 HENDERSON ALLEY SITE PLAN

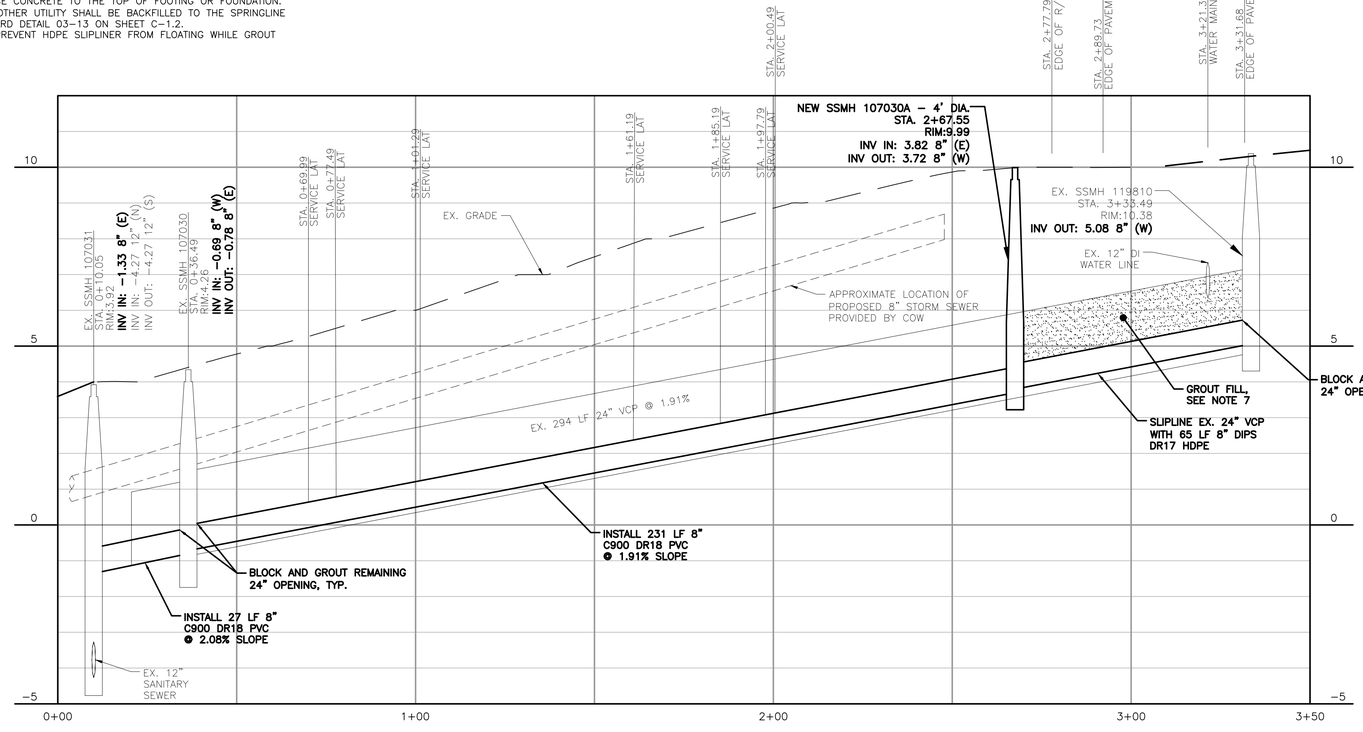
SCALE: 1" = 20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

NOTES:
1. COORDINATE ACCESS TO PROPERTIES ALONG ALIGNMENT WITH RESIDENTS, LOCATE SERVICE LATERALS IN THE CRAWLSPACES BENEATH THE PROPERTIES, AND VERIFY SERVICE LATERAL DEPTH AND LOCATION PRIOR TO ORDERING MATERIALS FOR SERVICE CONNECTIONS. IF SERVICE LATERAL CONNECTIONS ARE IMPOSSIBLE ACCORDING TO STATE AND LOCAL STANDARDS, CONTRACTOR SHALL HALT WORK AND NOTIFY ENGINEER.
2. DETERMINE TRIBUTARY SEWER FROM EACH PROPERTY ADJOINING THE ALLEY THROUGH DIE TESTING OR OTHER MEANS.
3. LOCATE AND POTHOLE SERVICE LATERALS THAT ARE TRIBUTARY TO THE ALLEY TO DETERMINE SIZE, MATERIAL, AND INVERT ELEVATION PRIOR TO ORDERING MANHOLES. PROVIDE LOCATION, SIZE, AND DEPTH TO ENGINEER WHO WILL EVALUATE THE PROPOSED SANITARY SEWER DEPTH AND SET THE FINAL MANHOLE DEPTH. DO NOT ORDER MANHOLES UNTIL ENGINEER HAS PROVIDED FINAL MANHOLE DEPTH.
4. SEE ALLEY TRENCHING NOTES SHEET C-0.0
5. IF EXCAVATION UNDERMINES A FOOTING OR FOUNDATION, PLACE CONCRETE TO THE TOP OF FOOTING OR FOUNDATION.
6. SANITARY SEWER INSTALLED WITHIN 12" HORIZONTALLY OF ANOTHER UTILITY SHALL BE BACKFILLED TO THE SPRINGLINE WITH FLOWABLE FILL BETWEEN UTILITIES PER HIGHFILL STANDARD DETAIL 03-13 ON SHEET C-1.2.
7. PROVIDE WEIGHT AND ESTABLISH GROUTING PLAN THAT WILL PREVENT HDPE SLIPLINER FROM FLOATING WHILE GROUT IS CURING. PROVIDE THIS IN A PROJECT SUBMITTAL.



2 HENDERSON ALLEY PROFILE

SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

MANHOLE TABLE

DESCRIPTION	NORTHING	EASTING
107030A	178139.6665	2317740.3290

BY	JDD				
REVISION	ISSUED FOR BID				
DATE	1/12/26				

PLOT DATE: 1/12/2026

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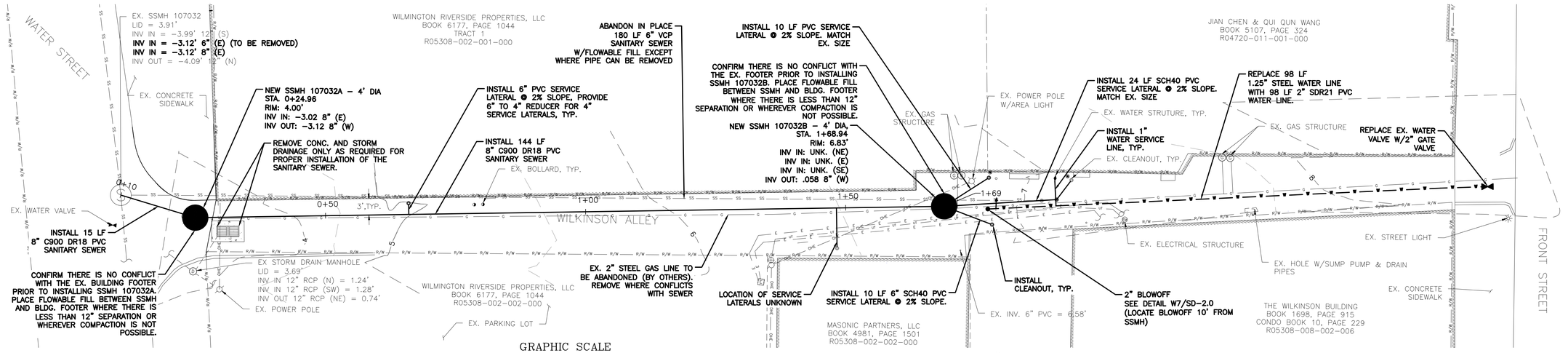
HENDERSON ALLEY PLAN & PROFILE

PROJECT NO.
CFA2202

C-1.1

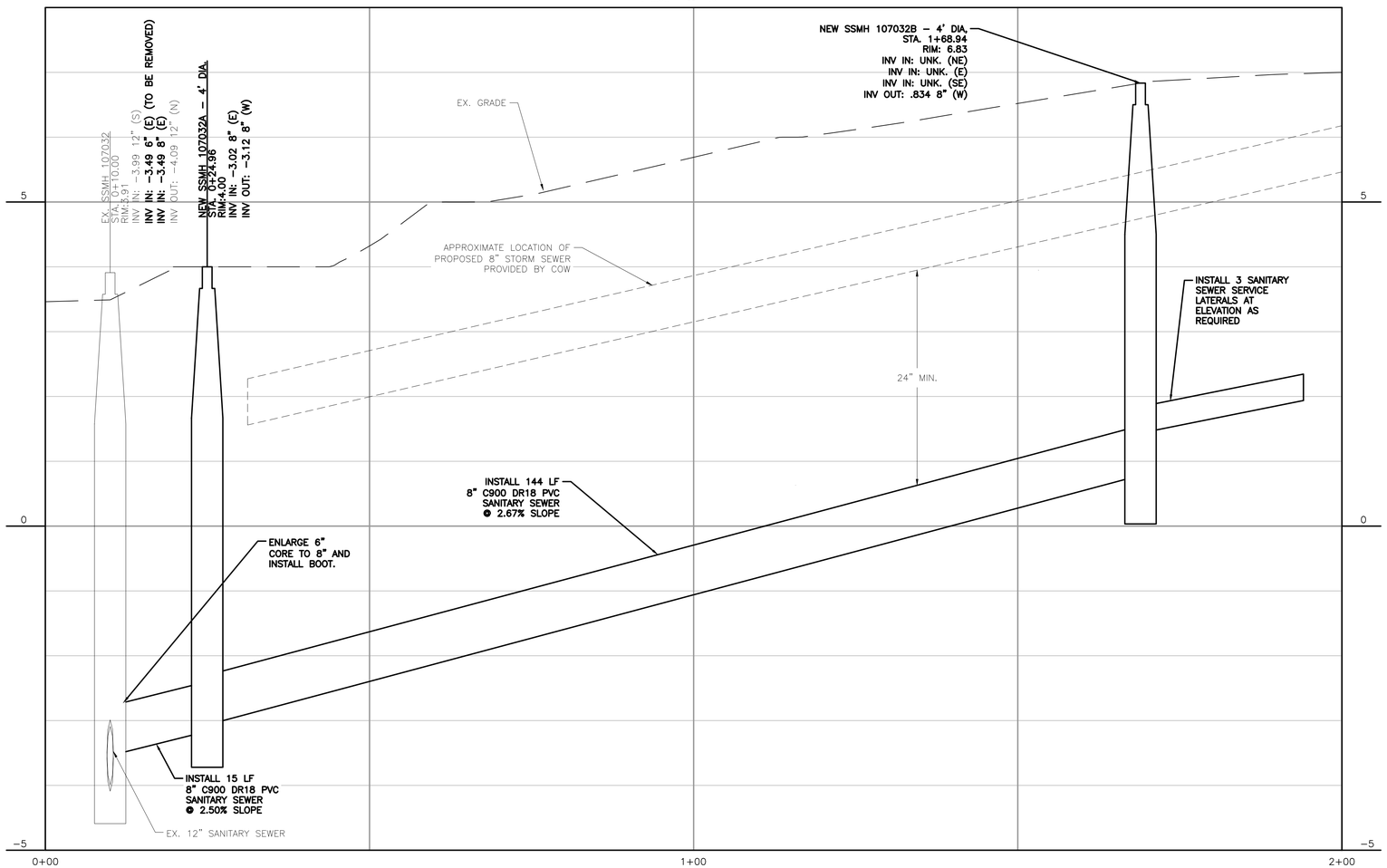


1 WILKINSON ALLEY SITE PLAN

SCALE: 1" = 10'

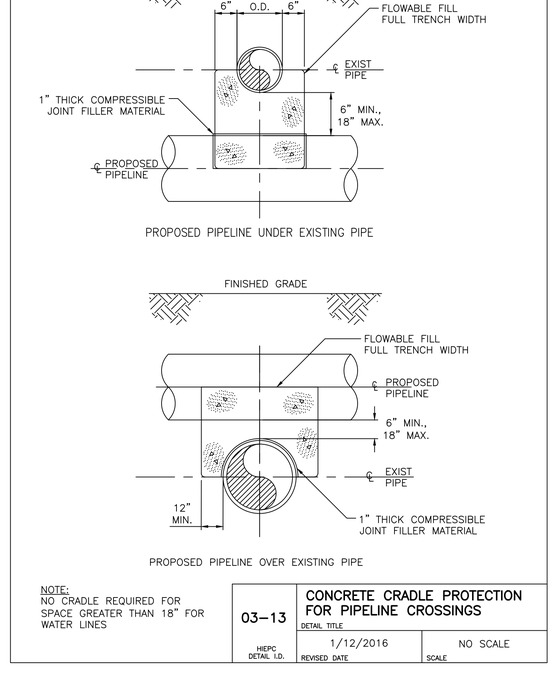
NOTES:
1. DETERMINE TRIBUTARY SEWER FROM EACH PROPERTY ADJOINING THE ALLEY THROUGH DIE TESTING OR OTHER MEANS.
2. LOCATE AND POTHOLE SERVICE LATERALS THAT ARE TRIBUTARY TO THE ALLEY TO DETERMINE SIZE, MATERIAL, AND INVERT ELEVATION PRIOR TO ORDERING MANHOLES. PROVIDE LOCATION, SIZE, AND DEPTH TO ENGINEER WHO WILL EVALUATE THE PROPOSED SANITARY SEWER DEPTH AND SET THE FINAL MANHOLE DEPTH. DO NOT ORDER MANHOLES UNTIL ENGINEER HAS PROVIDED FINAL MANHOLE DEPTH.
3. SEE ALLEY TRENCHING NOTES SHEET C-0.0
4. IF EXCAVATION UNDERMINES A FOOTING OR FOUNDATION, PLACE CONCRETE TO THE TOP OF FOOTING OR FOUNDATION.
5. SANITARY SEWER INSTALLED WITHIN 12" HORIZONTALLY OF ANOTHER UTILITY SHALL BE BACKFILLED TO THE SPRINGLINE WITH FLOWABLE FILL BETWEEN UTILITIES PER HIGHFILL STANDARD DETAIL 03-13 ON SHEET C-1.2.

MANHOLE TABLE		
DESCRIPTION	NORTHING	EASTING
107032A	178021.4139	2317520.3054
107032B	178040.2531	2317663.0445



2 WILKINSON ALLEY PROFILE

SCALE: 1" = 10'
VERTICAL SCALE: 1" = 1'



NOTE:
NO CRADLE REQUIRED FOR SPACE GREATER THAN 18" FOR WATER LINES

03-13	CONCRETE CRADLE PROTECTION FOR PIPELINE CROSSINGS (DETAIL TITLE)	
HIEPC DETAIL I.D.	1/12/2016 (REVISED DATE)	NO SCALE (SCALE)

NO.	---	---	---	1/12/26	ISSUED FOR BID	JDD
				DATE	REVISION	BY

PLOT DATE: 1/13/2026

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WILKINSON ALLEY PLAN & PROFILE

PROJECT NO.
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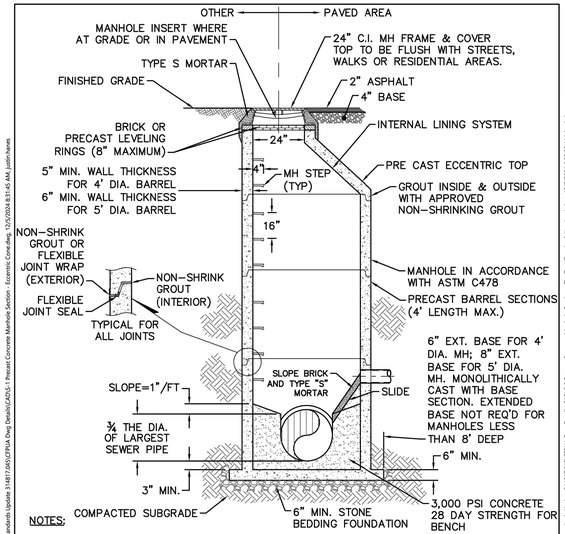
C-1.2



NOTES:

1. FOR MANHOLES UP TO 12 FEET IN DEPTH MINIMUM BARREL DIAMETER SHALL BE 4 FEET. MANHOLES GREATER THAN 12 FEET IN DEPTH SHALL BE A MINIMUM OF 5 FEET IN DIAMETER.
2. PROVIDE A MINIMUM DISTANCE OF SIX (6) INCHES BETWEEN EDGE OF MANHOLE CORE HOLES AND MANHOLE BARREL JOINTS. PROVIDE A MINIMUM OF SIX (6) INCHES BETWEEN EDGES OF CORE HOLES. CORING THE MANHOLE CONE IS NOT ALLOWED.
3. ALL MANHOLE MAIN LINE AND SERVICE PIPING TO BE INSTALLED AT A MINIMUM OF CROWN TO CROWN OF THE LARGEST DIAMETER PIPE.

FOR LESS THAN 30" INSIDE DROP

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-1 Precast Concrete Manhole Section - Eccentric Cone.dwg, 12/5/2024 8:31:45 AM, justin.hanes

DETAIL: PRECAST CONCRETE MANHOLE SECTION - ECCENTRIC CONE		DETAIL NO: S-1
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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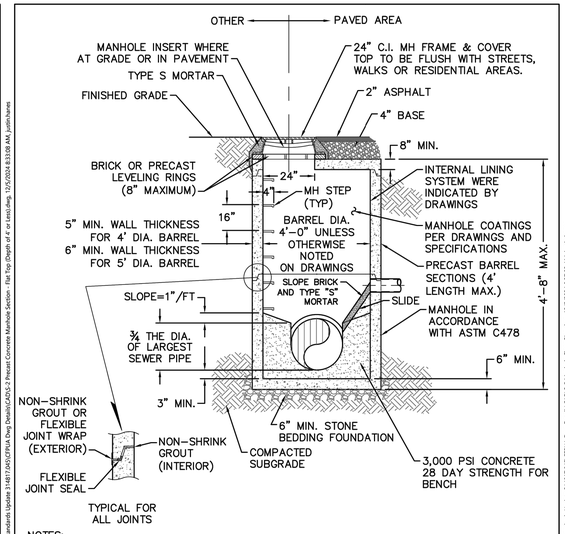
WILMINGTON, NC 28403
OFFICE: (910)332-6560



NOTES:

1. PROVIDE A MINIMUM DISTANCE OF SIX (6) INCHES BETWEEN EDGE OF MANHOLE CORE HOLES AND MANHOLE BARREL JOINTS. PROVIDE A MINIMUM OF SIX (6) INCHES BETWEEN EDGES OF CORE HOLES. CORING THE MANHOLE CONE IS NOT ALLOWED.
2. ALL MANHOLE MAIN LINE AND SERVICE PIPING TO BE INSTALLED AT A MINIMUM OF CROWN TO CROWN OF THE LARGEST DIAMETER PIPE.

FOR LESS THAN 30" INSIDE DROP

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-2 Precast Concrete Manhole Section - Flat Top (Depth of 4' or Less).dwg, 12/5/2024 8:33:08 AM, justin.hanes

DETAIL: PRECAST CONCRETE MANHOLE SECTION - FLAT TOP (DEPTH OF 4' OR LESS)		DETAIL NO: S-2
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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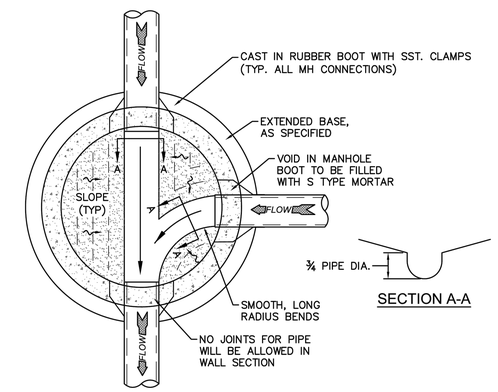

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-3 Manhole Floor Plan.dwg, 12/5/2024 8:37:02 AM, justin.hanes

DETAIL: MANHOLE FLOOR PLAN		DETAIL NO: S-5
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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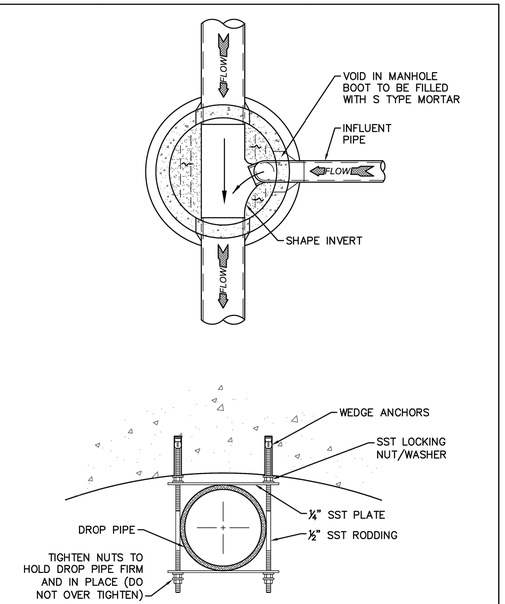
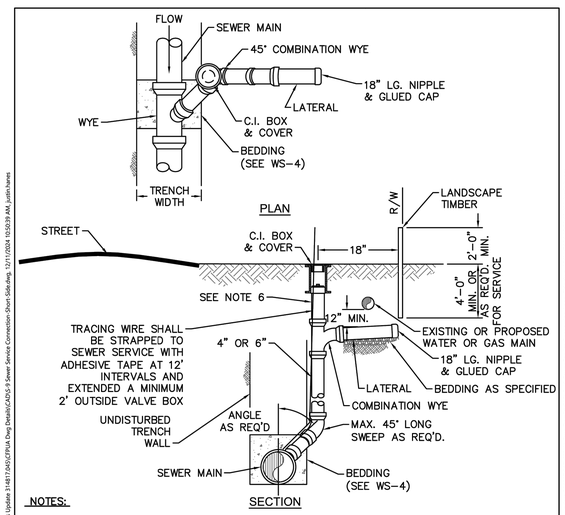


NOTE: ALL PARTS TO BE 316 SST.

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-4 Drop Manhole Floor Plan and Strap Detail.dwg, 12/5/2024 8:38:06 AM, justin.hanes

DETAIL: DROP MANHOLE FLOOR PLAN AND STRAP DETAIL		DETAIL NO: S-6
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560



NOTES:

1. SEWER SERVICES SHALL BE PERPENDICULAR TO MAIN. SEWER SERVICES IN CUL-DE-SACS ARE REQUIRED TO BE PERPENDICULAR, OR MUST ORIGINATE IN END OF LINE MANHOLE AND TERMINATE AT RIGHT-OF-WAY LINE.
2. ALL SERVICES CONNECTING INTO DUCTILE IRON MAINS SHALL BE CONSTRUCTED OF DIP, WITH PROTECTIVE LINING.
3. CLEANOUTS SHALL BE LOCATED A MINIMUM OF 6 FEET FROM ALL PROPERTY CORNERS.
4. FOR PRIVATE 8" SERVICES, MANHOLES ARE REQUIRED FOR CONNECTION TO MAIN.
5. A MINIMUM PIPING LENGTH OF 1' 6" SHALL BE USED BETWEEN FITTINGS.
6. 6" SERVICES SHALL HAVE A 6" X 4" CONCENTRIC REDUCER INSTALLED ABOVE THE COMBINATION PRIOR TO ENTERING THE CAST IRON BOX.
7. NO FLEXIBLE COUPLINGS SHALL BE USED.

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-9 Sewer Service Connection-Short-Side.dwg, 12/11/2024 10:55:39 AM, justin.hanes

DETAIL: SEWER SERVICE CONNECTION - SHORT-SIDE		DETAIL NO: S-9
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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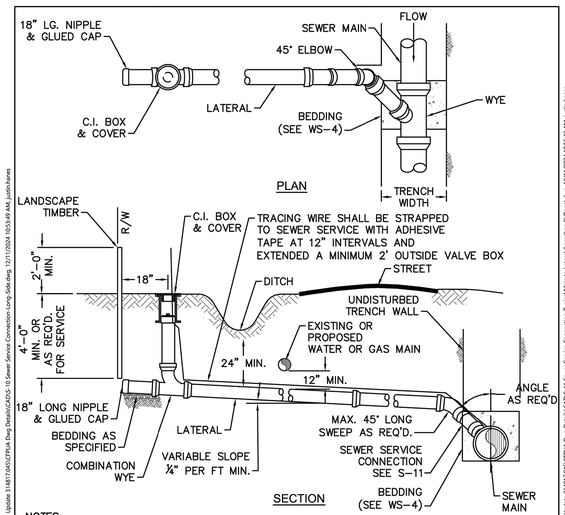
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560



NOTES:

1. SEWER SERVICES SHALL BE PERPENDICULAR TO MAIN. SEWER SERVICES IN CUL-DE-SACS ARE REQUIRED TO BE PERPENDICULAR, OR MUST ORIGINATE IN END OF LINE MANHOLE AND TERMINATE AT RIGHT-OF-WAY LINE.
2. ALL SERVICES CONNECTING INTO DUCTILE IRON MAINS SHALL BE CONSTRUCTED OF DIP, WITH PROTECTIVE LINING.
3. CLEANOUTS SHALL BE LOCATED A MINIMUM OF 6 FEET FROM ALL PROPERTY CORNERS.
4. MINIMUM 1'-6" NIPPLE SPACING BETWEEN FITTINGS.
5. FOR PRIVATE 8" SERVICES, MANHOLES ARE REQUIRED FOR CONNECTION TO MAIN.
6. NO FLEXIBLE COUPLINGS SHALL BE USED.

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-10 Sewer Service Connection-Long-Side.dwg, 12/11/2024 10:53:49 AM, justin.hanes

DETAIL: SEWER SERVICE CONNECTION - LONG-SIDE		DETAIL NO: S-10
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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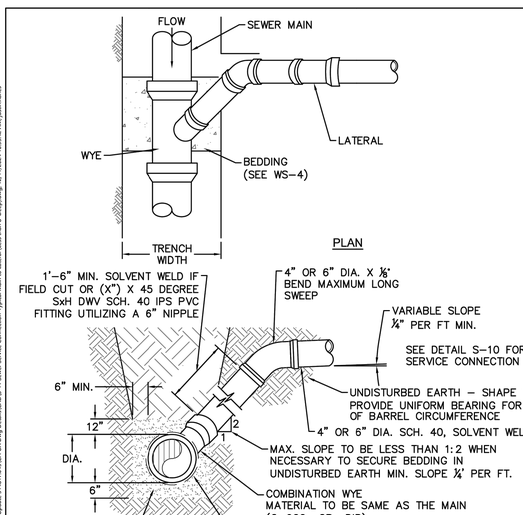

NOTES:

1. FOR PRIVATE 8" SERVICES, MANHOLES ARE REQUIRED FOR CONNECTION TO SYSTEM AND AT THE PROPERTY LINE, WITH REQUIRED EASEMENT.
2. ALL SERVICES CONNECTING INTO DUCTILE IRON MAINS SHALL BE CONSTRUCTED OF DIP, WITH PROTECTIVE LINING.
3. NO FLEXIBLE COUPLINGS SHALL BE USED.

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-11 Sewer Service Connection-Typical Main to Lateral (Less than 8' Deep).dwg, 12/11/2024 10:53:45 AM, justin.hanes

DETAIL: SEWER SERVICE CONNECTION - MAIN to LATERAL (LESS THAN 8' DEEP)		DETAIL NO: S-11
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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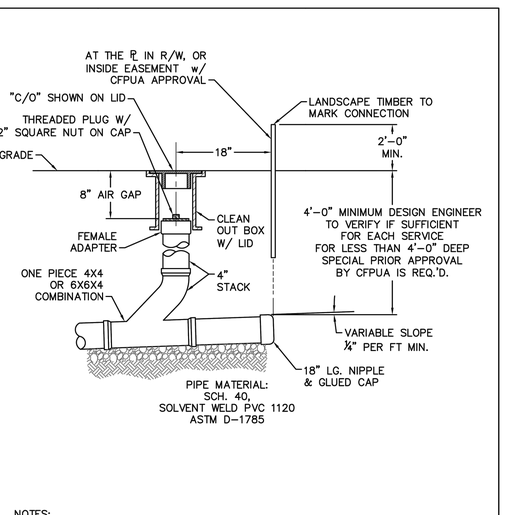

NOTES:

1. FOR PRIVATE 8" SERVICES, MANHOLES ARE REQUIRED FOR CONNECTION TO SYSTEM AND AT THE PROPERTY LINE, WITH REQUIRED EASEMENT.
2. CLEANOUTS SHALL BE LOCATED A MINIMUM OF 6 FEET FROM ALL PROPERTY CORNERS.

S:\Treatment\Eng\CAD\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148710450\CFPUA Dwg Details\CADS-13 Sewer Service Connection - Typical Cleanout.dwg, 12/5/2024 8:52:56 AM, justin.hanes

DETAIL: SEWER SERVICE CONNECTION - TYPICAL CLEAN-OUT		DETAIL NO: S-13
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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BY	DATE	REVISION
JDD	1/12/26	ISSUED FOR BID

PLOT DATE: 1/12/2026

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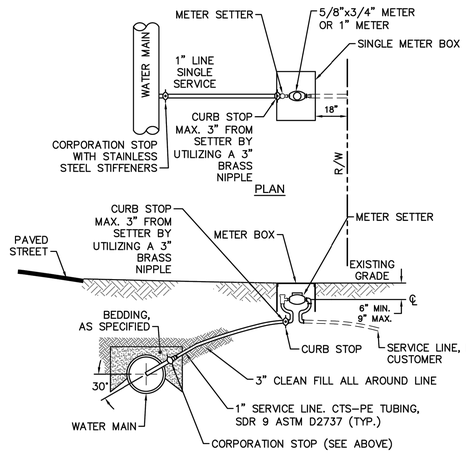
CFPUA SANITARY SEWER DETAILS

PROJECT NO.
CFA2202

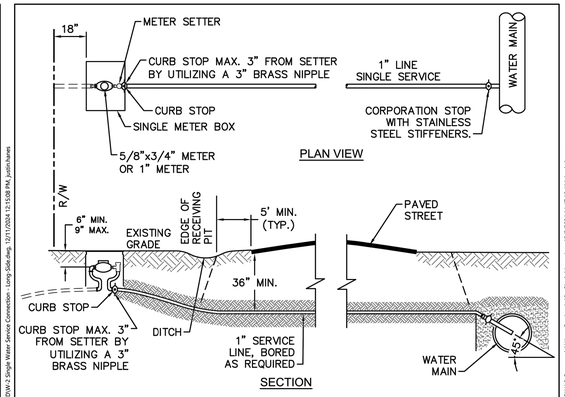
SD-1.0



NOTES:
1. NO JOINT SHALL BE INSTALLED BETWEEN THE MAIN SERVICE TAP AND THE METER STOP. ALL SERVICES SHALL BE INSTALLED PERPENDICULAR TO MAIN.
2. SERVICE SADDLES ON PVC MAINS SHALL BE WIDE BAND BRASS BODY.
3. METER BOXES SUBJECT TO TRAFFIC LOADS SHALL CONFORM TO ASTM A48, CLASS 30B AND AASHTO H20 LOAD RATING STANDARDS.
4. WATER SERVICE LINE SHALL TERMINATE 18" WITHIN RIGHT-OF-WAY LINE.
5. WATER METER BOXES ARE TO BE A MINIMUM OF 5 FEET FROM THE PROPERTY CORNER.
6. SERVICE PIPING AND METER SETTER TO BE CENTERED IN THE METER BOX.
7. TRACING WIRE SHALL BE INSTALLED WITH ADHESIVE TAPE AT 12' INTERVALS AND EXTEND A MINIMUM OF 2' OUTSIDE OF METER BOX PER CFPUA DETAIL WS-6.
8. PLASTIC PIPE STIFFENERS SHALL BE USED.

S:\Treatment\Eng\CM\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148170\05\CFPUA Dwg Details\CADs\W-1 Single Water Service Connection - Short Side.dwg, 12/11/2024 12:13:54 PM, justin.hanes

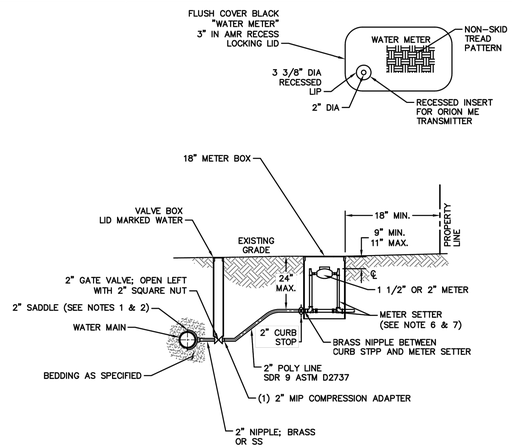
DETAIL: SINGLE WATER SERVICE CONNECTION - TYPICAL SHORT-SIDE CONNECTION		CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	DETAIL NO: W-1
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025		SHEET NO: -



NOTES:
1. NO JOINT SHALL BE INSTALLED BETWEEN THE MAIN SERVICE TAP AND THE METER STOP. ALL SERVICES SHALL BE INSTALLED PERPENDICULAR TO MAIN.
2. SERVICE SADDLES ON PVC MAINS SHALL BE WIDE BAND BRASS BODY.
3. METER BOXES SUBJECT TO TRAFFIC LOADS SHALL CONFORM TO ASTM A48, CLASS 30B AND AASHTO H20 LOAD RATING STANDARDS.
4. WATER SERVICE LINE SHALL BE PERPENDICULAR TO MAIN AND TERMINATE 18" WITHIN RIGHT-OF-WAY LINE.
5. WATER METER BOXES ARE TO BE A MINIMUM OF 5 FEET FROM THE PROPERTY CORNER.
6. SERVICE PIPING AND METER SETTER TO BE CENTERED IN THE METER BOX.
7. TRACING WIRE SHALL BE INSTALLED WITH ADHESIVE TAPE AT 12' INTERVALS AND EXTEND A MINIMUM OF 2' OUTSIDE OF METER BOX PER CFPUA DETAIL WS-6.
8. PLASTIC PIPE STIFFENERS SHALL BE USED.

S:\Treatment\Eng\CM\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148170\05\CFPUA Dwg Details\CADs\W-2 Single Water Service Connection - Long Side.dwg, 12/11/2024 12:15:08 PM, justin.hanes

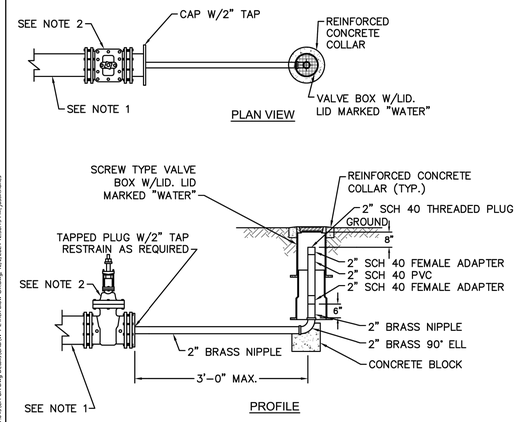
DETAIL: SINGLE WATER SERVICE CONNECTION - LONG-SIDE		CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	DETAIL NO: W-2
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025		SHEET NO: -



NOTES:
1. WATER SERVICES SHALL BE INSTALLED PERPENDICULAR TO MAIN AND TERMINATE 18" INSIDE THE RIGHT-OF-WAY LINE.
2. SERVICE SADDLES ON PVC MAINS SHALL BE WIDE BAND BRASS BODY.
3. METER BOXES SUSCEPTIBLE TO TRAFFIC SHALL CONFORM TO ASTM A48, CLASS 30B AND AASHTO H20 LOAD RATING STANDARDS.
4. NON-TRAFFIC METER BOXES SHALL BE PER CFPUA STANDARD MATERIAL.
5. 3" CLEAN FILL REQUIRED ALL AROUND 2" POLY SERVICE LINE.
6. 1 1/2" METER – NL METER SETTER SHALL BE PER CFPUA STANDARD MATERIAL.
7. 2" METER – NL METER SETTER SHALL BE PER CFPUA STANDARD MATERIAL.
8. WATER METER BOXES ARE TO BE A MINIMUM OF 5 FEET FROM THE PROPERTY CORNERS.
9. SERVICE PIPING AND METER SETTER TO BE CENTERED IN THE METER BOX.
7. TRACING WIRE SHALL BE INSTALLED WITH ADHESIVE TAPE AT 12' INTERVALS AND EXTEND A MINIMUM OF 2' OUTSIDE OF METER BOX PER CFPUA DETAIL WS-6.

S:\Treatment\Eng\CM\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148170\05\CFPUA Dwg Details\CADs\W-3 Commercial Water Service 1-1 1/2inch Meter.dwg, 12/2/2024 11:47:18 AM, justin.hanes

DETAIL: COMMERCIAL WATER SERVICE - 1 1/2 OR 2-INCH METERS		CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	DETAIL NO: W-3
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025		SHEET NO: -



NOTES:
1. PROVIDE TOTAL LENGTH OF RESTRAINED JOINTS UPSTREAM AS REQUIRED FOR MAIN DIAMETER AT 150 psi TEST PRESSURE. WHEN UPSTREAM BENDS ARE WITHIN THE DEAD LENGTH, ADD TOTAL BEND RESTRAINT FOR EACH BEND TO DEAD-IN LENGTH.
2. IF MAIN IS LARGER THAN 2", END WITH A VALVE SIZED FOR THE MAIN, THREADED CAP SIZED ON VALVE FOR THE 2" BLOW-OFF.

S:\Treatment\Eng\CM\Engineer\2003 Project Management\2017 Projects\-Standards Update 3148170\05\CFPUA Dwg Details\CADs\W-7 2 inch Blow-Off.dwg, 12/2/2024 12:58:13 PM, justin.hanes

DETAIL: 2 INCH BLOW-OFF		CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	DETAIL NO: W-7
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025		SHEET NO: -

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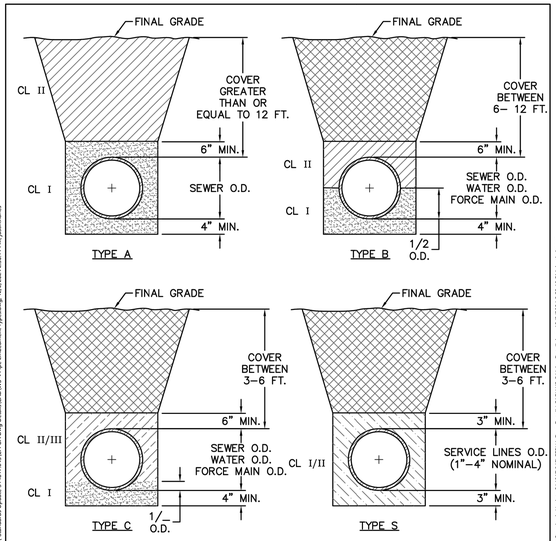
CFPUA WATER DETAILS

PROJECT NO.
CFA2202

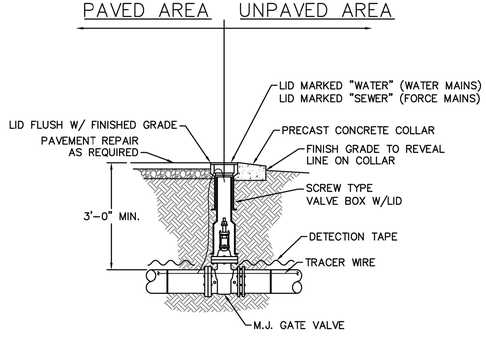
SD-2.0



COMPACTION NOTES:

1. ALL ZONES: 95% STD EFFORT PER ASTM D698, EXCEPT AS STATED IN COMPACTION NOTE 2.
2. 12" SUBGRADE UNDER PAVEMENT: 98% STD EFFORT PER ASTM D698.
3. BEDDING REQUIREMENTS FOR SEWER FORCE MAINS AND WATER MAINS WITHIN TYPE A THROUGH TYPE S CONDITIONS, SHALL BE FOLLOWED IF IT HAS BEEN DETERMINED THAT UNSUITABLE SOILS EXIST WITHIN THE EXCAVATED TRENCH. OTHERWISE BEDDING FOR SEWER FORCE MAINS AND WATER MAINS MAY BE CLASS I OR CLASS II.

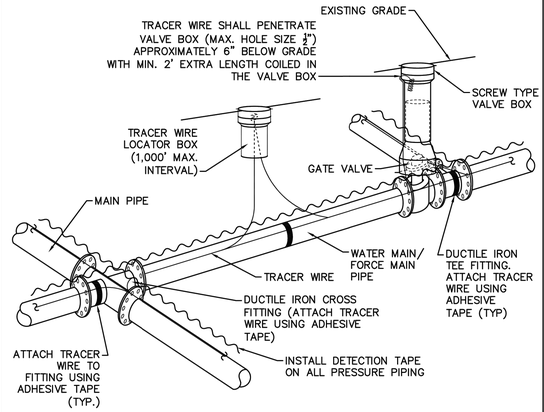
DETAIL:		DETAIL NO:
PIPE EMBEDMENT TYPES	CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	WS-4
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -



NOTES:

1. TRACER WIRE SHALL PENETRATE VALVE BOX THROUGH DRILLED HOLE APPROX. 6" BELOW GRADE WITH MINIMUM 2–FEET EXTRA LENGTH COILED IN THE VALVE BOX. SEE WS–6.

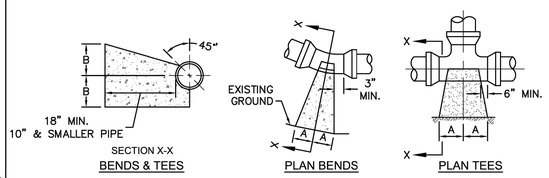
DETAIL:		DETAIL NO:
VALVE DETAIL	CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	WS-5
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -



NOTES:

1. TRACER WIRE SHALL BE INSTALLED PER THE CFPUA MSM.
2. WIRE SHALL BE STRAPPED TO ALL PVC PIPING WITH ADHESIVE TAPE AT 12 FOOT INTERVALS.
3. SECURE WIRE TO ALL TEE AND CROSS FITTINGS WITH ADHESIVE TAPE.
4. ALL SPLICES IN THE WIRE SHALL BE MADE WITH 3M DBR DIRECT BURY SPLICE KITS.

DETAIL:		DETAIL NO:
TRACER WIRE DETAIL	CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	WS-6
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -



SIZE	90 BENDS		45 BENDS		22–1/2 BENDS		TEES/PLUGS		45 VERT. BENDS
	A	B	A	B	A	B	A	B	
3"	8"	6"	5"	6"	3"	7"	6"	8"	27"
4"	8"	9"	5"	8"	3"	11"	6"	9"	28"
6"	14"	11"	9"	9"	8"	8"	12"	9"	36"
8"	16"	16"	12"	12"	10"	13"	14"	13"	42"
10"	18"	22"	15"	14"	14"	16"	18"	15"	50"
12"	20"	28"	18"	17"	16"	16"	22"	18"	62"
14"	26"	29"	21"	19"	18"	18"	26"	20"	72"
16"	33"	29"	25"	21"	20"	21"	32"	21"	83"
18"	40"	30"	28"	24"	22"	23"	36"	24"	88"

NOTES:

1. THRUST BLOCKING IS NOT PERMITTED EXCEPT IN SPECIAL INSTALLATIONS WHERE DESIGNED BY ENGINEER AND APPROVED BY CFPUA.
2. ALLOW 7–DAY MINIMUM CONCRETE CURE TIME BEFORE PLACING LOAD ON THRUST BLOCK
3. BASED ON 150 PSI TEST PRESSURE AND 2,000 PSF SOIL BEARING CAPACITY.
4. ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED GROUND.
5. PIPE & FITTINGS TO BE WRAPPED IN 10 MIL PLASTIC PRIOR TO THRUST BLOCK BEING POURED.

DETAIL:		DETAIL NO:
THRUST BLOCK	CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	WS-13
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

CAPE FEAR PUBLIC UTILITY AUTHORITY STANDARD NOTES:

1. ALL INDIVIDUALS ENGAGED IN CFPUA PROJECTS MUST ADHERE TO THE CFPUA TECHNICAL STANDARDS, WHICH ENCOMPASS SPECIFICATIONS, STANDARD DETAILS, THE DESIGN GUIDE MANUAL, AND THE MATERIAL SPECIFICATION MANUAL. THESE DOCUMENTS PROVIDE ESSENTIAL REQUIREMENTS FOR MATERIALS, CONSTRUCTION METHODS, AND DESIGN PRINCIPLES. AN UNDERSTANDING OF THE ABOVE–MENTIONED RESOURCES IS REQUIRED TO AVOID NON–COMPLIANCE ISSUES.
2. ATTENTION: COMPLY WITH NOTES ON APPLICABLE DETAILS.

DETAIL:		DETAIL NO:
STANDARD NOTES (REQUIRED ON ALL PLAN AND PROFILE SHEETS)	CAPE FEAR PUBLIC UTILITY AUTHORITY 235 GOVERNMENT CENTER DRIVE WILMINGTON, NC 28403 OFFICE: (910)332-6560	WS-14
SCALE: NOT TO SCALE	CFPUA DETAIL DATE: 01/01/2025	SHEET NO: -

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CFPUA STANDARD DETAILS

PROJECT NO.
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