

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

SEWER LINE EXTENSION

WATER LINE EXTENSION

AND

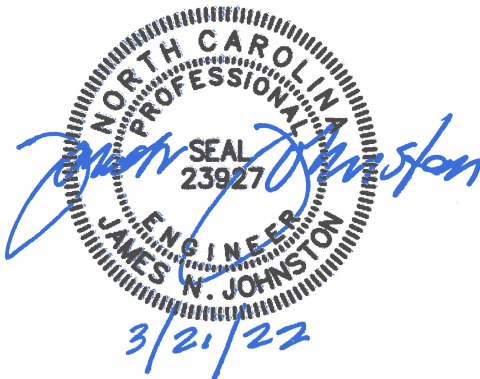
SEWER PUMP STATION

FOR

TRANSYLVANIA COUNTY, NORTH CAROLINA

101 S. BROAD STREET

BREVARD, NORTH CAROLINA 28712



HIGH COUNTRY ENGINEERING, P.C.

111 E. CHESTNUT STREET

ASHEVILLE, NORTH CAROLINA 28801

T:828-231-9380

Firm No. C-3347

CONTACT: James N. Johnston, PE

Project Number: TRA008

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SECTION 00100 ADVERTISEMENT FOR BIDS

Sealed bids for the project entitled **Sewer Line Extension, Water Line Extension and Sewer Pump Station** will be received by the **Transylvania County** until **10:00 AM EST** per Verizon Cellular Clock **April 28, 2022**. The bids will be received at the **Transylvania County Administrative Building located at 101 S. Broad Street, Brevard, NC 28712** and then publicly opened and read aloud.

The project generally consists of the following:

- Approx. 2,200 LF of 3-inch PVC SDR 21 sewer force main
- Approx. 13,200 LF of 6-inch PVC SDR 21 sewer force main
- Approx. 16,100 LF of 12-inch PVC C-900 water main
- Approx. 800 LF of HDPE horizontal directional drilling in various diameters
- Multiple steel encasements by standard bore and jack
- Multiple steel encasements by Guided Auger Boring (Guaranteed bores)
- A duplex submersible sewer pump station

Complete digital plans, specifications, and bidding documents are available through the online electronic bid service <http://www.questcdn.com/>. QuestCDN shall be considered the Issuing Office for purposes of the bid documents. You may download the digital plan documents for a non-refundable charge of \$15.00 by inputting Quest project #8158772 on the website's Project Search page. Please contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in obtaining a free membership registration and downloading this digital project information.

Prospective bidders are responsible for obtaining complete Plans, Specifications, and Bidding Documents, including any Addenda.

A Mandatory Pre-Bid Conference will be held at **10:00 AM on March 30, 2022** at **Transylvania County Administrative Building located at 101 S. Broad Street, Brevard, NC 28712**. Representatives of the Owner and the Engineer will be present to discuss the Project. To be eligible to submit a bid, attendance of this conference is mandatory.

Bidders and other interested parties should note specific project requirements listed in the *Special Provisions* and *Supplemental Conditions* of these contract documents.

Bidders and other interested parties should note requirements for good faith efforts to promote and solicit Equal Opportunity Employment and participation of Minority and Women Owned Businesses (WMBE) and Historically Underused Businesses (HUB). Sections 00320 through 00370 of the contract documents are included for these purposes.

Bidders and other interested parties should note that prequalification of equipment manufacturers by the Engineer prior to the bid opening may be required for this project. Equipment prequalification requirements, if any, are described in the contract documents.

A certified check or cashiers check, payable to **Transylvania County**, or a satisfactory Bid Bond executed by a corporate surety licensed under the laws of North Carolina to execute such bonds in the amount equal to five percent (5%) of the bid total shall be submitted with each bid.

The selected bidder shall be required to furnish separate, 100 percent Performance and Payment Bonds in compliance with North Carolina General Statutes Section 143-129 and Article 3 of Chapter 44A. The Performance Bond shall be in effect for one (1) year after the date of final acceptance of the project by the Owner.

Each bidder must be licensed as a Contractor in the State of North Carolina as provided in General Statutes Chapter 87.

Conditional or qualified bids will not be accepted.

The Owner reserves the right to waive any informalities or reject any or all bids. The Owner reserves the right to award a contract to the lowest, responsive, responsible bidder.

David McNeill
Assistant County Manager
Transylvania County

SECTION 00200

INSTRUCTIONS TO BIDDERS

1.0 PREPARATION OF BIDS

All bids shall be prepared in accordance with the following requirements:

1. The Bid form furnished by the Engineer shall be used and shall not be altered.
2. All entries, including signatures, shall be written in blue or black ink.
3. The Bidder shall submit a unit or lump sum price for every bid item in the Bid form unless specific directions in the Bid Form allows for partial Bids. The unit or lump sum prices bid for the various Contract Items shall be written figures.
4. Changes in any entry shall be made by marking through the entry in ink and making the correct entry adjacent thereto in ink. The individual signing the Bid shall initial the change in ink.
5. A Total Bid shall be entered in the Bid form for every item on which a unit price has been submitted. In case of a discrepancy between the unit price bid for a Contract Item and the Total Bid for that item, the unit price bid shall govern.
6. The Total Contract Bid Price shall be written in figures in the proper place in the Bid form. The Total Contract Bid Price shall be determined by adding the Total Bid for each item.
7. The Bid shall be properly executed. In order to constitute proper execution, the Bid shall be executed in strict compliance with the following. No other forms of execution will be accepted.
 - a. If a Bid is by an individual, it shall show the name and address of the individual and shall be signed by the individual.
 - b. If the Bid is by a Corporation, it shall be executed in the name of the Corporation by the President or Vice President. It shall be attested by the Secretary or Assistant Secretary. The seal of the Corporation shall be affixed. The Bid shall show the address of the principal office of the Corporation.
 - c. If the Bid is made by a partnership, it shall be executed in the name of the partnership by one of the general partners the address of the partnership shall also be shown.
 - d. If the Bid is a joint venture, it shall be executed by each of the joint ventures with an address for each joint venture in the address for the joint venture itself.
8. The Bid shall not contain any unauthorized additions, deletions or conditional bids.
9. The bid or shall not add provisions reserving the right to accept or reject an award, or interns or contraction contract pursuant to an award.
10. The bid shall not contain irregularities of any kind which, in the opinion of the Owner, make the Bid incomplete, indefinite, or ambiguous as to its meaning.

11. Alternative bids will not be considered unless specifically called for. Where numbered Alternative Bid items are provided under any Contract, each Bidder must submit a bid price for each numbered Alternative Item.
12. All attachments, certifications or acknowledgements mentioned the Bid shall be executed in the same manner as the Bid.

2.0 RECEIPT AND OPENING OF BIDS

The envelopes containing the Bids must be sealed and addressed to:

**Transylvania County
c/o Jennifer Galloway
101 S. Broad Street
Brevard, NC 28712**

The outside of the envelopes must bear the name, address, and license number of the Bidder and designate the particular Contract by name for which the Bid is submitted.

Bids received prior to the designated hour of opening will be securely kept sealed by the Owner. Mailed bids will be treated in every respect as though filed in person and will be subject to the same requirements of timeliness and completeness.

Bids received subsequent to the designated hour of opening will be returned to the Bidder unopened.

3.0 WITHDRAWAL OR REVISION OF BIDS

A Bidder may, without prejudice to himself or herself, withdraw a Bid after it has been delivered, providing the request for such withdrawal is made either in writing to the Engineer presiding over the opening of the Bids before the date and time set for the opening of Bids. The Bidder may then submit a revised Bid provided it is received prior to the time set for opening of Bids. No Bid may be withdrawn for a period of **sixty (60) days** after Bids have been opened pending the execution of a Contract with the successful Bidder except as provided for in Section 143-129.1 of the North Carolina General Statutes.

Only those persons authorized to sign Bids shall be recognized as being qualified to withdraw a Bid.

4.0 ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Plans, Specifications or other portions of the Contract Documents will be made orally by the Owner or Engineer. Every request for such interpretation must be addressed to the office of High Country Engineering, PC, and, to be given consideration, must be received in writing at least three (3) days prior to the date fixed for the opening of Bids. Any and all such interpretations and any supplemental instructions will be in the form of written Addenda which, if issued, will be posted to QuestCDN. Failure of any Bidder to receive any such Addenda shall not relieve said Bidder from any obligation under his Bid as submitted. All Addenda so issued shall become a part of the Contract Documents.

Prospective Bidders are cautioned concerning the use of a Post Office Box address as Addenda cannot be sent via overnight carrier (i.e., FedEx or UPS) to Post Office Boxes.

5.0 DISCREPANCY IN BIDS

In the event there is a discrepancy in any Bid between the unit prices and the extended totals, the unit prices shall govern. Discrepancies between the indicated sum of any, column of figures and the correct sum thereof will be resolved in favor of the correct sum. Bids which do not contain a price for every numbered item contained in the applicable Bid from will not be accepted, unless otherwise specified.

6.0 QUALIFICATIONS OF BIDDERS

The Owner may make such investigation as he deems necessary to determine the qualifications of the Bidder to perform the work and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the contract, and to complete the work contemplated therein. Conditional bids will not be accepted.

Bidders shall comply with all applicable laws regulating the practice of General Contracting as contained in Chapter 87 of the General Statutes of North Carolina.

7.0 RESPONSIBILITIES OF BIDDERS

Each Bidder shall, by careful examination, satisfy himself as to the nature and location of the work, the configuration of the ground, the character quality and quantity of the facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work or the cost thereof under the Contract.

The Contractor shall make his own determination as to the nature and extent of the utility facilities, including proposed adjustments, new facilities, or temporary work to be performed by the utility owner or his representative; and as to whether or not any utility work is planned by the Owner in conjunction with the project construction. The contractor shall consider in his Bid all of the permanent and temporary utility facilities in their present or relocated positions, whether or not specifically shown on the plans or covered in the project Special Conditions. It will be the Contractor's responsibility to anticipate any additional costs to him resulting from such utility work to reflect these costs in his Bid for the various items in the Contract.

The failure or omission of any Bidder to thoroughly examine and familiarize himself with the Contract Documents or to receive or examine any form, instrument or document or to visit the site and acquaint himself with the conditions there existing shall in no way relieve any Bidder from any obligation in respect to his Bid.

No verbal agreement or conversation with any officer, agent or employee of the Owner, either before or after the execution of the Contract, shall affect or modify any of the terms or obligations therein.

8.0 COLLUSIVE AGREEMENTS

Each Bidder submitting a Bid to the Owner for any portion of the work contemplated by the documents on which bidding is based, shall execute the attached affidavit, to the effect that

no contractor has entered into a collusive agreement with any person, firm or corporation in any regard to this Bid being submitted.

9.0 COMPARISON OF BIDS

Bids will be compared on the basis of the totals of the lump sum or unit prices provided in the Base Bid. The resulting Total Base Bid Price, which will include and cover the furnishing of all materials, and the performance of all labor requisite or proper, and completing of all the work called for under the accompanying Contract, and in the manner set forth and described in the Contract Documents.

The lowest Bidder will be that Bidder whose Base Bid totals the lowest number of dollars as determined above and verified by the Engineer.

10.0 AWARD OF CONTRACT

The award of the contract will be made to the lowest bidder, who, in the opinion of the Owner, is qualified to perform the work required.

These bids are asked for in good faith, and awards will be made as soon as practicable, provided satisfactory Bids are received.

The Owner may consider informal and reject any Bid not prepared and submitted in accordance with the provisions hereof.

The right is reserved to waive informalities in bidding, to reject any or all Bids, or to accept a Bid other than the lowest submitted if such action is deemed to be in the best interest of the Owner.

11.0 COMMENCEMENT OF WORK

Upon execution and delivery of the Contract and the delivery of the required performance and labor and material bonds and insurance certificates and policies by the Contractor to the Owner, the Contractor will be notified to proceed with the work of the Contract. The work of the Contract shall be commenced within thirty (30) days following such notification or as otherwise specified in the Notice to Proceed.

The Contractor shall notify the Engineer, in writing, of his intention to enter upon the site of the work at least three (3) days in advance of such entrance.

12.0 PREQUALIFICATION OF EQUIPMENT SUPPLIERS

Certain equipment on this project may require prequalification of manufacturers prior to the bid opening. When required by the Contract Documents, manufacturers wishing to supply equipment for this project must submit a prequalification submittal to the Engineer for approval. The prequalification submittal must be submitted by the equipment manufacturer and received by the Engineer by the specified time listed in the Contract Documents to receive consideration. The submittal shall demonstrate that the proposed equipment meets the requirements of the Contract Specifications and Drawings. The Engineer will issue an addendum prior to the bid date listing the approved manufacturers. The prequalification submittal shall include all information required by the Contract Documents, but as a minimum shall include the following:

- Literature and cut sheets from manufacturer(s) describing all equipment to be supplied

- Copy of warranties
- List of at least five (5) references for similar installations, including contact names and current telephone numbers
- A written statement from the manufacturer indicating that the manufacturer has reviewed the proposed application as detailed in the Contract Drawings and Specifications, and that all equipment, materials and systems proposed to be supplied are appropriate and compatible for this specific application.

Note: The submittal of prequalification information does not omit the requirement for the Contractor and manufacturers to submit complete shop drawing submittals to the Engineer in accordance with the Contract Documents.

SECTION 00300
BID

TO: **Jennifer Galloway, Purchasing Coordinator**
 Transylvania County
 101 S. Broad Street
 Brevard, North Carolina 28712

FROM: _____

Of the City/Town of _____, County of _____ and
State of _____, hereinafter called "Bidder".

PROJECT: Sewer Line Extension, Water Line Extension and Sewer Pump Station

The Bidder, in compliance with the Advertisement for Bids for the construction of the above-referenced project, having examined the Drawings and Technical Specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to construct the project in accordance with the Contract Documents, within the time set forth therein, and the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder declares that he has carefully examined the site of the proposed work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed work, and the difficulties attendant upon its execution, and that he has carefully read and examined the Drawings, the proposed Contractual Agreement, and the specifications and other Contract Documents therein referred to, and knows and understands the terms and provisions thereof.

Bidder understands that information relative to existing structures, apparent and latent conditions, and natural phenomena, as furnished to him on the Drawings, in the Contract Documents, or by the Owner or the Engineer, carries no guarantee expressed or implied as to its completeness or accuracy, and he has made due allowance thereof.

TIME FOR COMPLETION AND LIQUIDATED DAMAGES: Bidder hereby agrees to commence work under this contract within **30** days of receipt of the Notice to Proceed, as noted in Section 00200, and to fully complete the project within **365** consecutive calendar days after the date of the Notice to Proceed.

Bidder also agrees to pay **\$500.00 per day** as liquidated damages for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

ADDENDA: Bidder acknowledge receipt of the following Addenda:

Addendum No.:	_____	Date:	_____
Addendum No.:	_____	Date:	_____
Addendum No.:	_____	Date:	_____

BID SCHEDULE – SEE ATTACHED SHEETS

In compliance with the Advertisement for Bids, the undersigned hereby proposes to furnish all labor, equipment and materials and to perform all work for the construction of improvements referred to herein and in strict accordance with the Contract Documents and in consideration of the amounts shown on the Bid Schedule attached hereto.

The attached unit prices, with Bid price, include all costs for furnishing materials and labor complete, each item including all sales tax, labor cost, material cost, and cost of miscellaneous and incidental items.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of **60** calendar days after the scheduled closed time for receiving bids.

Upon receipt of written notice of the acceptance of this Bid, Bidder will execute the formal Agreement attached within **10** days. Surety Bonds will be required for this project.

The undersigned declares that the person or person signing this proposal is fully authorized to sign the proposal on behalf of the firm listed and to fully bind the firm listed to all the conditions and provisions thereof.

It is agreed that no person or persons or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal or the contract that may be entered into as a result thereof, and that in all respects the proposal is legal and fair, submitted in good faith, without collusion or fraud.

REQUIRED ATTACHMENTS TO BID

The following documents and forms must be attached to this bid sheet to be considered responsive:

1. Signed bid form
2. Completed bid schedule
3. Bid bond
4. Non-Collusion Affidavit
5. Equal Employment Opportunity Statement
6. MBE/WBE Compliance
 - a. Good Faith Efforts Form
 - b. Table A
7. E-Verify Affidavit of Compliance

Respectfully Submitted:

(Corporate Seal)

CONTRACTOR

Title

Address

North Carolina General Contractor's License No.: _____

Attest: _____

Project Title: Sewerline Extension, Waterline Extension and Sewer Pump Station

Project Owner: Transylvania County

Date: March 16, 2022

Bid Schedule

Item No.	Description	Unit	Quantity	Unit Price	Total Price
1	Mobilization & Construction Staking	LS	1		
2	Precast Concrete Meter Vault w/2-inch Mag Meter	LS	1		
3	3" PVC SDR 21 Sewer Force Main	LF	2,200		
4	3" HDPE Directional Bore	LF	325		
5	3" - 90° Mechanical Joint Fittings	EA	1		
6	3" - 45° Mechanical Joint Fittings	EA	5		
7	3" - 22-1/2° Mechanical Joint Fittings	EA	9		
8	6" PVC SDR 21 Sewer Force Main	LF	13,200		
9	6" HDPE Directional Bore -- Patterson Creek	LF	145		
10	6" HDPE Directional Bore -- Lime Kiln Branch	LF	100		
11	6" - 90° Mechanical Joint Fittings	EA	9		
12	6" - 45° Mechanical Joint Fittings	EA	26		
13	6" - 22-1/2° Mechanical Joint Fittings	EA	10		
14	6"x6" Tapping Sleeve & Valve	EA	1		
15	1" Air Release/Vacuum Breaker Valve in MH	EA	4		
16	14-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 6" PVC Carrier Pipe	LF	400		
17	16-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 8" PVC Gravity Sewer Carrier Pipe	LF	140		
18	Pump Station Earthwork	LS	1		
19	Wet Well & Valve Vault	LS	1		
20	Submersible Sewer Pumps	LS	1		
21	Panel Rack, Power and Controls	LS	1		
22	Back-up Power Generator and ATS	LS	1		

23	Emergency Bypass Pump Connection	LS	1		
24	Post Hydrant Assembly	EA	1		
25	Pump Station Concrete Pad	CY	12		
26	Pump Station 6" Aggregate Base Course	TON	35		
27	Pump Station Perimeter Fencing	LF	110		
28	Driveway 6" Aggregate Base Course	TON	72		
29	8" PVC SDR 35 Sewerline	LF	150		
30	4' Diameter PreCast Manhole #1 (Sealed/Vented)	EA	1		
31	4' Diameter PreCast Manhole #2 (Drop)	EA	1		
32	2" PVC SDR 21 Waterline	LF	95		
33	2" - 45° Mechanical Joint Fittings	EA	1		
34	2" - 22-1/2° Mechanical Joint Fittings	EA	1		
35	2" Gate Valve & Box	EA	1		
36	14-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 2" PVC Water Main Carrier Pipe	LF	140		
37	24-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 12" C900 PVC Water Main Carrier Pipe	LF	400		
38	12" C900 PVC Waterline	LF	16,100		
39	12" HDPE Directional Bore -- Patterson Creek	LF	145		
40	12" HDPE Directional Bore -- Lime Kiln Branch	LF	100		
41	12" - 90° Mechanical Joint Fittings	EA	4		
42	12" - 45° Mechanical Joint Fittings	EA	32		
43	12" - 22-1/2° Mechanical Joint Fittings	EA	20		
44	12" Gate Valve & Box	EA	25		
45	12" End of Line Plug	EA	7		
46	12"x12" Tee	EA	5		
47	12"x6" Tee	EA	1		
48	8"X8" Tapping Sleeve & Valve	EA	2		
49	8"X12" Mechanical Joint Reducer	EA	2		

50	6" Mechanical Plug Tapped 2"	EA	1		
51	Fire Hydrant Assembly	EA	18		
52	Asphalt Driveway Repair	SF	1,650		
53	Gravel Driveway Repair	SF	1,800		
54	Construction Entrance / Exit	EA	1		
55	Clearing & Grubbing	AC	0		
56	Large Tree Removal (12" - 24" Diameter at Breast Height)	EA	8		
57	Large Tree Removal (Greater than 24" Diameter at Breast Height)	EA	1		
58	Silt Fence	LF	16,750		
59	Straw Wattle Check Dams	EA	22		
60	Non-Erosive Outlets	EA	62		
61	Inlet Protection	EA	7		
62	Site Stabilization	LS	1		
63	NCDOT Controlled Access Fence	LF	540		
64	Final Grassing & Cleanup	LS	1		
65	Sod	SF	3,600		
66	12" HDPE Directional Bore Through Rock	LF	45		
67	6" HDPE Directional Bore Through Rock	LF	45		
68	3" HDPE Directional Bore Through Rock	LF	60		
69	Misc. Concrete Repair (ALLOWANCE)	SY	400		
70	Rip Rap (ALLOWANCE)	TON	400		
71	Trench Rock Removal (ALLOWANCE)	CY	200		
72	Unsuitable Soil Removal (ALLOWANCE)	CY	400		
73	Suitable Backfill (ALLOWANCE)	CY	400		
74	#57 Washed Stone (ALLOWANCE)	TON	500		
75	Driveway Culvert Replacement (ALLOWANCE)	LF	45		
Base Bid Price					

Alternate 1: Cassell Road Waterline					
76	16-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 8" C900 PVC Water Main Carrier Pipe	LF	230		
77	8" C900 PVC Waterline	LF	1,220		
78	12"x8" Tee	EA	1		
79	12" Gate Valve & Box	EA	1		
80	12"X8" Tapping Sleeve and Valve	EA	1		
81	8" 45° Mechanical Joint Fittings	EA	2		
82	Fire Hydrant Assembly	EA	1		
83	NCDOT Road Trench Repair and Patching	SF	200		
84	NCDOT Road 2" Asphalt Milling and Overlay	SF	2,650		
85	Concrete Driveway Repair	SF	230		
86	Gravel Driveway Repair	SF	450		
87	Silt Fence	LF	1,050		
88	Non-Erosive Outlets	EA	5		
Alternate Bid Price					
Alternate 2: Whitmire Road Waterline					
89	16-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 8" C900 PVC Water Main Carrier Pipe	LF	60		
90	8" C900 PVC Waterline	LF	240		
91	12"x8" Tee	EA	1		
92	12" Gate Valve & Box	EA	1		
93	8" Gate Valve & Box	EA	1		
94	8" 45° Mechanical Joint Fittings	EA	1		
95	8" 22-1/2° Mechanical Joint Fittings	EA	2		
96	Fire Hydrant Assembly	EA	1		
97	8" End of Line Plug	EA	1		
Alternate Bid Price					

Alternate 3: Whitmire Road Sewerline

98	14-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 6" PVC Force Main Carrier Pipe	LF	60		
99	6" PVC SDR 21 Sewer Force Main	LF	45		
100	6"x6" Tee	EA	1		
101	6" Gate Valve & Box	EA	2		
102	6" 45-degree bend	EA	1		
103	6" 22 1/2-degree bend	EA	2		
104	6" End of Line Plug	EA	1		
Alternate Bid Price					

SECTION 00310 BID BOND

KNOW ALL MEN BY THESE PRESENT, THAT WE, THE UNDERSIGNED,
_____ as **Principal**, and
_____ as **Surety**, are hereby held and firmly bound unto **Transylvania
County, North Carolina**, as **OWNER** penal sum of 5% of Bid for the payment of which, well
and truly to be made, were hereby jointly and severally bind ourselves, successors and
assigns.

Signed this _____ day of _____, 20__.

The condition of the above obligation is such that whereas the Principal has submitted a
certain BID, attached hereto and hereby made a part hereof to enter into a contract in
writing for the project entitled:

Sewer Line Extension, Water Line Extension and Sewer Pump Station

NOW THEREFORE,

- a) If said Bid shall be rejected, or
- b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in
the Form of Contract attached hereto (properly completed in accordance with said
BID) and shall furnish a BOND for his faithful performance of said Contract, and for
the payment of all persons performing labor or furnishing materials in connection
therewith, and shall in all other respects perform the agreement created by the
acceptance of said BID, then this obligation shall be void, otherwise the same shall
remain in force and effect; it being expressly understood and agreed that the liability
of the Surety for any and all claims hereunder shall, in no event, exceed the penal
amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of
said Surety and its BOND shall be in no way impaired or affected by any extension of
the time within which the OWNER may accept such BID; and said Surety does hereby
waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

By: _____

Surety

By: _____

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

SECTION 00320
NON-COLLUSION AFFIDAVIT

State of: _____

County of: _____

The undersigned, being duly sworn on oath says, that he is the contracting party, or that he is the representative, agent, member, or officer of the contracting party, that he has not, nor has any other member, employee, representative, agent or officer of the firm, company, corporation or partnership represented by him, directly or indirectly, entered into or offered to enter into any combination, collusion or agreement to receive or pay, and that he has not received or paid, any sum of money or other consideration for the execution of the annexed contract other than that which appears upon the face of the contract.

Signature
Printed Name
Title
Company

Before me, a Notary Public in and for said County and State personally appeared, _____, who acknowledged the truth of the statements in the foregoing affidavit on this the _____ day of _____, 20__.

(SEAL)

Notary Public

Printed Name

My Commission Expires

SECTION 00330

EQUAL EMPLOYMENT OPPORTUNITY STATEMENT

During the performance of the Contract the Bidder agrees as follows:

1. The Bidder shall not discriminate against any employee or applicant because of race, color, religion, sex, or national origin. The Bidder shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to 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 Bidder agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of the nondiscrimination clause.
2. The Bidder shall, in all solicitations or advertisements for employees placed by or on behalf of the Bidder; state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
3. The Bidder shall send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract understanding, a notice, to be provided, advising the labor union or worker's representative of the Bidders commitments under this Section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment
4. In the event of the Bidder's noncompliance with the nondiscrimination clauses of this section or with any of such rules, regulations, or orders, the Contract may be canceled, terminated or suspended in whole or in part and the Bidder may be declared ineligible for further OWNER contracts.
5. The Bidder will include the provisions of this Addendum in every subcontract or purchase order unless exempted by rules, regulations, or orders of the OWNER so that such provisions will be binding upon each Subcontractor or Vendor.

Signature
Printed Name
Title
Company

Statement encouraging Minority/Women Owner Businesses (M/WBE) to submit bids/proposals

The _____ County of Transylvania, NC _____ (local government) and the _____ (Prime Contractor) are committed to provide small, minority, and women business enterprises equal access to opportunity for participation in _____ Transylvania County _____ (local government) contracts for Construction, Professional Services, Other Services, and Goods and Supplies. The _____ County of Transylvania, NC _____ (local government) encourages all _____ Transylvania County _____ (local government) M/WBE firms to participate in procurement and contracting activities. The is recognizing its responsibilities to the communities it serves and the society in which it conducts business. The use of minority and women business enterprises must be a function of our normal purchasing/contracting procedures, just as equal employment opportunity must be an integral part of normal personnel policy and procedures. No potential supplier/contractors will be precluded from consideration on the basis of race, color, religion, sex (including sexual orientation, gender identity, and pregnancy, national origin, age (40 and over), disability, marital status, veteran status, and genetic information. ace, color, religion, sex, age or national origin.

Statement encouraging Historically Underutilized Businesses (HUB) to submit bids/proposals

The _____ County of Transylvania, NC _____ (local government) and the _____ (Prime Contractor) are committed to and supportive of efforts to effectively maintain and/or increase HUB contract participation for Construction Projects, services (including professional and consulting services) and commodities purchases. The _____ County of Transylvania, NC _____ (local government) encourages all _____ Transylvania County _____ (local government) HUB firms to participate in procurement and contracting activities. The _____ County of Transylvania, NC _____ (Grantee) is recognizing its responsibilities to the communities it serves and the society in which it conducts business. The use of Historically Underutilized Businesses must be a function of our normal purchasing/contracting procedures, just as equal employment opportunity must be an integral part of normal personnel policy and procedures. No potential supplier/contractors will be precluded from consideration on the basis of race, color, religion, sex (including sexual orientation, gender identity, and pregnancy, national origin, age (40 and over), disability, marital status, veteran status, and genetic information.

NC Division of Water Infrastructure MBE/WBE (DBE) Compliance Supplement Instructions

(This package combines the various aspects of State of NC HUB program requirements and Federal DBE requirements into a single compliance supplement in order to eliminate redundancy and ambiguity)

Item	What to do with it
Good Faith Efforts Form	Provided by all bidders to be responsive Only low bidder's form is submitted to the State
Table A (Summary of firms on job)	Provided by all bidders to be responsive Only low bidder's form is submitted to the State
Table B (per item being subbed)	Provided by low bidder if SRF project or SRP/SEL* that obtains less than 10% M/WBE utilization (see page 2)
Provide documentation of anything you did that is mentioned later in this supplement	- Proof of trade paper advertisement - Printouts of DBE sources used - Solicitation emails and/or letters
Additional Forms for SRF Projects (these forms are currently not applicable)	
6100-3 (per M/WBE firm)	Provided by low bidder if SRF project
6100-2	Distributed to M/WBE firms if SRF project
Subs submit concerns on 6100-2 forms to:	Michael Pigram Region 4, Atlanta Federal Center 61 Forsyth Street Atlanta, GA 30303-8960

NOTES on this Compliance Supplement

Verifiable Goals

- EPA MBE/WBE participation goals: MBE 10.9%
WBE 10.4%

These are goals that the State reports against and are not quotas. The good faith efforts must be adhered to and all forms provided regardless of what percentage utilization is achieved.

- State of NC MBE/WBE participation goal: 10% (combined)

Table B is not required for SRP and SEL projects if you achieve 10% utilization.

DBE (MBE or WBE) Certification

In order for a firm to count towards the goals, a firm must be properly certified. Table A and Table B both provide spaces to note who certified the firm. The North Carolina Department of Administration and North Carolina Department of Transportation are the most common certifications we see listed. Division of Water Infrastructure staff verify all certifications listed.

For SRF projects, please note the EPA's six Good Faith Efforts found in 40 CFR 33

Filling out the Good Faith Efforts Form and providing Table B (if subcontracting is achieved) constitutes compliance with EPA's six good faith efforts.

(1) Ensure MBE/WBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and local Government recipients, this will include placing MBE/WBEs on solicitation lists and soliciting them whenever they are potential sources.

(2) Make information of forthcoming opportunities available to MBE/WBEs and arrange time for contracts and establish delivery schedules, where requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

(3) Consider in the contracting process whether firms competing for large contracts could subcontract with MBE/WBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities in order to increase opportunities for participation by MBE/WBEs in the competitive process.

(4) Encourage contracting with a consortium of MBE/WBEs when a contract is too large for one of these firms to handle individually.

(5) Use the services and assistance of the SBA and the MBDA.

(6) If the prime contractor awards subcontracts, require the prime contractor to take the steps in subparagraphs (1)-(5) of this section.

Pertinent State of North Carolina Administrative Code Regarding M/WBE Compliance. The provisions in this Compliance Supplement constitute compliance with the Rules below.

Owner Requirements 01 NCAC 30I .0306

Contractor Requirements 01 NCAC 30I .0308

Resources

Some sources for identifying MBE/WBE (DBE) firms

- <https://www.ips.state.nc.us/vendor/SearchVendor.aspx> (NCDOA)
- <https://www.ebs.nc.gov/VendorDirectory/default.html> (NCDOT)
- http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm (US SBA)

Some sources for finding minority trade papers for potential solicitation advertisements and Federal advertising options

- <http://web.sba.gov/subnet/> (US SBA Subnet advertising website)
- <https://www.mbda.gov/> (US Dept. of Commerce)
- <https://ncadmin.nc.gov/businesses/hub> (NC HUB Office)

Good Faith Efforts Form

Attempts to provide subcontracting opportunities for MBE/WBE firms.

Per 01 NCAC 30I .0101, 50 points must be claimed below by the bidder.

(This is identical to State of NC Affidavit A)

- ☐ **1 – (10 pts)** 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.
- ☐ **2 --(10 pts)** 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.
- ☐ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ☐ **4 – (10 pts)** 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.
- ☐ **5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- ☐ **6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ☐ **7 – (15 pts)** 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.
- ☐ **8 – (25 pts)** 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.
- ☐ **9 – (20 pts)** 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.
- ☐ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

Results of Good Faith Efforts Undertaken (you must check one box below)

- ☐ No subcontractors are being used for this contracted work. Fill out Table A listing only the Prime Contractor. (This statement takes the place of State of NC Affidavit B)
- ☐ Subcontractors are being used. Fill out Table A and B for each trade. **Each Table B lists 3.**
- ☐ Subcontractors are being used. If any Table B has fewer than 3 solicitations you must also advertise in an M/WBE trade paper and indicate what source of M/WBE firms you used (*must list at least one*). Some possible papers and sources of M/WBE firms are listed in the Instructions of this Supplement.

Name of the Trade Paper: _____

Submit proof of advertisement with package

M/WBE Sources: Source: _____ Source: _____

Submit printouts from M/WBE source(s)

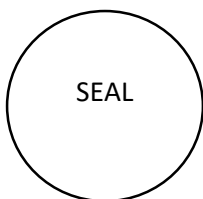
Certification Statement and Affidavit of Contractor.

The below affidavit constitutes compliance with 01NCAC 30I .0308(7)(a) and (b) and takes the place of State of North Carolina Affidavits C and D.

I have read the information in this compliance supplement and all information provided to the State in this package is accurate and true to the extent of my knowledge including the calculated percentages and the good faith efforts presented herein.

Prime Contractor Company Name (Print)

Prime Contractor Representative (Sign & Date)



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My Commission Expires _____

Certification of Project Owner/Funding Applicant

Funding Applicant (City, Town etc)

Applicant Authorized Representative (Sign & Date)

Division of Water Infrastructure Project Number

Table A: Prime Contractor and list of selected subcontractors

List Prime and ALL of the selected subcontractors (both DBE's and non-DBE's) being used on the project. Each Trade listed on this sheet should have a completed Table B: Subcontract Solicitation List showing the DBE firms contacted and given opportunities to bid.

Company Name (list prime first then subs)	Company Address and Phone	Trade (Above) and Price (Below)	MBE or WBE and certifying agency <u>if applicable</u>	(State use only) Listed in EPLS as Debarred?
		\$		
		\$		
		\$		
		\$		

Calculate M/WBE utilization as a percent (00.00%) of the prime contract. Limited to 100% even if the Prime is a DBE.

MBE and WBE subs total	\$	
Prime Contract Price	\$	
		_____ %

Note: Table A substitutes for both the State of NC "Identification of Minority Participation" form and EPA Form 6100-4.

Table B: Subcontract Solicitation List

Table B is required if:

- 1) Project is Federally funded (**SRF**) OR;
- 2) Project is a State Reserve Project or State Emergency Loan (**SRP or SEL**) and Utilization % on Table A is less than 10%
- 3)

Trade: _____ (enter the trade being solicited, paving, hauling etc.)

List the firm being used on the project first. If three MBE or WBE firms are not listed, additional information must be provided showing advertisements and/or sources used to identify MBE/WBE subs.

Use as many of these sheets as are necessary to cover every trade being subbed out.

Company Name	Company Address and Phone	MBE or WBE and certifying agency if applicable.	How was this firm contacted (email, letter, phone) and what was the result of the solicitation?*

*Must submit copies of emails or letters. If phone calls were made this sheet can serve as documentation of calls.

MBE/WBE (DBE) – Change or Add a Subcontractor Form

According to EPA guidance on 40 CFR 33.302

If a DBE subcontractor fails to complete work under the subcontract for any reason, the recipient must require the prime contractor to employ the six good faith efforts described in §33.301 if soliciting a replacement subcontractor.

Please provide the information below **if the subcontracted work in question was included in previously submitted good faith efforts documentation:**

Prime Contractor:

Subcontracted work:

Previous Subcontractor:

Reason this firm did not complete the work:

New subcontractor and DBE status:

☐ MBE

☐ WBE

☐ N/A

If this is a new trade being subcontracted, or was not documented in the original Project Bid Information submittal to the State then good faith efforts to solicit a DBE firm must be documented. As the original DBE instructions indicate, please provide a Table B from those original instructions, showing all the DBE firms contacted to perform this work. If three (3) firms are not listed on Table B, then additionally you must submit proof of an advertisement in a minority trade paper and evidence that there were not three reasonably available firms in the work area. The EPA provides in 33.301(a) that good faith efforts are to be carried out "...to the fullest extent practicable...". If solicitations were not carried out due to being impracticable, please attach this explanation to this form.

Please follow the steps below for new subcontracted work:

Indicate the new trade being subcontracted:

Indicate the firm being used and DBE status:

☐ MBE

☐ WBE

☐ N/A

Attach Table B

(For State Use) Is this sub debarred?

☐ Yes

☐ No

Project Owner/Applicant:

Project Number:

Signature of Prime Contractor's Representative

SECTION 00100

American Iron and Steel (AIS)

Guidance for Clean Water SRF Projects in North Carolina

This State guidance summarizes the requirements under Subsection 436(a)(2) of the Consolidated Appropriations Act of 2014 that SRF recipients only use iron and steel products produced in the United States. The Environmental Protection Agency has provided full guidance on the requirements at the following website:

http://water.epa.gov/grants_funding/aisrequirement.cfm.

Recipients of subject SRF awards must submit the executed Certification for SRF Projects and any waiver requests, with their Bid Information Package. The recipient will not receive any funds if the State has not received these items.

Manufacturers can use the template “Compliance Certification” to document that materials are “produced in the United States”

Contents

1. Certification for SRF Projects
2. Waiver Instructions
3. Materials covered by AIS
4. Template Compliance Certification for Materials Covered by AIS
5. Template De Minimis list

American Iron and Steel (AIS)

Certification for SRF Projects

Recipients of subject SRF awards must submit this executed form and any waiver requests with their Bid Information package to the State SRF program in order to receive funding.

The (Applicant) certifies that their contractors performing construction, alteration, maintenance and repair of the public treatment works under project number will comply with subsection 436 (a)(2) of the Consolidated Appropriations Act of 2014 and only use iron and steel products produced in the United States.

Contractor	Owner
(print)_____	(print)_____
(sign and date)_____	(sign and date)_____

American Iron and Steel (AIS)

Waiver Instructions

Approved national waivers can be found at this website:

http://water.epa.gov/grants_funding/aisrequirement.cfm

Please note, that a national waiver for “de minimis” iron and steel components has been approved. A table is included in this document for use in documenting what items are to be considered as covered under this waiver. Note that no single de minimis item can be more than 1% of the total material cost of the project and the total of all de minimis items must not exceed 5% of the total material cost of the project.

Waiver Requests are provided for in subsection 436(b) of the Act. It states they will be granted if the Administrator of the EPA finds that:

- (1) Applying subsection (a) would be inconsistent with the public interest;
- (2) Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
- (3) Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Submit waiver requests to mark.hubbard@ncdenr.gov. The State will forward these to the EPA at cwsrfwaiver@epa.gov for a final determination. A checklist of items for a complete waiver application package can be found in the EPA guidance document for AIS found here:

http://water.epa.gov/grants_funding/upload/AIS-final-guidance-3-20-14.pdf

American Iron and Steel (AIS)

Materials Covered by AIS

Lined and unlined pipes and fittings, manhole covers, municipal castings (detailed below), hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel (detailed below), reinforced precast concrete and construction materials (detailed below). Products must be composed of greater than 50% iron and steel measured by cost and permanently incorporated into the project to be subject to the provision.

<u>Municipal Castings</u>	<u>Structural Steel</u>	<u>Construction Material</u>
Access Hatches Ballast Screen Benches Bollards Cast Bases Cast Iron Hinged Hatches Cast Iron Riser Rings Catch Basin Inlet Cleanout/Monument Boxes Construction Covers and Frames Curb and Corner Guards Curb Openings Detectable Warning Plates Downspout Shoes Drainage Grates, Frames and Inlets Inlets Junction Boxes Lampposts Manhole Covers, Rings, Frames and Risers Meter Boxes Service Boxes Steel Hinged Hatches Steel Riser Rings Trash Receptacles Tree Grates Tree Guards Trench Grates Valve Boxes, Covers and Risers	Wide Flange shapes I-beams Channels Angles Tees Zees H-piles Sheet piling Tie Plates Cross Ties (note: at least one dimension must be 3 inches or greater to be subject)	Wire Rod Bar Angles Concrete Reinforcing Bar Wire Wire Cloth Wire Rope and Cables Tubing Framing Joists Trusses Fasteners Welding Rods Decking Grating Railings Stairs Access Ramps Fire Escapes Ladders Wall Panels Dome Structures Roofing Ductwork Surface Drains Cable Hanging Systems Manhole Steps Fencing and Fence Tubing Guardrails Doors Stationary Screens

Mechanical and electrical components, equipment and systems are not subject to AIS. See the EPA guidance for details.

American Iron and Steel (AIS)

Template Compliance Certification For Materials Covered By AIS

Company Name:

Company Address:

SRF Project name and project number:

I _____, certify that the following products were produced at the following location or steps in the production of the listed products, occurred at the following location:

Location:

<u>Product</u>	<u>Step in production (Final production, melting, bending, etc.)</u>
----------------	--

1)

2)

3)

Therefore, these materials are “produced in the United States”

(signature and title of company representative)

(date)

American Iron and Steel (AIS)

Template De Minimis List

<u>Item</u>	<u>Cost</u>

Total De Minimis Cost: _____

Total Material Cost For Project: _____

De Minimis Cost Is _____% of total material costs

29 CFR §5.5 Contract provisions and related matters.

(a) The Agency head shall cause or require the contracting officer to insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in §5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, *Provided*, That such modifications are first approved by the Department of Labor):

(1) *Minimum wages.* (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

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

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by

the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) *Withholding.* The (write in name of Federal Agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) *Payrolls and basic records.* (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show

that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under §5.5(a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5(a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the (write the name of the agency) or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) *Apprentices and trainees*—(i) *Apprentices*. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) *Trainees*. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In

addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) *Equal employment opportunity.* The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) *Compliance with Copeland Act requirements.* The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) *Contract termination: debarment.* A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) *Compliance with Davis-Bacon and Related Act requirements.* All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) *Disputes concerning labor standards.* Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) *Certification of eligibility.* (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) *Contract Work Hours and Safety Standards Act.* The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by §5.5(a) or §4.6 of part 4 of this title. As used in this paragraph, the terms *laborers* and *mechanics* include watchmen and guards.

(1) *Overtime requirements.* No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) *Violation; liability for unpaid wages; liquidated damages.* In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) *Withholding for unpaid wages and liquidated damages.* The (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in §5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

EMPLOYEE RIGHTS UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

THE UNITED STATES DEPARTMENT OF LABOR WAGE AND HOUR DIVISION

PREVAILING WAGES	You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.
OVERTIME	You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.
ENFORCEMENT	Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.
APPRENTICES	Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.
PROPER PAY	If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

or contact the U.S. Department of Labor's Wage and Hour Division.



For additional information:
1-866-4-USWAGE
(1-866-487-9243) TTY: 1-877-889-5627



WWW.WAGEHOUR.DOL.GOV

Wage and Hour Division

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.



Rev. Dec. 2008

OMB No.: 1235-0008
Expires: 01/31/2015

NAME OF CONTRACTOR <input type="checkbox"/> OR SUBCONTRACTOR <input type="checkbox"/>							ADDRESS						OMB No.: 1235-0008 Expires: 01/31/2015				
PAYROLL NO.				FOR WEEK ENDING				PROJECT AND LOCATION					PROJECT OR CONTRACT NO.				
(1)	(2)	(3)	(4) DAY AND DATE	(5)	(6)	(7)	(8) DEDUCTIONS						(9)				
NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	NO. OF WITHHOLDING EXEMPTIONS	WORK CLASSIFICATION		OT. OR ST.	TOTAL HOURS	RATE OF PAY	GROSS AMOUNT EARNED	FICA	WITH- HOLDING TAX			OTHER	TOTAL DEDUCTIONS	NET WAGES PAID FOR WEEK			
															HOURS WORKED EACH DAY		
			O			/											
			S			/											
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

(over)

Date _____

I, _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by _____ on the _____
(Contractor or Subcontractor)
_____ ; that during the payroll period commencing on the _____
(Building or Work)
_____ day of _____, _____, and ending the _____ day of _____, _____,
all persons employed on said project have been paid the full weekly wages earned, that no rebates have
been or will be made either directly or indirectly to or on behalf of said _____
_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly
from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part
3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948,
63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

(2) That any payrolls otherwise under this contract required to be submitted for the above period are
correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the
applicable wage rates contained in any wage determination incorporated into the contract; that the classifications
set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship
program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and
Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered
with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:
(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ — in addition to the basic hourly wage rates paid to each laborer or mechanic listed in
the above referenced payroll, payments of fringe benefits as listed in the contract
have been or will be made to appropriate programs for the benefit of such employees,
except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ — Each laborer or mechanic listed in the above referenced payroll has been paid,
as indicated on the payroll, an amount not less than the sum of the applicable
basic hourly wage rate plus the amount of the required fringe benefits as listed
in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR
SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE
31 OF THE UNITED STATES CODE.

"General Decision Number: NC20220068 02/25/2022

Superseded General Decision Number: NC20210068

State: North Carolina

Construction Type: Heavy

Counties: Ashe, Avery, Cherokee, Clay, Graham, Jackson, Macon, McDowell, Mitchell, Polk, Rutherford, Surry, Swain, Transylvania, Watauga, Wilkes and Yancey Counties in North Carolina.

HEAVY CONSTRUCTION PROJECTS

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

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none"> . Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none"> . Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

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

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

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

* SUNC2011-049 08/26/2011

	Rates	Fringes
CARPENTER (Form Work Only).....	\$ 14.85 **	1.38
CEMENT MASON/CONCRETE FINISHER...	\$ 13.10 **	1.32
LABORER: Common or General.....	\$ 10.60 **	0.49
LABORER: Pipelayer.....	\$ 12.54 **	1.56
OPERATOR:		
Backhoe/Excavator/Trackhoe.....	\$ 14.86 **	1.50
TRUCK DRIVER.....	\$ 12.32 **	1.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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

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

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

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular

rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

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

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

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

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

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

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END OF GENERAL DECISION"

**SECTION 00400
NOTICE OF AWARD**

TO: _____

DATE: _____

PROJECT: Sewer Line Extension, Water Line Extension and Sewer Pump Station

The Owner has considered the Bid Proposal submitted by you for the above described Project in response to its receipt of Bids on _____, and the instructions to Bidders.

You are hereby notified that your Bid Proposal has been accepted in the amount of _____ dollars (\$_____).

You are required by the Instructions to Bidders to execute the Agreement and furnish the required Contractor's Performance Bond, Payment Bonds and Certificates of Insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds with ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid Proposal as abandoned and as a forfeiture of your Bid Proposal. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner. Dated this _____ day of _____, 20____.

OWNER: Transylvania County, NC

BY: _____

TITLE: _____

ACCEPTANCE OF NOTICE

Receipt of the above **NOTICE TO AWARD** is hereby acknowledged by _____, this the _____ day of _____, 20____.

CONTRACTOR: _____

BY: _____

TITLE: _____

SECTION 00500 AGREEMENT

This Agreement, made and entered into this _____ day of _____, 2021, by and between the Transylvania County, party of the first part, hereinafter designated as the Owner and _____ of _____ County of the State of _____, party of the second part, hereinafter designated as the Contractor.

WITNESSETH: That the parties hereto, for the considerations contained herein, hereby mutually agree as follows:

ARTICLE I:

Under this Agreement and Contract, the Contractor shall construct the Project entitled:

Sewer Line Extension, Water Line Extension and Sewer Pump Station

ARTICLE II:

In consideration of the payments to be made as hereinafter provided, the Contractor agrees, at his own sole cost and expense, to perform all the labor and services and to furnish all the labor and materials, plant and equipment necessary to complete, and to complete in good, substantial, workmanlike and approved manner, the work named under Article I hereof, within the time hereinafter specified and in accordance with the terms, conditions and provisions of this Contract and with the instructions, orders and directions of the Engineer made in accordance with this Contract.

ARTICLE III:

The Owner agrees to pay and the Contractor agrees to accept as full compensation for all work done, and materials furnished, and for materials, equipment and supplies sold, and also for all costs and expenses incurred, and loss or damages sustained by reason of the action of the elements or growing out of the nature of the work, or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all risks of every description connected with the work, and for all expenses incurred by, or in consequence of, the suspension or discontinuance of the work as herein specified, and for faithfully completing the work and the whole thereof as herein provided, and for maintaining the work in good condition until the final payment is made, the prices stipulated in the Bid hereto attached.

The Owner shall pay to the contractor for the performance of the contract the amounts determined for the total number of each of the units of work in the attached Bid Proposal. The final payment shall be made for the actual number of units that are incorporated in or made necessary by the work covered by the Contract.

ARTICLE IV:

The following documents shall constitute integral parts of the Agreement, the whole to be collectively known and referred to as the Contract Documents or Contract: Invitation for Bids; Instructions to Bidders; Bid; Agreement; General Conditions; Special Conditions; Technical Specifications; Contract Drawings and all interpretations of or addenda to the Contract Documents issued by the Engineer with the approval of the Owner.

The Table of Contents, Headings and Titles contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

ARTICLE V:

The work to be performed under this Contract shall be commenced within 10 calendar days after the date of written notice by the Owner to the Contractor to proceed. The work shall be completed by 360 days from Notice to Proceed and with such extensions of time as are provided for in the Contract.

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of Beginning, rate of progress and the time for completion of the work to be done hereunder as ESSENTIAL CONDITIONS of this Contract. The Contractor agrees that said work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as will insure full completion of the work described herein in a reasonable time for the completion of the same, taking into consideration the average climatic range and construction conditions prevailing in this locality.

If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, then the Contractor does hereby agree, as a part of the consideration for the awarding of this Contract to pay to the Owner the sum of \$500.00, 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 Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain.

It is further agreed that time is of the essence to each and every portion of this Contract and to the specifications wherein a definite portion and certain length of time is fixed for the performance of any act whatsoever; and where, under the Contract, any additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be the essence of this Contract.

ARTICLE VI:

If the Contractor shall fail to comply with any of the terms, conditions, provisions or stipulations of this Contract, according to the true intent and meaning thereof, then the Owner may make use of any or all remedies provided in that behalf in the Contract and shall have the right and power to proceed in accordance with the provisions thereof.

The following alterations and addenda have been made and included in this Contract before it was signed by the parties hereto:

IN WITNESS WHEREOF, the parties to this Agreement have hereunto set their hands and seals and have executed this Agreement, the day and year first above written.

OWNER: Transylvania County

BY: _____

TITLE: _____

ATTEST: _____

CONTRACTOR: _____

BY: _____

TITLE: _____

ATTEST: _____

SECTION 00510 PAYMENT BOND

KNOW ALL MEN BY THESE PRESENT, THAT:

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter called Principal, and
(Corporation, Partnership, or Individual)

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

(Name of Owner)

(Address of Owner)

hereinafter called OWNER, in the penal sum of: _____
Dollars (\$ _____) in lawful money of the United States, for the payment of which
sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally,
firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION is such that whereas, the Principal entered into a certain
contract with the Owner, dated the _____ day of _____, 20____, a copy of which is
hereto attached and made a part hereof for the construction of:

(Name of Project)

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms,
Subcontractors, and corporations furnishing materials for or performing labor in the prosecution of
the Work provided for in such contract, and any authorized extension or modification thereof,
including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on
machinery, equipment and tools, consumed or used in connection with the construction of such
Work, and all insurance premiums on said Work, and for all labor, performed in such Work whether
by Subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and
effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no
change, extension of time, alteration or addition to the terms of the contract or to the Work to be
performed there under or the Specifications accompanying the same shall in any wise affect its

obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each one of which shall be deemed as original, this the _____ day of _____, 20____.

(Principal)

(Seal)

(Principal Secretary)

ATTEST:

BY:

(Witness as to Principal)

(Address)

(Address)

(Surety)

(Seal)

ATTEST:

BY:

(Attorney-In-Fact)

(Witness as to Surety)

(Address)

(Address)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute Bond.

IMPORTANT:

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.

SECTION 00520 PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENT, THAT:

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter called Principal, and
(Corporation, Partnership, or Individual)

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

(Name of Owner)

(Address of Owner)

hereinafter called OWNER, in the penal sum of: _____
Dollars (\$_____) in lawful money of the United States, for the payment of which
sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally,
firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION is such that whereas, the Principal entered into a certain
contract with the Owner, dated the _____ day of _____, 20____, a copy of which is
hereto attached and made a part hereof for the construction of:

(Name of Project)

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the
undertakings, covenants, terms, conditions, and agreements of said contract during the original term
thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the
Surety and during the one year guaranty period, and if he shall satisfy all claims and demands
incurred under such Contract, and shall fully indemnify and save harmless the OWNER from all costs
and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the
Owner all outlay and expense which the Owner may incur in making good any default, then this
obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no
change, extension of time, alteration or addition to the terms of the Contract or to Work to be
performed there under or the specifications accompanying the same shall in any wise affect its

obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each one of which shall be deemed as original, this the _____ day of _____, 20____.

(Principal) (Seal)

(Principal Secretary)

ATTEST:

BY: _____

(Witness as to Principal)

(Address)

(Address)

(Surety) (Seal)

ATTEST:

BY: _____
(Attorney-In-Fact)

(Witness as to Surety)

(Address)

(Address)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute Bond.

IMPORTANT:

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.

SECTION 00530 CERTIFICATE OF INSURANCE

Satisfactory certificates of insurance shall be filed with the Owner through the Engineer prior to starting any construction work on this contract. The Owner will be named as an additional insured on all policies of insurance and all certificates shall contain a 60-day Notice of Cancellation. In connection with the provisions set forth in the General Conditions Article 2.7, the Notice to Proceed will not be issued until satisfactory certificates of insurance are filed.

Insert all applicable certificates of insurance in this section.

AFFIDAVIT of COMPLIANCE
With N.C. E-Verify Statutes

STATE OF NORTH CAROLINA
COUNTY OF Transylvania

I, _____ (Hereinafter the "Affiant"), being duly authorized by and on behalf of _____ (the entity bidding on project hereinafter the "Employer") after first being duly sworn hereby affirms 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" is the federal E-Verify program operated by the United States Department 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 in accordance with NCGS §64-25(5).
3. Select one of the following statements:

_____ Employer employs 25 or more employees in the State of North Carolina, and is in compliance with the provisions of NCGS §64-26(a). 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 NCGS §64-26(a).

4. All subcontractors engaged by or to be engaged by Employer have or will have likewise complied with the provisions of NCGS §64-26(a).
5. Employer shall keep the Transylvania County, informed of any changes in its status pursuant to Article 2 of Chapter 64 of the North Carolina General Statutes.

This is the _____ day of _____, 20_____.

Affiant

STATE OF NORTH CAROLINA
COUNTY OF _____

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

Notary Public
My commission expires: _____

[SEAL]

**SECTION 00550
NOTICE TO PROCEED**

TO: _____

DATE: _____

PROJECT: **Sewer Line Extension, Water Line Extension and Sewer Pump Station**

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 20____, on or before _____, 20____, and you are to complete the Work within **120** consecutive calendar days thereafter. The date of completion of all work is therefore _____, 20____.

OWNER: Transylvania County, NC

BY: _____

TITLE: _____

ACCEPTANCE OF NOTICE

Receipt of the above **NOTICE TO PROCEED** is hereby acknowledged by _____, this the _____ day of _____, 20____.

CONTRACTOR: _____

BY: _____

TITLE: _____

SECTION 00600
APPLICATION FOR PAYMENT

PROJECT: Sewer Line Extension, Water Line Extension and Sewer Pump Station

Application No.: _____

Date of Notice to Proceed: _____

Completion Date: _____

Days Remaining in Contract: _____

Percent Complete: _____

ENGINEER: High Country Engineering, P.C.
Asheville, North Carolina

CONTRACTOR: _____ Federal Tax ID# _____

Address: _____

<u>CONTRACT:</u>	Original Contract Amount	\$
	Approved Change Order Amount	\$
	Revised Contract Amount	\$
<u>SUMMARY:</u>	Total Work Completed to Date	\$
	Total Materials Stored on Site	\$
	Total Earned this Application	\$
	Less _____ % Retainage	\$
	Subtotal	\$
	Less Previous Payments	\$
	Current Payment Due	\$

SIGNATURES:

CONTRACTOR:

Name

Title

Date

VERIFICATION:

In accordance with the Contract and this application for payment, the contractor has completed the work stated above and is entitled the full payment in the amount shown.

ENGINEER: High Country Engineering, P.C.

Name

Title

Date

APPROVAL:

This application is hereby approved for payment:

OWNER:

Name

Title

Date

[illegible]

SECTION 00610

SALES TAX REIMBURSEMENT FORM

The following sales tax reimbursement form must be submitted prior to the issuance of the final payment from the OWNER in accordance with the provisions of the General Conditions. The CONTRACTOR shall file these documents and supporting information with the ENGINEER.

STATE OF NORTH CAROLINA
COUNTY SALES AND USE TAX REPORT
SUMMARY TOTALS AND CERTIFICATION

CONTRACTOR: _____

Page 1 of _____

PROJECT: _____

FOR PERIOD: _____

	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL ALL COUNTIES
CONTRACTOR							
SUBCONTRACTOR(S)*							
COUNTY TOTAL							

* Attach subcontractor(s) report(s)

** Must balance with Detail Sheet(s)

I certify that the above figures do not include any tax paid on supplies, tools and equipment which were used to perform this contract and only includes those materials, supplies, fixtures and equipment which actually became a part of or annexed to the project facilities. I certify that, to the best of my knowledge, the information provided here is true, correct, and complete.

Sworn to and subscribed before me,

This the _____ day of _____, 20____

Signed

Notary Public

My Commission Expires: _____

Print or Type Name of Above

Seal

NOTE:

This certified statement may be subject to audit.

STATE OF NORTH CAROLINA

SALES AND USE TAX REPORT DETAIL

CONTRACTOR: _____

Page 2 of

SUBCONTRACTOR: _____

FOR PERIOD: _____

PROJECT:

PURCHASE DATE	VENDOR NAME	INVOICE NUMBER	TYPE OF PROPERTY	INVOICE TOTAL	COUNTY TAX PAID	COUNTY OF SALE *
				\$	\$	
				TOTAL:	\$	

* If this is an out-of-state vendor, the County of Sale should be the county to which the merchandise was shipped.

SECTION 00620
CONTRACT CHANGE ORDER

Change Order No. _____

Date of Issuance: _____ Effective Date: _____

Project: Sewer Line Extension, Water Line Extension and Sewer Pump Station	Owner: Transylvania County	Owner's Contract No.:
Contract:	Date of Contract:	
Contractor:	Engineer's Project No.: TRA008	

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments (list documents supporting change):

CHANGE IN CONTRACT PRICE:

Original Contract Price:

\$ _____

[Increase] [Decrease] from previously approved
Change Orders No. _____ to No. _____:

\$ _____

Contract Price prior to this Change Order:

\$ _____

[Increase] [Decrease] of this Change Order:

\$ _____

Contract Price incorporating this Change Order:

\$ _____

CHANGE IN CONTRACT TIMES:

Original Contract Times: ☐ Working days ☐ Calendar days

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

[Increase] [Decrease] from previously approved Change Orders
No. _____ to No. _____:

Substantial completion (days): _____

Ready for final payment (days): _____

Contract Times prior to this Change Order:

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

[Increase] [Decrease] of this Change Order:

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

Contract Times with all approved Change Orders:

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

RECOMMENDED:

By: _____
Engineer (Authorized Signature)

Date: _____

ACCEPTED:

By: _____
Owner (Authorized Signature)

Date: _____

ACCEPTED:

By: _____
Contractor (Authorized Signature)

Date: _____

SECTION 00630
CONTRACTOR'S FINAL AFFIDAVIT AND WAIVER OF LIEN

PROJECT: Sewer Line Extension, Water Line Extension and Sewer Pump Station

OWNER: Transylvania County, NC CONTRACTOR: _____

CONTRACT AMOUNT: _____ CONTRACT DATE: _____

STATE OF: _____ DATE: _____

COUNTY OF: _____

This is to certify that all claims for labor, material, services and any other just claims arising out of the performance of this Contract have been satisfied, except for payment to subcontractors to be made out of retainage presently being held by the Owner, and that no claims or liens exist against this Contractor in connection with this contract; that to the best of our knowledge no claims or liens exist, and if any such claims or liens appear after payment of the retained amount due on the Contract, this Contractor shall save the Owner harmless on account thereof. After payment of the retained amount the undersigned does hereby waive, release and relinquish any and all claims or rights of lien presently held or hereafter accruing upon the above project.

CONTRACTOR: _____

BY: _____

TITLE: _____

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

Notary Public

My Commission expires: _____

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



Endorsed by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. Addenda—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. Agreement—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. Application for Payment—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. Bid—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. Bidder—An individual or entity that submits a Bid to Owner.
 6. Bidding Documents—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. Bidding Requirements—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. Change Order—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. Change Proposal—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. Claim—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. **Constituent of Concern**—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. **Contract**—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. **Contract Documents**—Those items so designated in the Agreement, and which together comprise the Contract.
14. **Contract Price**—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. **Contract Times**—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. **Contractor**—The individual or entity with which Owner has contracted for performance of the Work.
17. **Cost of the Work**—See Paragraph 13.01 for definition.
18. **Drawings**—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. **Effective Date of the Contract**—The date, indicated in the Agreement, on which the Contract becomes effective.
20. **Engineer**—The individual or entity named as such in the Agreement.
21. **Field Order**—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. **Hazardous Environmental Condition**—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. **Laws and Regulations; Laws or Regulations**—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. Liens—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. Milestone—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. Notice of Award—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. Notice to Proceed—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. Owner—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. Progress Schedule—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
30. Project—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. Project Manual—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. Resident Project Representative—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
33. Samples—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. Schedule of Submittals—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.
35. Schedule of Values—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
36. Shop Drawings—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. Site—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. Specifications—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. Subcontractor—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. Substantial Completion—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. Successful Bidder—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. Supplementary Conditions—The part of the Contract that amends or supplements these General Conditions.
43. Supplier—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. Technical Data—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. Underground Facilities—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. Unit Price Work—Work to be paid for on the basis of unit prices.
47. 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; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. Work Change Directive—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. Intent of Certain Terms or Adjectives:
1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. Day:
1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.
- D. Defective:
1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. Furnish, Install, Perform, Provide:
1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

- A. Bonds: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. Evidence of Contractor's Insurance: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. Evidence of Owner's Insurance: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 Copies of Documents

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 Before Starting Construction

- A. Preliminary Schedules: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 Preconstruction Conference; Designation of Authorized Representatives

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 Initial Acceptance of Schedules

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 Electronic Transmittals

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 Reference Standards

- A. Standards Specifications, Codes, Laws and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 Reporting and Resolving Discrepancies

- A. Reporting Discrepancies:
 - 1. Contractor's Verification of Figures and Field Measurements: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. Contractor's Review of Contract Documents: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. Resolving Discrepancies:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Requirements of the Contract Documents

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 Reuse of Documents

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 Starting the Work

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 Reference Points

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 Progress Schedule

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 Delays in Contractor's Progress

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 Use of Site and Other Areas

- A. Limitation on Use of Site and Other Areas:
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. Removal of Debris During Performance of the Work: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. Cleaning: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. Loading of Structures: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 Subsurface and Physical Conditions

- A. Reports and Drawings: The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 Differing Subsurface or Physical Conditions

- A. Notice by Contractor: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. Engineer's Review: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. Owner's Statement to Contractor Regarding Site Condition: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. Possible Price and Times Adjustments:
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
- 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 Underground Facilities

- A. Contractor's Responsibilities: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. Notice by Contractor: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. Engineer's Review: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. Owner's Statement to Contractor Regarding Underground Facility: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. Possible Price and Times Adjustments:
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 Hazardous Environmental Conditions at Site

- A. Reports and Drawings: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 Insurance—General Provisions

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 Contractor's Insurance

- A. Workers' Compensation: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. Commercial General Liability—Claims Covered: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. Commercial General Liability—Form and Content: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
 1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. Automobile liability: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. Umbrella or excess liability: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. Contractor's pollution liability insurance: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. Additional insureds: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. Contractor's professional liability insurance: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. General provisions: The policies of insurance required by this Paragraph 6.03 shall:
 - 1. include at least the specific coverages provided in this Article.
 - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 Owner's Liability Insurance

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 Property Insurance

- A. Builder's Risk: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. Notice of Cancellation or Change: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. Deductibles: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. Partial Occupancy or Use by Owner: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. Additional Insurance: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. Insurance of Other Property: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 Waiver of Rights

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 Receipt and Application of Property Insurance Proceeds

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 Supervision and Superintendence

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 Services, Materials, and Equipment

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. Contractor's Expense: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. Engineer's Evaluation and Determination: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. Effect of Engineer's Determination: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. Treatment as a Substitution Request: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 Substitutes

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. Engineer's Evaluation and Determination: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. Reimbursement of Engineer's Cost: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. Effect of Engineer's Determination: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 Concerning Subcontractors, Suppliers, and Others

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 Patent Fees and Royalties

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 Permits

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 Taxes

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 Laws and Regulations

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 Record Documents

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 Safety Representative

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 Hazard Communication Programs

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 Emergencies

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 Shop Drawings, Samples, and Other Submittals

- A. Shop Drawing and Sample Submittal Requirements:
 - 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 - 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
 - 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. Submittal Procedures for Shop Drawings and Samples: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
 - 1. Shop Drawings:
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. Samples:
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. Other Submittals: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. Engineer's Review:
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. Resubmittal Procedures:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 Indemnification

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 Delegation of Professional Design Services

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 Other Work

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 Coordination

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 Legal Relationships

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 Communications to Contractor

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 Replacement of Engineer

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 Furnish Data

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 Pay When Due

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 Lands and Easements; Reports, Tests, and Drawings

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 Insurance

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 Change Orders

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 Inspections, Tests, and Approvals

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 Limitations on Owner's Responsibilities

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 Undisclosed Hazardous Environmental Condition

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 Evidence of Financial Arrangements

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 Safety Programs

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 Owner's Representative

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 Visits to Site

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 Project Representative

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 Rejecting Defective Work

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 Shop Drawings, Change Orders and Payments

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 Determinations for Unit Price Work

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 Decisions on Requirements of Contract Documents and Acceptability of Work

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 Limitations on Engineer's Authority and Responsibilities

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 Compliance with Safety Program

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 Amending and Supplementing Contract Documents

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. Change Orders:
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 - 2. Work Change Directives: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. Field Orders: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 Owner-Authorized Changes in the Work

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 Unauthorized Changes in the Work

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. Contractor's Fee: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 Change of Contract Times

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 Change Proposals

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. Procedures: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. Engineer's Action: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. Binding Decision: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. Resolution of Certain Change Proposals: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 Notification to Surety

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 Claims

- A. Claims Process: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. Submittal of Claim: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. Review and Resolution: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. Mediation:
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. Partial Approval: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. Denial of Claim: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. Final and Binding Results: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

- A. Purposes for Determination of Cost of the Work: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. Costs Included: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. Costs Excluded: The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. Contractor's Fee: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. Cash Allowances: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. Contingency Allowance: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 Defective Work

- A. Contractor's Obligation: It is Contractor's obligation to assure that the Work is not defective.
- B. Engineer's Authority: Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. Notice of Defects: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. Correction, or Removal and Replacement: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. Preservation of Warranties: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. Costs and Damages: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 Acceptance of Defective Work

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 Uncovering Work

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 Owner May Stop the Work

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. Basis for Progress Payments: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. Applications for Payments:
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 - 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 - 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. Review of Applications:
 - 1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 - 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.
- D. Payment Becomes Due:
 - 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.
- E. Reductions in Payment by Owner:
 - 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
 - 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 Contractor's Warranty of Title

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 Substantial Completion

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 Partial Use or Occupancy

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 Final Inspection

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 Final Payment

- A. Application for Payment:
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

- C. Completion of Work: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. Payment Becomes Due: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 Waiver of Claims

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 Correction Period

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 Owner May Suspend Work

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 Owner May Terminate for Cause

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 Owner May Terminate For Convenience

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 Contractor May Stop Work or Terminate

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 Methods and Procedures

- A. Disputes Subject to Final Resolution: The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. Final Resolution of Disputes: For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 Computation of Times

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 Cumulative Remedies

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 Limitation of Damages

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 No Waiver

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 Survival of Obligations

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 Controlling Law

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 Headings

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00710 SUPPLEMENTAL CONDITIONS

PART 1: GENERAL

1.01 SUMMARY OF WORK

- A. This project generally includes the following:

The construction of new waterlines, sewerlines, force mains, pump station and related appurtenances.

1.02 PROJECT MEETINGS

- A. Progress Meetings: The Contractor and any subcontractors, material suppliers or vendors whose presence is necessary or requested shall attend meetings, referred to as Progress Meetings, when requested by the Engineer for the purpose of discussing the execution of work. Each meeting will be held at the time and place designated by the Engineer. Any decisions, instructions and interpretations at these meetings shall be binding and conclusive on the Contractor and such decisions, instructions and interpretations shall be confirmed in writing by the Engineer. The proceedings of these meetings will be documented and distributed to the Contractor, subcontractors, material suppliers and vendors involved.

1.03 PROJECT PAYMENTS AND RETAINAGE

- A. The Owner may retain a portion of the amount otherwise due to the Contractor. Except as provided elsewhere, the amount retained by the Owner shall be limited to the following:
1. Withholding of not more than 10% of the payment claimed until work is 50% complete.
 2. When work is 50% complete, reduction of the withholding to 5% of the dollar value of all work satisfactorily completed to date, provided that the Contractor is making satisfactory progress and there is not specific cause for greater withholding.
 3. When the work is substantially complete (operational or beneficial occupancy), the withheld amount shall be further reduced below 5% to only that amount necessary to assure completion.
 4. The Owner may reinstate up to 10% withholding if the Owner determines, at its discretion, that the Contractor is not making satisfactory progress or there is other specific cause for such withholding.
 5. The Owner may accept securities negotiable without recourse, conditions or restrictions, a release of retainage bond or an irrevocable letter of credit provided by the Contractor in lieu of all or part of the cash retainage.
- B. Sales Tax Statement: When requested by the Owner, each request for progress payment submitted by the Contractor shall include a sales tax reimbursement statement. The Contractor shall utilize the form provided in Section 00610 Sales

Tax Reimbursement Form, or a similar form that provides the required information and certification.

1.04 SUBMITTALS

- A. General: All transmittals from the Contractor shall be accompanied by a transmittal cover form that includes pertinent information related to the project and the particular transmittal.
- B. Construction Schedule: The Contractor shall, within ten (10) days after receipt of the Notice of Award, prepare and submit to the Engineer for approval a practicable construction schedule showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features and the contemplated dates for completing such salient features. The schedule may be in any form, at the option of the Contractor, but shall maintain current with each submittal for progress payment, at least the following information.
 - 1. The various classes and area of work broken down into times projected for submittals, approvals and procurement; times for installation and erection; and times for testing and inspection.
 - 2. The work completed and the work remaining to complete the project.
 - 3. Any items of work which will delay the start or completion of other major items of work so as to delay completion of the whole project.
- C. Schedule of Values: For lump sum projects, the Contractor shall, within thirty (30) days after the Notice of Award and prior to submitting the first Application for Payment, submit to the Engineer for approval a Schedule of Values for the project. The Schedule of Values shall establish the actual value of the components of the work and, after approval by the Engineer, shall be the basis for the Contractor's Applications for Payment. The Schedule of Values shall include separate line items for all major portions of the work.
- D. Material Suppliers and Subcontractor Listings: As soon as possible, but in no case more than 30 days after receipt of the Notice of Award, the Contractor shall supply the names and addresses of all major material suppliers and subcontractors to the Engineer.
- E. Shop Drawings and Samples: The Contractual requirements for shop drawings and samples are specified in the General Conditions and in the individual specification sections for each item. The Contractor shall submit shop drawings and samples accompanied by the appropriate transmittal sheet. Resubmissions, where required, shall be in accordance with the procedures established for the initial submittal.
- F. Record Documents: Record drawings will not be required of the Contractor; however, to enable the Owner to prepare record drawings, the Contractor shall keep a complete and accurate record of changes and/or deviations from the Contract Documents and shop drawings, indicating the work as actually installed. Changes shall be neatly and correctly shown on the respective portion of the affected document, using prints of the Drawings affected, or the Specifications,

with appropriate supplementary notes. The record set of marked-up Drawings, shop drawings, and Specifications shall be kept at the job site during construction and be available for inspection by the Engineer and the Owner. These marked prints shall be included in the package of final documentation submitted before final payment is required.

1.05 TYPES AND LIMITS OF INSURANCE

- A. Certificates of Insurance: Satisfactory certificates of insurance shall be filed with the Owner through the Engineer prior to starting the work. The Owner will be named as an additional insured on all policies of insurance and all certificates shall contain a 60-day Notice of Cancellation. In connection with the provisions set forth in the General Conditions Article 6, the Notice to Proceed will not be issued until satisfactory certificates of insurance are filed.
1. Worker's Compensation and Employer's Liability: This insurance shall protect the Contractor and Owner against all claims under applicable state workmen's compensation laws. The Contractor and Owner shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workmen's compensation law. This policy shall include an "all states" endorsement.

The liability limits shall be not less than:

- | | |
|--------------------------|---------------------------|
| a. Worker's Compensation | Statutory |
| b. Employer's Liability | \$100,000 each occurrence |

2. Comprehensive Automobile Liability: This insurance shall be written in comprehensive form and shall protect the Contractor and Owner against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned or hired.

The liability limits shall be not less than:

- | | |
|--------------------|--|
| a. Bodily Injury | \$100,000 each person
\$300,000 each occurrence |
| b. Property Damage | \$100,000 each occurrence
\$100,000 aggregate |

3. Comprehensive General Liability: This insurance shall be written in comprehensive form and shall protect the Contractor and Owner against all claims arising from injuries to persons other than his employees or damage to property of the Owner or others arising out of any act or omission of Contractor or his agents, employees, or Subcontractors. The policy shall also include protection against claims insured by usual personal injury liability coverage and shall include a "protective liability" endorsement to insure the contractual liability assumed by the Contractor under the indemnification

provisions in the General Conditions, and "Completed Operations and Products Liability" coverage (to remain in force during the correction period).

To the extent that the Contractor's work, or work under his direction, may require blasting, explosive conditions, or underground operations, the comprehensive general liability coverage shall contain no exclusion relative to blasting, explosion, collapse of building, or damage to underground property.

- | | |
|--------------------|---------------------------|
| a. Bodily Injury | \$100,000 each person |
| | \$300,000 each occurrence |
| b. Property Damage | \$100,000 each occurrence |
| | \$100,000 aggregate |

4. **Umbrella Liability Policy:** This insurance shall protect the Contractor against all claims in excess of the limits provided under the workmen's compensation and employer's liability, comprehensive automobile liability, and general liability policies. The liability limits of the umbrella liability policy shall not be less than \$5,000,000.

1.06 DELIVERY, STORAGE AND HANDLING

- A. As noted in the Bid, the Owner will procure, provide, store and secure certain materials for the project. The Contractor shall be responsible for maintaining the provided security for the stored materials. The Contractor shall be responsible for safely and properly transporting these provided materials to the work areas and installing them per the plans and specifications.
- B. For materials provided by the Contractor, the Contractor shall be responsible for delivery, storage and handling of all materials and equipment. All material and equipment shall be shipped to arrive at the job site on the dates indicated on the purchase order. The following information shall be supplied:
 - 1. The contents and bill of lading, number of shipments.
 - 2. The method of shipment.
 - 3. The date of shipment.
 - 4. The name of the construction project.
- C. Prior to shipment, all items shall be properly prepared to protect all critical areas from the effects of weather, normal expected transport and on site handling.
- D. Items shall be tagged and marked with equipment and/or motor numbers as per the manner stipulated in the purchase order.
- E. All spare parts and expendable supplies shall be properly crated, marked, and shipped to the job site on the date specified.

PART 2: PRODUCTS

2.01 EQUIPMENT AND MATERIAL STANDARDS

- A. All equipment and materials of construction described in this specification shall meet the more stringent requirements of the applicable codes listed below:

1. OSHA - Occupational Safety and Health Administration.
2. ASTM - American Society for Testing Materials.
3. ANSI - American National Standards Institute.
4. AGMA - American Gear Manufacturers Association.
5. AISC - American Institute of Steel Construction.
6. AWS - American Welding Society.
7. NEC - National Electric Code.
8. NEMA - National Electrical Manufacturers Association.
9. API - American Petroleum Institute.

2.02 QUALITY ASSURANCE

- A. All equipment, after installation by the Contractor, shall be inspected, tested and started up by a qualified representative of the equipment manufacturer. The Contractor and the manufacturer's representative shall complete and submit an "Equipment Start-up Form" to the Engineer.
- B. The listing of a manufacturer in the specifications does not necessarily imply that the manufacturer's standard equipment meets the requirements of the specifications, but that the manufacturer listed has the capability to meet the requirements of the specifications.

PART 3: EXECUTION

3.01 SPECIAL REQUIREMENTS

- A. Limits of Construction: The Contractor shall confine all operations and personnel to the limits of construction as shown on the plans. There shall be no disturbance whatsoever of any areas outside the limits of construction nor shall the workmen be allowed to, travel at will through the surrounding private property.
- B. Site Conditions:
 1. The Contractor shall maintain the work and project grounds free from rubbish, debris and waste materials during all phases of the work.
 2. Immediately upon completion of the work and prior to final acceptance, the Contractor shall remove all rubbish, debris, temporary structures, equipment, excess or waste materials and shall leave the work and project grounds in a neat and orderly condition that is satisfactory to the Engineer and Owner.
- C. Right of Entry: The Engineer and his representative will at all times have access to the work. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.
- D. Temporary Construction Services and Facilities: The Contractor shall obtain all necessary permits, licenses, etc. and shall pay all costs incident to the furnishing, installing and maintenance of temporary utility services and facilities required for the duration of the work.

E. Control of Erosion, Siltation, and Pollution:

1. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes or drains, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum. Fills and waste areas shall be constructed by selective placement to eliminate silts or clays on the surface that will erode and contaminate adjacent streams.
 2. The Contractor shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations. The Contractor shall also comply with the applicable regulations of all legally constituted authorities relating to pollution prevention and control. The Contractor shall keep himself fully informed of all such regulations which in any way affect the conduct of the work, and shall at all times observe and comply with all such regulations. In the event of conflict between such regulations and the requirements of the specifications, the more restrictive requirements shall apply.
 3. The Engineer shall have the authority to limit the area over which clearing and grubbing, excavation, borrow, and embankment operations are performed whenever the Contractor's operations do not make effective use of construction practices and temporary measures which will minimize erosion, or whenever construction operations have not been coordinated to effectively minimize erosion, or whenever permanent erosion control features are not being completed as soon as permitted by construction operations.
 4. The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project, including, but not specifically limited to, unpaved secondary roads, haul roads, access roads, disposal sites, borrow and material pits, and production sites. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property.
 5. The Contractor will not be directly compensated for any dust control measures necessary, as this work will be considered incidental to the work covered by the various contract items.
- F. Disposal of Materials: Debris and waste materials, including all combustibles, shall be removed by the Contractor from the construction area unless otherwise approved in writing by the Owner or his Representative.
- G. Estimate of Quantities: The estimated quantities of work to be done and materials to be furnished under this Contract shown in any of the documents, including the proposal, are given for use in comparing bids and to indicate approximately the total amount of the contract; and the right is especially reserved, except as herein

otherwise specifically limited, to increase or diminish the quantities as may be reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract.

- H. Utility Coordination: The Contractor shall make all necessary arrangements with private and public utility companies to avoid any possible damage to or interruption of utility equipment or service. The Contractor shall be responsible for all inquiries concerning locations of utility lines. Repair of any damage to public or private utilities resulting from this work shall be the responsibility of the Contractor.
- I. Construction Surveying: All work shall be constructed in accordance with the lines, grades and elevations shown on the plans or as given by the Engineer in the field. The Contractor shall be fully responsible for maintaining alignment and grade. All available survey information obtained from the design survey will be provided by the Engineer. From this information, the Contractor shall verify benchmarks and develop and make all detail surveys needed for construction. The Contractor shall protect and safeguard all points, stakes, grade marks, monuments, and benchmarks at the site of the work and shall re-establish, at his own expense, any marks which are removed or destroyed due to his construction operations.
- J. Laying Out Work:
 - 1. It is imperative that the Contractor work within the shown rights of way, easements and limits of disturbance at all times, unless approved otherwise by the property owner and the Engineer.
 - 2. The Contractor shall, at his expense, provide competent engineering survey services and shall provide and maintain accurate, detailed, survey work.
 - 3. The plans and supplementary drawings shall not be scaled and the Contractor must verify all dimensions and elevations at the site prior to proceeding with the work. The Contractor shall also verify existing utility locations prior to purchasing materials affected by these locations.
- K. Use of Explosives:
 - 1. If the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage or injury to persons or property resulting from the use of explosives. Such responsibility shall include, but shall in no way be limited to, all damages arising from all forms of trespass to adjacent property as a result of blasting by the Contractor.
 - 2. All explosives shall be stored in a secure manner, in compliance with all laws, and all such storage places shall be marked clearly "DANGEROUS EXPLOSIVES".
- L. Use of Chemicals: All chemicals used during project construction, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in conformance with instructions.

M. Safety and Health Regulations:

1. The Contractor shall comply with all Federal, State and Local Safety and Health Regulations including the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (P.L. 91 - 596) and under Section 107 of the Contract Work Hours and Safety Standards Act (P.L. 91-54).
2. The Contractor shall provide continuous, safe access to all properties, both public and private, along the project in all cases where such access will be provided by the completed facility and shall conduct his operations in such a manner that inconvenience to the property owners will be held to a minimum.

N. Equipment and Material Storage: The Contractor shall plan his activities so that all materials and equipment can be stored within the project limits. There shall be no disturbance whatsoever of any areas outside the project limits without the prior approval of the Engineer.

O. Disturbed Areas: All areas disturbed as a result of the work of the Contractor shall be restored to the original or better condition. Reasonable care shall be taken during construction to avoid damage to the Owner's property or that of any adjacent property owner(s).

P. Tree and Plant Protection: No trees or shrubs except those specifically indicated, shall be removed or trimmed without prior approval from the Engineer. All trees and shrubs within the construction limits to be retained by the Owner shall be properly protected by fencing, posts or other means approved by the Engineer. Where any trees or shrubs are damaged or where limbs are required to be trimmed or removed because of operations under this Contract a qualified horticulturist shall be consulted and the trimming performed in the proper manner. Any landscape plantings severely damaged or which die as a result of the Contractor's operations shall be replaced at no additional cost to the Owner.

Q. Temporary Sanitary Facilities: The Contractor shall be solely responsible for furnishing and maintaining temporary sanitary facilities during the construction period. Such facilities shall include but not be limited to, potable water supply and toilet facilities. Such facilities shall be in compliance with all applicable state and local laws, codes, and ordinances and shall be placed convenient to work stations and secluded from public observation. Once the project is completed all temporary sanitary facilities shall be removed by the Contractor.

R. Traffic Maintenance:

1. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient warning lights, danger signals, and signs, shall provide a sufficient number of flagmen to direct the traffic and shall take all necessary precautions for the protection of the work and the safety of the public.

2. All barricades and obstructions or hazardous conditions shall be illuminated as necessary to provide for safe traffic conditions.
 3. Warning and caution signs shall be posted throughout the length of any portion of the project where traffic flow is restricted.
- S. Special Provisions: NC Department of Transportation: see encroachment agreement.

3.02 WEATHER DELAYS

A. Extensions of Contract Time for Abnormal Weather:

1. If the basis exists for an extension of time in accordance with Article 4.05 of the Standard General Conditions of the Construction Contract, an extension of time on the basis of Abnormal Weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for the period of the contract.
2. The contractor shall maintain a rain gauge on site. The rain gauge shall be read daily and documentation of Abnormal Weather Days should be coordinated with the Engineer's Representative.

B. Standard Baseline for Average Climactic Range:

1. The Engineer has reviewed weather data available from the National Oceanic and Atmospheric Administration (NOAA) and determined a Standard Baseline of average climatic range for the City of Asheville, North Carolina. In the event that the standard baseline for the construction site differs significantly from the Asheville, North Carolina Standard Baseline it will be the Contractor's responsibility to provide documentation of said differences.
2. Standard Baseline shall be regarded as the normal and anticipatable number calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.
3. Standard Baseline is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	6	6	7	5	8	7	5	6	3	5	7

C. Adverse Weather and Rain Delay Days:

1. Adverse Weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours:
 - a. Precipitation (rain, snow, and/or ice) in excess of two-tenths inch (0.20") liquid measure.

- b. Standing snow in excess of one inch (1").
- 2. Adverse Weather may include, if appropriate, "dry-out" or "mud" days:
 - a. For rain days above the standard baseline,
 - b. Only if there is a hindrance to site access or site work such as excavation, backfill, footings; and,
 - c. At a rate no greater than 1 make-up day for each day or consecutive days of rain beyond the standard baseline that total 1" or more, liquid measure, unless specifically recommended otherwise by the Engineer.
- 3. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day, including a weekend day or holiday if the Contractor has scheduled construction activity for that day.

3.03 PROJECT CLOSE-OUT

- A. Final Documentation: Prior to final payment, and before the issuance of a final certificate for payment in accordance with the provisions of the General Conditions, the Contractor shall file with the Engineer the documents listed hereinafter:
 - 1. Guarantees: The Contractor's one (1) year guarantee required by the General Conditions and all other guarantees stated in the Specifications.
 - 2. Affidavit and Waiver of Liens: As required by General Conditions.
 - 3. Consent of Surety Company to Final Payment.
 - 4. Certified Final Sales Tax Statement.
 - 5. Certified Payroll Records (as required).
 - 6. Project Record Documents.
 - 7. Operation and Maintenance Manuals: Submit at least three (3) sets of operation and maintenance manuals for all equipment, electrical valve actuators, electrical devices, and all other materials or devices with special operating and maintenance requirements.
- B. No review or receipt of such records by the Engineer or the Owner shall be a waiver of any change from the Contract Documents or the shop drawings, or in any way relieve the Contractor of his responsibility to perform the work as required by the Contract Documents, and the shop drawings to the extent they are in accordance with the Contract Documents.

END OF SECTION

SECTION 00800 MEASUREMENT AND PAYMENT

1.0 Scope

This section covers the method of measurement and payment for items of work under this contract.

2.0 General

The total Bid Price for each section of the contract shall cover all the work required by the Plans and Contract Documents. All costs in connection with the proper and successful completion of the work including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

3.0 Estimated Quantities

All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only a) as a basis for estimating the probable cost of the work and b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. In some cases a unit price item has been added to the bid schedule for the purpose of establishing a cost basis in the event work associated with that item is required. No guarantee is expressed or implied that the quantities shown in the bid schedule shall be required to fulfill the Contract. The basis of payment for work and materials will be the actual amount of work done and materials furnished. The Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts thereof.

4.0 Work Items

The following describe the method of measurement and payment for the bid items shown in the Bid Schedule in Section 00300.

ITEM NO. 1 - Mobilization & Construction Staking: All work covered by this item will be paid at the contract lump sum price. The lump sum bid price shall not exceed 3% of the base bid amount. Mobilization and Construction Staking shall include the Contractor's cost for providing all contract bonds, certificates of insurance and other required contract items, the mobilization of equipment and personnel to the site, initial and subsequent construction staking, and other costs associated with the planning and beginning of construction.

Partial payment for this item will be made with the first and second partial pay estimates paid on the contract, and will be made at a rate of 50 percent of the lump sum price on each of these partial pay estimates.

ITEM NO. 2 - Precast Concrete Meter Vault w/2-inch Mag Meter: This item shall cover the installation of a precast concrete vault, internal piping, fittings and valves, a 2-inch electromagnetic flow meter, electrical service to the site, external panel rack, controls wired to and mounted on external panel rack and start-up services. Payment will be made on the lump sum in the Bid Form.

ITEM NO. 3 - 3" PVC SDR 21 Sewer Force Main: This item shall cover the installation of 3" PVC SDR 21 Sewer Force Main, including but not limited to trench excavation, pipe laying, pipe bedding, tracer wire, location tape, flushing, pressure testing, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 4 - 3" HDPE Directional Bore: This item shall cover the installation of 3" HDPE Sewerline installed by Horizontal Directional Bore, including but not limited to preparation/clearing/grading of the boring entry and exit areas, pit excavation, drilling fluid and drilling fluid management, pipe fusing, joining to SDR 21 pipe on both ends, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 5 - 3" - 90° Mechanical Joint Fittings: This item shall cover the installation of 3" 90° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed. Receipts or similar items will be required for payment of this item.

ITEM NO. 6 - 3" - 45° Mechanical Joint Fittings: This item shall cover the installation of 3" 45° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed. Receipts or similar items will be required for payment of this item.

ITEM NO. 7 - 3" - 22-1/2° Mechanical Joint Fittings: This item shall cover the installation of 3" 22-1/2° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed. Receipts or similar items will be required for payment of this item.

ITEM NO. 8 - 6" PVC SDR 21 Sewer Force Main: This item shall cover the installation of 6" PVC SDR 21 Sewer Force Main, including but not limited to trench excavation, pipe laying, pipe bedding, tracer wire, location tape, flushing, pressure testing, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 9 - 6" HDPE Directional Bore -- Patterson Creek: This item shall cover the installation of 6" HDPE Sewerline installed by Horizontal Directional Bore under Patterson Creek, including but not limited to preparation/clearing/grading of the boring entry and exit areas, pit excavation, drilling fluid and drilling fluid management, pipe fusing, joining to SDR 21 pipe on both ends, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 10 - 6" HDPE Directional Bore -- Lime Kiln Branch: This item shall cover the installation of 6" HDPE Sewerline installed by Horizontal Directional Bore under Lime Kiln Branch, including but not limited to preparation/clearing/grading of the boring entry and exit areas, pit excavation, drilling fluid and drilling fluid management, pipe fusing, joining to SDR 21 pipe on both ends, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 11 - 6" - 90° Mechanical Joint Fittings: This item shall cover the installation of 6" 90° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed. Receipts or similar items will be required for payment of this item.

ITEM NO. 12 - 6" - 45° Mechanical Joint Fittings: This item shall cover the installation of 6" 45° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 13 - 6" - 22-1/2° Mechanical Joint Fittings: This item shall cover the installation of 6" 22-1/2° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 14 - 6"x6" Tapping Sleeve & Valve: This item shall cover the installation of a 6"x6" tapping sleeve & valve and concrete collar/pad including thrust blocking, labor, and any additional components necessary to complete installation in locations as shown on the plans. Payment will be made on the basis of each 6"x6" tapping sleeve installed.

ITEM NO. 15 - 1" Air Release/Vacuum Breaker Valve in MH: This item shall cover the installation of air release/vacuum breaker valve and associated manhole as well as all components necessary for the complete installation including connection to main pipeline, riser pipe, isolation valve, etc. in the locations shown on the plans. Payment will be made according to the unit price bid in the Bid Form.

ITEM NO. 16 - 14-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 6" PVC Carrier Pipe: This item shall cover the installation of 14" steel pipe casing installed by bore and jack using guided auger boring as well as the installation of 6" PVC carrier pipe in accordance with specifications, including pipe spacers (spiders) and joint restrainers at all joints of the carrier pipe and including but not limited to bore pit excavation, pipe welding, work space and traffic safety, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 17 - 16-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 8" PVC Gravity Sewer Carrier Pipe: This item shall cover the installation of 16" steel pipe casing installed by bore and jack using guided auger boring as well as the installation of 8" PVC carrier pipe in accordance with specifications, including pipe spacers (spiders) and joint restrainers at all joints of the carrier pipe and including but not limited to bore pit excavation, pipe welding, work space and traffic safety, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 18 - Pump Station Earthwork: This item shall include all work for completing the Final Site Grading Plan for the pump station site as indicated on the plans, details, and specifications. This shall include all labor, material, and equipment required to cut, fill, excavate, backfill, compact, and grade the site to meet the design contours of this phase of the project. This includes the cost of removing and disposing unsuitable earthen materials. Payment will be made on the lump sum in the Bid Form.

ITEM NO. 19 - Wet Well & Valve Vault: This item shall cover the excavation for and installation of the precast concrete wet well and valve vault, access hatches, pump guiderails and mounting hardware, discharge piping from the wet well, to and through the valve vault to the joining of the force main, valves, gate valves and fittings, and associated components as shown in plans and specifications. Payment will be made on the lump sum in the Bid Form.

ITEM NO. 20 - Submersible Sewer Pumps: This item shall cover the supply and installation of two submersible sewer pumps, connection to power and control panel and start-up services. Payment will be made on the lump sum in the Bid Form.

ITEM NO. 21 - Panel Rack, Power and Controls: This item shall cover the installation of 3-phase, 480V power service to the site, panel rack, meter base, main shut off, pump control panel with all specified components, auxiliary circuits, alarm floats and hangers, stainless steel rain hood, lighting, conduits and start-up services as shown in plans and specifications. Note requirement in specifications to size components to facilitate a future doubling in pump horsepower. Payment will be made on the lump sum in the Bid Form.

ITEM NO. 22 - Back-up Power Generator and ATS: This item shall cover the installation of Back-up Power Generator and Automatic Transfer Switch (ATS), coordinated with the supplied pumps and control panel as shown in plans and specifications. Note requirement in specifications to size components to facilitate a future doubling in pump horsepower. Payment will be made on the lump sum in the Bid Form.

ITEM NO. 23 - Emergency Bypass Pump Connection: This item shall cover the installation of the Emergency Bypass Pump Connection at the proposed pump station. This includes installation of all associated components including the 6"x6" MJ Tee, 6" Gate Valve & Box, 6" 90° Flanged Elbow Joint, Riser W/ Cam Lock Connection W/ Dust Cap, two concrete bollards, all required piping, as well as all labor and additional materials necessary for construction as shown on the plans. Payment will be made on a lump sum basis in the bid form for the entire Emergency Bypass Pump Connection.

ITEM NO. 24 - Post Hydrant Assembly: This item shall cover the installation of the post hydrant and 2" gate valve & valve box, double backflow preventer in Hot Box with conduit and wiring for heat tape. This shall include all equipment, labor, and materials to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 25 - Pump Station Concrete Pad: This item shall include the construction of a 6" thick concrete pad at the pump station site as shown on the plans including all associated steel reinforcement, formwork, labor, and additional materials necessary for the construction. Payment will be made on the cubic yards of concrete used in the construction.

ITEM NO. 26 - Pump Station 6" Aggregate Base Course: This item shall cover the installation of a 6" aggregate base course beneath the pump station slab and around the perimeter of the fence as shown on the plans and specifications. This shall include all material, equipment, and labor to complete the installation. Payment will be based upon the unit price per ton as listed in the Bid Form. Quarry receipts or similar items will be required for

payment of this item.

ITEM NO. 27 - Pump Station Perimeter Fencing: This item shall cover the installation of the chain link perimeter fencing around the pump station site as shown on the plans including all bracing rods, line posts, concrete footings, barbed wire, openings, all associated hardware, and installation. Payment will be made on the linear foot basis of actual perimeter fencing installed.

ITEM NO. 28 - Driveway 6" Aggregate Base Course: This item shall cover the installation of 6" aggregate base course for the construction of the 16' wide gravel drive serving as the access to the pump station site as shown on the plans and specifications. This shall include all material, equipment, and labor to complete the installation. Payment will be based upon the unit price per ton as listed in the Bid Form. Quarry receipts or similar items will be required for payment of this item.

ITEM NO. 29 - 8" PVC SDR 35 Sewerline: This item shall cover the installation of 8" PVC SDR 35 Sewerline, including but not limited to ditch excavation, pipe laying, pipe bedding etc., as indicated on the plans and specifications. This shall include all equipment, labor, and materials to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 30 - 4' Diameter PreCast Manhole #1 (Sealed/Vented): This item shall include the installation of a 4' Diameter Precast Manhole, frame, cover, and vent, formed invert and any necessary coring for pipe connections, in the location as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 31 - 4' Diameter PreCast Manhole #2 (Drop): This item shall include the installation of a 4' Diameter Precast Manhole, frame and cover, formed invert and any necessary coring for pipe connections, in the location as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 32 - 2" PVC SDR 21 Waterline: This item shall cover the installation of 2" PVC SDR 21 Waterline, including but not limited to trench excavation, pipe laying, pipe bedding, indicator tape, tracer wire, flushing, disinfection, pressure testing, etc., as indicated on the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 33 - 2" - 45° Mechanical Joint Fittings: This item shall cover the installation of 2" 45° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed. Receipts or similar items will be required for payment of this item.

ITEM NO. 34 - 2" - 22-1/2° Mechanical Joint Fittings: This item shall cover the installation of 2" 22-1/2° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed. Receipts or similar items will be required for payment of this item.

ITEM NO. 35 - 2" Gate Valve & Box: This item shall cover the installation of a 2" Gate Valve, Valve Box and concrete collar/pad as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 36 - 14-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 2" PVC Water Main Carrier Pipe: This item shall cover the installation of 14" steel pipe casing installed by bore and jack using guided auger boring as well as the installation of 2" PVC carrier pipe in accordance with specifications, including pipe spacers (spiders) and joint restrainers at all joints of the carrier pipe and including but not limited to bore pit excavation, pipe welding, work space and traffic safety, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 37 - 24-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 12" C900 PVC Water Main Carrier Pipe: This item shall cover the installation of 24" steel pipe casing installed by bore and jack using guided auger boring as well as the installation of 12" C900 PVC carrier pipe in accordance with specifications, including pipe spacers (spiders) and joint restrainers at all joints of the carrier pipe and including but not limited to bore pit excavation, pipe welding, work space and traffic safety, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 38 - 12" C900 PVC Waterline: This item shall cover the installation of 12" C900 PVC Waterline, including but not limited to trench excavation, pipe laying, pipe bedding, indicator tape, tracer wire, flushing, disinfection, pressure testing, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 39 - 12" HDPE Directional Bore -- Patterson Creek: This item shall cover the installation of 12" HDPE Sewerline installed by Horizontal Directional Bore under Patterson Creek, including but not limited to preparation/clearing/grading of the boring entry and exit areas, pit excavation, drilling fluid and drilling fluid management, pipe fusing, joining to DIP pipe on both ends, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 40 - 12" HDPE Directional Bore -- Lime Kiln Branch: This item shall cover the installation of 12" HDPE Sewerline installed by Horizontal Directional Bore under Lime Kiln Branch, including but not limited to preparation/clearing/grading of the boring entry and exit areas, pit excavation, drilling fluid and drilling fluid management, pipe fusing, joining to DIP pipe on both ends, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 41 - 12" - 90° Mechanical Joint Fittings: This item shall cover the installation of 12" 90° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 42 - 12" - 45° Mechanical Joint Fittings: This item shall cover the installation of 12" 45° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 43 - 12" - 22-1/2° Mechanical Joint Fittings: This item shall cover the installation of 12" 22-1/2° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 44 - 12" Gate Valve & Box: This item shall cover the installation of a 12" Gate Valve, Valve Box and concrete collar/pad as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 45 - 12" End of Line Plug: This item shall include the installation of a 12" End of Line Plug in the locations as indicated on the plans and specifications, including but not limited to a concrete deadman and rods. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 46 - 12"x12" Tee: This item shall include the installation of a 12" x 12" Tee in the locations as indicated on the plans and specifications, including but not limited to thrust blocking. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 47 - 12"x6" Tee: This item shall include the installation of a 12" x 6" Tee in the locations as indicated on the plans and specifications, including but not limited to thrust blocking. This shall include all equipment, labor, and material to complete the installation. Note that this does not include the 12"x6" tees on hydrant legs as they are included as a part of the fire hydrant assemblies. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 48 - 8"x8" Tapping Sleeve & Valve: This item shall cover the installation of a 8"x8" tapping sleeve & valve and concrete collar/pad including thrust blocking, labor, and any additional components necessary to complete installation in locations as shown on the plans. Payment will be made on the basis of each 8"x8" tapping sleeve installed.

ITEM NO. 49 - 8"x12" Mechanical Joint Reducer: This item shall include the installation of a 8"x12" Reducer in the locations as indicated on the plans and specifications, including but not limited to a concrete deadman and/or rods. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 50 - 6" Mechanical Plug Tapped 2": This item shall include the installation of a 6" Mechanical Plug Tapped 2" in the locations as indicated on the plans and specifications, including but not limited to a concrete deadman and/or rods. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 51 - Fire Hydrant Assembly: This item shall cover the installation of the fire hydrant, 6" gate valve & valve box, mainline diameter x 6" branch tee, 6" DIP hydrant leg, riser adjustments, thrust blocking and rodding and concrete collars/pads around valve and hydrant. This shall include all equipment, labor, and material to complete the installation. Note that this does not include any valves placed on the main line adjacent to the hydrant location. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 52 - Asphalt Driveway Repair: This item shall cover the temporary patching, final patching, and final 2" overlay on all existing asphalt driveways as shown on the drawings and details. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square footage of driveway repair in the Bid Form.

ITEM NO. 53 - Gravel Driveway Repair: This item shall cover the temporary and final patching on all existing gravel driveways as shown on the drawings. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square footage of gravel driveway repair in the Bid Form.

ITEM NO. 54 - Construction Entrance / Exit: This item shall cover the installation of the construction entrance / exits and includes all associated grading, aggregate and additional materials as well as all equipment and labor to complete the installation as shown on drawings and details. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 55 - Clearing & Grubbing: This item shall include Clearing & Grubbing as shown on the plans within the "Limit of Disturbance" and shall include removing trees, underbrush, undesirable growth, stumps, roots, etc. and disposing of material in approved off-site areas. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the unit price per acre in the Bid Form.

ITEM NO. 56 - Large Tree Removal (12" - 24" Diameter at Breast Height) : This item shall cover the felling and removal of large trees along the frontage of the Richter property on Island Ford Road. Work shall include the removal and disposal of all branches, the removal of the stump and roots as needed for pipeline installation and cutting the trunk into milling length logs. Logs shall be placed on and given to the Richter property where indicated by the Engineer. This shall include all equipment and labor to perform the work. Payment will be made on a per each basis.

ITEM NO. 57 - Large Tree Removal (Greater than 24" Diameter at Breast Height) : This item shall cover the felling and removal of large trees along the frontage of the Richter property on Island Ford Road. Work shall include the removal and disposal of all branches, the removal of the stump and roots as needed for pipeline installation and cutting the trunk into milling length logs. Logs shall be placed on and given to the Richter property where indicated by the Engineer. This shall include all equipment and labor to perform the work. Payment will be made on a per each basis.

ITEM NO. 58 - Silt Fence: This item shall include all silt fence as shown on the erosion control plans and all associated materials and labor required for the installation as shown in the drawings and details. Payment will be made on the basis of the linear feet of silt fence.

ITEM NO. 59 - Straw Wattle Check Dams: This item shall include all straw wattle check dams as shown on the erosion control plans and all associated materials and labor required for the installation. This includes removal of straw wattles upon establishment of surface stabilization. Payment will be made on the basis of each check dam.

ITEM NO. 60 - Non-Erosive Outlets: This item shall include the installation, labor, and materials necessary for the installation of all Non-Erosive Outlets in locations as shown on the plans and details. Payment will be made on the basis of each Non-Erosive Outlet installed.

ITEM NO. 61 - Inlet Protection: This item shall include all the components of inlet protection as shown on the erosion control plans for the existing stormwater inlets located along the construction route and all associated materials and labor required for the installation. This includes removal of inlet protection upon establishment of surface stabilization. Payment will be made on the basis of each inlet along the route requiring inlet protection.

ITEM NO. 62 - Site Stabilization: This item shall include all temporary seeding, permanent seeding, mulching, tacking, rolled erosion control products, soil amendments and surface roughening as shown on the erosion control plans. Also included is all associated materials and labor necessary for the installation. Payment will be made on a lump sum basis for all site stabilization work performed.

ITEM NO. 63 - NCDOT Controlled Access Fence: This item shall cover the installation of NCDOT Controlled Access Fence including all materials, labor, and equipment necessary to construct the fence in locations as shown on the plans. Payment will be made on the basis of linear feet of actual NCDOT Controlled Access Fence installed.

ITEM NO. 64 - Final Grassing & Cleanup: This item shall cover the final clean up and restoration of the site at the conclusion of the project, including removal of construction entrances and all remnants of construction work and erosion control materials. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the lump sum in the Bid Form.

ITEM NO. 65 - Sod: This item shall cover the ground preparation and placement of sod (along with watering and maintenance of the sod during the construction period) as shown on the drawings. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square footage of gravel driveway repair in the Bid Form.

ITEM NO. 66 - 12" HDPE Directional Bore Through Rock: This item shall cover the installation of 12" HDPE Waterline installed by Horizontal Directional Bore through rock, and is considered in addition to other HDD bid items. Other items include the pipe, fusing, pits and other standard items related to HDD installation. This item includes but is not limited to switching to rock bits, pneumatic hammering, and other items only involved in drilling through rock as indicated in the plans and specifications. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the linear foot basis of actual pipe installed through rock.

ITEM NO. 67 - 6" HDPE Directional Bore Through Rock: This item shall cover the installation of 6" HDPE Waterline installed by Horizontal Directional Bore through rock, and is considered in addition to other HDD bid items. Other items include the pipe, fusing, pits and other standard items related to HDD installation. This item includes but is not limited to switching to rock bits, pneumatic hammering, and other items only involved in drilling through rock as indicated in the plans and specifications. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the linear foot basis of actual pipe installed through rock.

ITEM NO. 68 - 3" HDPE Directional Bore Through Rock: This item shall cover the installation of 3" HDPE Waterline installed by Horizontal Directional Bore through rock, and is considered in addition to other HDD bid items. Other items include the pipe, fusing, pits and other standard items related to HDD installation. This item includes but is not limited to switching to rock bits, pneumatic hammering, and other items only involved in drilling through rock as indicated in the plans and specifications. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the linear foot basis of actual pipe installed through rock.

ITEM NO. 69 - Misc. Concrete Repair (ALLOWANCE): This item shall cover concrete flatwork repairs to items such as NCDOT roadside swales and shall include ground preparation, forming and placement of concrete with 4" thickness as shown on the drawings and details. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square yardage of misc. concrete repair in the Bid Form.

ITEM NO. 70 - Rip Rap (ALLOWANCE): This item shall cover Rip Rap stone for miscellaneous uses such as surface stabilization, erosion control or other uses as may be directed by the Engineer and includes the purchase, delivery, storage and placement of the Rip Rap. Payment will be made on the ton of placed Rip Rap.

ITEM NO. 71 - Trench Rock Removal (ALLOWANCE): This item shall cover the removal and proper off-site disposal of material that classifies as rock and cannot be removed by routine means of trench excavation. It shall also include all necessary materials, equipment and labor. Payment will be made on the cubic yards of necessary trench volume created, not the gross cubic yardage of rock removed.

ITEM NO. 72 - Unsuitable Soil Removal (ALLOWANCE): This item shall include the removal and proper off-site disposal of soil that is not suitable for fill or backfill material. It shall also include all necessary materials, equipment and labor. Payment will be made on the cubic yards of soil removed.

ITEM NO. 73 - Suitable Backfill (ALLOWANCE): This item shall include the providing and placing suitable backfill material where on-site materials are lacking. This shall include the purchase, delivery, storage and placement of suitable backfill. Payment will be made on the cubic yards of placed suitable backfill.

ITEM NO. 74 - #57 Washed Stone (ALLOWANCE): This item shall cover #57 Washed Stone for miscellaneous uses such as surface stabilization, erosion control or other uses as may be directed by the Engineer and includes the purchase, delivery, storage and placement of the washed stone. Payment will be made on the ton of placed Rip Rap.

ITEM NO. 75 - Driveway Culvert Replacement (ALLOWANCE): This item shall cover the demolition of existing driveway culverts and the replacement with a 15" RCP culvert. This includes all materials, labor, and equipment necessary to demolish and replace existing driveway culverts in all locations shown on the plans. Payment will be made on the basis of linear feet of actual 15" RCP culvert installed.

ITEM NO. 76 - 16-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 8" C900 PVC Water Main Carrier Pipe: This item shall cover the installation of 16" steel pipe casing installed by bore and jack using guided auger boring as well as the installation of 8" C900 PVC carrier pipe in accordance with specifications, including pipe spacers (spiders) and joint restrainers at all joints of the carrier pipe and including but not limited to bore pit excavation, pipe welding, work space and traffic safety, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 77 - 8" C900 PVC Waterline: This item shall cover the installation of 8" C900 PVC Waterline, including but not limited to trench excavation, pipe laying, pipe bedding, indicator tape, tracer wire, flushing, disinfection, pressure testing, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 78 - 12"x8" Tee: This item shall include the installation of a 12" x 8" Tee in the locations as indicated on the plans and specifications, including but not limited to thrust blocking. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 79 - 12" Gate Valve & Box: This item shall cover the installation of a 12" Gate Valve, Valve Box and concrete collar/pad as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 80 - 12"x8" Tapping Sleeve and Valve: This item shall cover the installation of a 12"x8" tapping sleeve & valve and concrete collar/pad including thrust blocking, labor, and any additional components necessary to complete installation in locations as shown on the plans. Payment will be made on the basis of each 12"x8" tapping sleeve installed.

ITEM NO. 81 - 8" 45° Mechanical Joint Fittings: This item shall cover the installation of 8" 45° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed. Receipts or similar items will be required for payment of this item.

ITEM NO. 82 - Fire Hydrant Assembly: This item shall cover the installation of the fire hydrant, 6" gate valve & valve box, 8"x6" branch tee, 6" DIP hydrant leg, riser adjustments, thrust blocking and rodding and concrete collars/pads around valve and hydrant. This shall include all equipment, labor, and material to complete the installation. Note that this does not include any valves placed on the main line adjacent to the hydrant location. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 83 - NCDOT Road Trench Repair and Patching: This item shall cover the temporary and final patching over all utility trenches through NCDOT roads as shown on the drawings and details. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square footage of pavement repair in the Bid Form.

ITEM NO. 84 - NCDOT Road 2" Asphalt Milling and Overlay: This item shall cover the milling and final 2" overlay on all NCDOT roads as shown on the drawings and details. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square footage of pavement repair in the Bid Form.

ITEM NO. 85 - Concrete Driveway Repair: This item shall cover the temporary and final patching on all existing concrete driveways as shown on the drawings. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square footage of concrete driveway repair in the Bid Form.

ITEM NO. 86 - Gravel Driveway Repair: This item shall cover the temporary and final patching on all existing gravel driveways as shown on the drawings. This shall include all material, equipment, and labor to complete the installation. Payment will be made on the square footage of gravel driveway repair in the Bid Form.

ITEM NO. 87 - Silt Fence: This item shall include all silt fence as shown on the erosion control plans and all associated materials and labor required for the installation as shown in the drawings and details. Payment will be made on the basis of the linear feet of silt fence.

ITEM NO. 88 - Non-Erosive Outlets: This item shall include the installation, labor, and materials necessary for the installation of all Non-Erosive Outlets in locations as shown on the plans and details. Payment will be made on the basis of each Non-Erosive Outlet installed.

ITEM NO. 89 - 16-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 8" C900 PVC Water Main Carrier Pipe: This item shall cover the installation of 16" steel pipe casing installed by bore and jack using guided auger boring as well as the installation of 8" C900 PVC carrier pipe in accordance with specifications, including pipe spacers (spiders) and joint restrainers at all joints of the carrier pipe and including but not limited to bore pit excavation, pipe welding, work space and traffic safety, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 90 - 8" C900 PVC Waterline: This item shall cover the installation of 8" C900 PVC Waterline, including but not limited to trench excavation, pipe laying, pipe bedding, indicator tape, tracer wire, flushing, disinfection, pressure testing, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 91 - 12"x8" Tee: This item shall include the installation of a 12" x 8" Tee in the locations as indicated on the plans and specifications, including but not limited to thrust blocking. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 92 - 12" Gate Valve & Box: This item shall cover the installation of a 12" Gate Valve, Valve Box and concrete collar/pad as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 93 - 8" Gate Valve & Box: This item shall cover the installation of a 8" Gate Valve, Valve Box and concrete collar/pad as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 94 - 8" 45° Mechanical Joint Fittings: This item shall cover the installation of 8" 45° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 95 - 8" 22-1/2° Mechanical Joint Fittings: This item shall cover the installation of 8" 22-1/2° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 96 - Fire Hydrant Assembly: This item shall cover the installation of the fire hydrant, 6" gate valve & valve box, 8"x6" branch tee, 6" DIP hydrant leg, riser adjustments, thrust blocking and rodding and concrete collars/pads around valve and hydrant. This shall include all equipment, labor, and material to complete the installation. Note that this does not include any valves placed on the main line adjacent to the hydrant location. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 97 - 8" End of Line Plug: This item shall include the installation of a 8" End of Line Plug in the locations as indicated on the plans and specifications, including but not limited to a concrete deadman and rods. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 98 - 14-inch Steel Casing GUARANTEED BORE using Guided Auger Boring with 6" PVC Force Main Carrier Pipe: This item shall cover the installation of 14" steel pipe casing installed by bore and jack using guided auger boring as well as the installation of 6" PVC carrier pipe in accordance with specifications, including pipe spacers (spiders) and joint restrainers at all joints of the carrier pipe and including but not limited to bore pit excavation, pipe welding, work space and traffic safety, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 99 - 6" PVC SDR 21 Sewer Force Main: This item shall cover the installation of 6" PVC SDR 21 Sewer Force Main, including but not limited to trench excavation, pipe laying, pipe bedding, tracer wire, location tape, flushing, pressure testing, etc., as indicated in the plans and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the linear foot basis of actual pipe installed.

ITEM NO. 100 - 6"x6" Tee: This item shall include the installation of a 6" x 6" Tee in the locations as indicated on the plans and specifications, including but not limited to thrust blocking. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 101 - 6" Gate Valve & Box: This item shall cover the installation of a 6" Gate Valve, Valve Box and concrete collar/pad as indicated on the plans, details and specifications. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

ITEM NO. 102 - 6" 45-degree bend: This item shall cover the installation of 6" 45° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 103 - 6" 22 1/2-degree bend: This item shall cover the installation of 6" 22-1/2° mechanical joint fittings as necessary for the complete installation, including thrust blocking, in locations shown on the plans and/or as necessary. Payment will be made according to the unit price bid in the Bid Form for each fitting installed.

ITEM NO. 104 - 6" End of Line Plug: This item shall include the installation of a 6" End of Line Plug in the locations as indicated on the plans and specifications, including but not limited to a concrete deadman and rods. This shall include all equipment, labor, and material to complete the installation. Payment will be made on the unit price bid in the Bid Form for each complete installation.

SECTION 00100 SPECIAL PROVISIONS

PART 1: GENERAL

1.01 SPECIAL PROVISIONS REGARDING THE EXECUTION OF THE SCOPE OF WORK

- A. TIME WINDOW FOR TREE REMOVAL: Due to the potential presence of endangered bat species, clearing and tree removal may be executed **only** during the period of

November 16 through March 14

No clearing or tree removal shall be allowed outside this time window.

- B. OTHER TREE REMOVAL REQUIREMENTS: Removal of trees larger than 4" diameter is not allowed without prior approval of the Engineer.

Logs from large trees removed along Island Ford Road shall be given to the property owner, Leroy Richter. Limbs and debris shall be removed and legally disposed by the Contractor.

- C. MATERIAL STORAGE: The Owner has procured an area for material storage located at 535 Old Rosman Highway. This site is fenced and equipped with a lockable gate. The Contractor will have keys to the lock and access to the material storage area. Materials may be stored at this location throughout the duration of the project at no cost to the Contractor. The Contractor is responsible for transportation of materials to and from the job site.
- D. AVAILABLE CONTRACTOR OFFICE SPACE: The upstairs of the material storage shop is available for Contractor's use as office space at no cost to the Contractor. The space is available 'as-is' and is equipped with internet.
- E. EASEMENTS: Utility installation along Cassell Road, Old County Home Road, and Island Ford Road will be done within easements across private property. Any change in alignment shall be discussed with and approved by the Engineer. Special provisions for specific easements are discussed elsewhere in the contract documents or on the Plans.
- F. TIME WINDOW FOR WORK ON OLD COUNTY HOME ROAD: Work between STA 7+00 and 16+00 related to force main installation, culvert repair/replacement, driveway repair, site stabilization, etc. may be executed **only** during the period of

July 1 through July 31

and

November 20 through February 28

Work in this area shall be completed and completely stabilized and restored by the end of this period. Note that much of the site restoration in this area is by sodding and not seed and straw.

To the extent possible, excavation work shall be executed using a trenching machine as opposed to a tracked or rubber tire excavator.

- G. RELATIONSHIP BETWEEN UTILITY PIPELINE AND NCDOT ROADWAY: Project drawings show the utility pipeline installed a minimum of 10 feet off the NCDOT edge of pavement along Hwy 64. Installation closer to the edge of pavement than 10 feet shall require a lane closure and commensurate traffic control and shall be the responsibility and at the cost of the Contractor unless previously approved by the Engineer and Owner in writing.
- H. NCDOT BOND: see encroachment agreement special provision.
- I. DUKE ENERGY: Contractor shall coordinate directly with Duke Energy to obtain service to the pump station and meter vault sites.
- J. TRANSYLVANIA COUNTY BUILDING PERMIT: Contractor shall be responsible for obtaining a building permit for the pump station site.
- K. EROSION AND SEDIMENTATION CONTROL: Due to the proximity and drainage to special designated State waters, the following requirements apply:
 - 1. All linear work shall be stabilized at the end of each workday. No work shall take place during wet weather or periods of predicted wet weather.
 - 2. Work performed within riparian buffers must be stabilized at the end of each workday.
 - 3. No fertilizer shall be used within riparian buffers.
 - 4. Native grass seed mix must be used in riparian buffers.
 - 5. Erosion control matting shall be 100% biodegradable such as coconut coir.
- L. TRAFFIC CONTROL: Traffic control shall be incidental to the work except where noted otherwise.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION – NOT APPLICABLE

END OF SECTION

SECTION 01705 MOBILIZATION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of preparatory work and operations, including but not limited to those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, building, and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the project scope. Included in this item will be the erection of all construction signs and signals, traffic warning devices, project sign and other preparatory signs.
- B. As defined in Section 00100 – Special Provisions, Owner has procured at 535 Old Rosman Highway. Contractor may use this site for storage of their material. See Special Provisions for more detail.
- C. Contractor shall be responsible for procuring any additional material storage sites as well as lay-down areas for equipment and materials. All storage and lay-down areas shall be maintained by the Contractor.
- D. Contractor shall be responsible for restoration of lay-down and storage areas to the satisfaction of the person or persons providing the areas.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION – NOT APPLICABLE

END OF SECTION

SECTION 02200 EARTHWORK

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. General: This work included in this section is the grading of the project area. The work specifically includes:
1. Site clearing and off-site disposal of all debris and unsuitable material.
 2. Removal of all topsoil, organically contaminated soil and existing unsuitable fill.
 3. Proof rolling and grading of the property to the prescribed elevations.
 4. Stockpiling or wasting on site of any excess cut material for providing acceptable material as required to obtain the desired grades.

1.02 SITE CONDITIONS

- A. Site Information: No subsurface test results are available for this project. Test borings and other exploratory operations may be undertaken by the Contractor at his own expense, provided such operations are acceptable to the Owner.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Unstable Material:
1. Organically contaminated soils must be removed from the area of grading operations. At the discretion of the Engineer, topsoil within the area to be stripped shall be stockpiled in a convenient area, selected by the Engineer, for later use in planting area. All topsoil shall be graded by the Engineer as suitable and shall be stockpiled separately as directed by the Engineer in the field.
 2. Soft or excessively yielding material shall be removed and replaced with inert controlled fill.
- B. Fill Material:
1. Material to be used for fill shall be approved by the Engineer.
 2. All roots, organic matter, trash, debris, and other unsuitable materials that may find their way into otherwise acceptable fill material shall be removed during the dumping and spreading operations.
 3. Broken rock and boulders larger than 6" in any dimension may not be used as fill without the specific approval of the Engineer.
 4. Frozen soil shall not be used for fill.

5. Fill material shall have a minimum laboratory dry weight, **ASTM D-698**, of at least 100 pounds per cubic foot unless specifically exempted from this requirement by the Engineer.

PART 3: EXECUTION

3.01 PREPARATION

A. Surface Preparation:

1. After removal of all existing topsoil, debris, and other undesirable material, the areas which are to receive fill, which have been cut to the desired grade, or which are at the approximate required subgrade elevation without additional earthwork, should be proof rolled to locate any soft or yielding area. Proof rolling shall be done with at least four overlapping passes of a heavy-duty flat wheel vibratory roller, at least 20 tons, or by its approved equivalent.
2. Any soft, or excessively yielding material revealed by the proof rolling shall be removed and replaced with inert controlled fill. The Engineer shall be the sole judge of what constitutes soft or excessively yielding material.
3. Drainage from existing watercourses, springs or other sources should be rerouted out of the earthwork area. The Contractor shall take special care to remove all organically contaminated sediment, saturated soil, and other undesirable material from existing watercourses.

- B. Blasting and Damages: Where blasting is done, it shall be done by qualified personnel and in accordance with all federal, state or local requirements and procedures. The Contractor shall be responsible for any damage done to adjoining properties, or to persons, by reason of the blasting or other earthwork operations. The Contractor shall also be responsible for damage to embankments and cut areas, and sewer, water, gas or other underground lines which may result from blasting or earthwork operations. All such damage shall be repaired and made good by the Contractor in a timely manner.

3.02 INSTALLATION

A. Filling and Compaction:

1. After a stable non-yielding surface has been established, the surface of the area to be filled shall be scarified with a disc or harrow to a depth of 4" to 6". An initial 3" layer of fill material shall then be spread over the scarified surface and the entire area compacted as specified below.
2. No fill shall be placed on any area until that area has been inspected and approved by the Engineer. Fill shall not be placed on a snow covered or frozen surface. Fill materials shall be spread in uniform horizontal layers not exceeding 8" in uncompacted thickness. Alternating layers of cohesive and granular fill soils shall not be permitted. Spreading and compacting of fill material should be started at the lowest portion of the site. All fill must be placed in horizontal layers. Sloping fill planes will not be permitted. Fill material shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form.

3. Keyways shall be provided at the toe of each fill slope as shown on the drawings. As each layer of fill meets the natural grade of a slope, a bench, approximately 7 to 8 feet wide, shall be cut into the existing grade with each layer of newly placed fill. If rock is encountered at the face of the natural grade, the original ground shall be cut in vertical steps of 4 to 5 feet and a horizontal bench cut into the rock at the top of each vertical increment. A horizontal plateau, approximately 15 to 20 feet wide, should be provided in the existing slope at vertical intervals of roughly 25 feet. Subsurface drains shall be installed at the toe of the slope and wherever springs or excessive seepage are encountered. Drains should be led to the outside face of the embankment and the water picked up and carried away in such a manner as to avoid softening the embankment or its toe, or producing erosion gullies.
4. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction. This may require aerating the material if it is too wet or the addition of water if it is too dry. If additional water is required, it should be uniformly distributed through the use of approved water wagons, and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.
5. The standard Proctor method of moisture-density relationship test, ASTM D 698 or AASHTO T-99, shall be used to determine the maximum laboratory dry density and the optimum moisture content of the material which is to be used for fill.
6. Each layer of fill material shall be compacted until its density is not less than 95% of the maximum laboratory dry density for the same material. The moisture content of compacted cohesive materials shall not vary by more than two (2) percentage points from the optimum moisture content for the same material, providing excessive yielding is not produced within this range of moisture contents. Where, in the opinion of the Engineer, proposed fill material is too wet to permit drying in a reasonable length of time, the Engineer may reject the material and it must be removed from the work area.
7. The above compaction requirements are to be satisfied for all soil and weathered or soft rock fills. Weathered or soft rocks are those that can be broken down and disintegrated under normal compaction procedures and equipment.
8. At the close of each day's work, or where work is to be interrupted for a period of time, the surface of the site shall be shaped to drain freely, and sealed. If after a prolonged rainfall, the surface of the area to be filled or cut is too wet to work properly, the unsuitable material shall be removed to expose workable soil. The wet material removed may be dried and reused. Construction traffic shall be controlled so as to prevent rutting of graded areas and to avoid over-rolling of any section.
9. All cut areas shall be rolled and compacted to produce a compaction equal to that of the filled area. If soft or yielding material is encountered in cuts, or fills

as a result of trapping water, over-rolling or improper control of construction traffic, and cannot be satisfactorily stabilized by moisture control, compaction or other means approved by the Engineer, the unstable material shall be excavated to the depth required by the Engineer. The excavation shall then be filled with suitable compacted material in accordance with the requirements outlined above.

B. Grading:

1. Elevations shown on the plans are finished ground unless otherwise noted. Grading shall be maintained in such a manner as to provide free surface drainage of the site at all times without any ponding of water.
2. Provide ditches and swales to the cross-sections and grades shown on the drawings. Cut ditch subgrades 4" below the grades shown and provide 4" of topsoil where the plans call for seeding or sodding of the ditch. Keep ditches and swales free of accumulations of debris or washed in material until final acceptance of work by the Engineer.
3. Shape all surfaces to within not more than 0.10 feet above or below the required subgrade elevations and free from irregular surface changes.

C. Maintenance:

1. The Contractor shall be responsible during construction and until final acceptance for the maintenance of all embankments made under the Contract.
2. During construction and until final acceptance; the Contractor shall construct temporary or permanent earth berms along the outer edges of the top surface of the embankment, construct temporary ditches, shape the embankment surface to provide for the drainage of surface runoff along and throughout the length of the embankments, and use any other methods necessary to maintain the work covered by this section so that the work will not contribute to excessive soil erosion. The Contractor shall construct brush dikes or install temporary or permanent slope drains or other drainage features to assist in controlling erosion.
3. The Contractor shall replace, at no cost to the Owner, any portion of embankment which have become displaced or damaged due to carelessness or neglect on the part of the Contractor. Where the work has been properly constructed, completely drained and properly maintained, and damage occurs due to natural causes, the Contractor will be paid at the Contract unit price for the excavated material required to make necessary repairs to such damage.
4. All embankments shall be brought to the grade and cross section shown on the plans or established by the Engineer, prior to final inspection and acceptance by the Engineer.

3.03 FIELD QUALITY CONTROL

A. Quality Control and Testing:

1. The services of qualified soils testing personnel may be engaged by the Owner for the making of tests to determine the moisture-density relationships, relative densities, plastic and liquid limits and suitability of materials for compaction and for inspection and control of the site preparation, selection, placing and compaction of the fill. Such tests will be provided and paid for by the Owner, except that tests which reveal non-conformance with the Specifications and all succeeding tests for the same area, until conformance with the Specifications is established shall be at the expense of the Contractor. The Owner will be responsible for paying for only the successful tests. A copy of the testing personnel's daily field report including results of in-place density and moisture content tests should be forwarded to the Owner and the Engineer at the end of each working day.
2. The Contractor shall cooperate with the testing personnel so as to permit proper inspection and control of the work without unnecessary delays.

END OF SECTION

SECTION 02211

CLEARING AND GRUBBING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Clearing and grubbing shall consist of the removal and satisfactory disposal of all trees, brush, stumps, logs, grass, weeds, roots, decayed vegetation, posts, fences, stubs, rubbish, and all other objectionable matter resting on or protruding through the original ground surface and occurring within the construction limits or right-of-way of any excavation, trench, borrow area, or embankment.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION

3.01 GENERAL

- A. Clearing and grubbing operations shall be completed sufficiently in advance of grading operations as may be necessary to prevent any of the debris from the clearing and grubbing operations from interfering with the excavation or embankment operations. All work under this section shall be performed in a manner which will cause minimum soil erosion. The Contractor shall perform such erosion control work, temporary or permanent, as may be directed by the Engineer in order to satisfactorily minimize erosion resulting from clearing and grubbing operations.

1. Clearing:

- a. The work of clearing shall be performed within the limits established by the plans, specifications, or the Engineer,
- b. Clearing shall consist of the felling and cutting up, or the trimming of trees, and the satisfactory disposal of the trees and other vegetation together with the down timber, snags, brush, and rubbish occurring within the areas to be cleared. Trees and other vegetation, except such individual trees, groups of trees, and vegetation, as may be indicated on the plans to be left standing, and all stumps, roots, and brush in the areas to be cleared shall be cut off six inches above the original ground surface.
- c. Individual trees and groups of trees designated to be left standing within cleared areas shall be trimmed of all branches to such heights and, in such manner as may be necessary to prevent interference with construction operations. All limbs and branches required to be trimmed shall be neatly cut close to the whole of the tree or to main branches, and the cuts thus made shall be painted with an approved tree wound paint. Individual trees, groups of trees, and other vegetation, to be left standing shall be thoroughly protected from damage incident to construction operations by the erection of barriers or by such other means as the circumstances require.

- d. The Engineer will designate all areas of growth or individual trees which are to be preserved due to their desirability for landscape or erosion control purposes. When the trees to be preserved are located within the construction limits, they will be shown on the plans or designated by the Engineer.
 - e. Clearing operations shall be conducted so as to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and so as to provide for the safety of employees and others. When such damages occur, all damaged areas shall be repaired, removed, or otherwise resolved utilizing generally accepted practices at the Contractor's expense.
2. Grubbing:
- a. Grubbing shall consist of the removal and disposal of all stumps, roots, and matted roots from all cleared areas, except as herein specified.
 - b. In embankment areas, when the depth of embankment exceeds 3'-6" in height sound stumps shall be cut off not more than 6" above the existing ground level and not grubbed. Unsound or decayed stumps shall be removed to a depth of approximately two feet below the natural ground surface.
 - c. All depressions excavated below the natural ground surface for or by the removal of stumps and roots shall be refilled with suitable material and compacted to make the surface conform to the surrounding ground surface.
3. Disposal of Cleared and Grubbed Material: Saw logs, pulp wood, cord wood or other merchantable timber removed incidental to clearing and grubbing shall remain the property of the Owner unless the Owner grants permission to the Contractor to take possession of the material(s). Disposal of materials shall be performed through legal permissible means and shall be the responsibility of the Contractor. All combustible matter shall be deposited at locations approved by the Engineer. Combustible matter may be burned or may be disposed of as stated above. Debris shall not be burned unless written permission or permit is issued by the Fire Marshall having jurisdiction in the area if applicable. The Contractor shall adhere to all limitations and conditions set forth in the permit. Burning shall be done at such time and, such manner as to prevent fire from spreading and to prevent any damage to adjacent cover and shall further be subject to all requirements of State or Federal Governments pertaining to the burning. Disposal by burning shall be kept under constant attendance until all fires have burned out or have been extinguished.

END OF SECTION

SECTION 02213 WASTE MATERIAL DISPOSAL

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the disposal of waste and debris in accordance with the requirements of these specifications. Waste will be considered to be all excavated, grubbed or removed materials which are not utilized in the construction of the project.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Waste shall be disposed of in areas that are outside of the project area and provided by the Contractor, unless otherwise required by the plans or special provisions or unless disposal within the project area is permitted by the Engineer.
- B. Concrete that is painted must be disposed of in accordance with requirements and regulations of the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Section. Prior to disposal of painted concrete, the Contractor shall submit a written certification to NCDENR that the paint on the concrete is not lead-based. Certification that paint on concrete is not lead-based paint is required prior to management as inert debris. Lead-based paint is defined by federal statute (Title X of the Housing and Community Development Act and the Toxic Substances Control Act, by reference). Concrete that is painted with lead-based paint, or paint that has not been certified to the satisfaction of the North Carolina Department of Environment and Natural Resources Solid Waste Section to be below the federal standard to be considered lead-based paint, must be disposed of at a properly permitted construction and demolition landfill or a permitted municipal solid waste landfill.
- C. The Contractor shall maintain the earth surfaces of all waste areas, both during the work and until the completion of all seeding and mulching or other erosion control measures specified, in a manner which will effectively control erosion and siltation.
- D. The following requirements shall also be applicable to all waste or disposal areas other than active public waste or disposal areas:
 - 1. Rock waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practical and shall be covered with a minimum 6" thick layer of earth material either from the project waste or from borrow.
 - 2. Earth waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practicable, but in no case will slopes steeper than 2:1 be permitted.

3. Construction debris, grubbed debris and all broken pavement and masonry shall be covered with a minimum 6" thick layer of earth waste material from the project or borrow. The completed waste area shall be shaped as required above for disposal of earth waste.
4. Seeding and mulching shall be performed over all earth or earth covered waste areas. The work of seeding and mulching shall be performed in accordance with Section 02931.
5. Where the Engineer has granted permission to dispose of waste and debris within the project, the Engineer will have the authority to establish whatever additional requirements may be necessary to insure the satisfactory appearance of the completed project.

Disposal of waste or debris in active public waste or disposal areas will not be permitted without prior approval by the Engineer. Such disposal will not be permitted when, in the opinion of the Engineer, it will result in excessive siltation or pollution.

END OF SECTION

SECTION 02220 EXCAVATION AND BACKFILL

PART 1: GENERAL

1.01 SCOPE OF WORK

A. General:

1. The work covered by this section shall consist of furnishing all materials, labor, equipment, and services for the excavation and backfill of all areas within the limits of the project. Work is limited to the areas of construction and includes (but is not necessarily limited to) stockpiling of topsoil, site grading, excavation of footings and trenches, filling, backfilling, compaction, finish grading, spreading of topsoil, disposal of waste material, and proof rolling.
2. Perform all excavation, dewatering, sheeting, bracing, and backfilling in such a manner as to eliminate all possibility of undermining or disturbing the foundations of existing structures.
3. Requirements of the General and Supplemental Conditions apply to, all work in this section. Provide all labor, materials, equipment, and services indicated on the drawings, or specified herein, or reasonably necessary for or incidental to a complete job.
4. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.
5. Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.
6. Backfilling during freezing weather shall not be done except by permission of the Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.

1.02 SYSTEM DESCRIPTION

- A. Excavation, General: Excavation consists of the removal and disposal of all materials encountered for footings, foundations, pipework, and other construction as shown on the drawings. Perform all excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

1.03 QUALITY ASSURANCE

- A. Referenced Standards: Unless otherwise indicated, all referenced standards shall be the latest edition available at the time of bidding. Any requirements of these specifications shall in no way invalidate the minimum requirements of the referenced standards. Comply with the provisions of the following codes and standards, except as otherwise shown or specified.
1. ASTM C33: Standard Specifications for Concrete Aggregate

2. ASTM D698: Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12" Drop.
 3. ASTM D3282: Standard Recommended Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
 4. Standard Specifications for Roads and Structures, North Carolina Department of Transportation, latest edition.
 5. Erosion and Sediment Control Planning and Design Manual.
- B. Unauthorized Excavation: Except where otherwise authorized, indicated, or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced, by and at the expense of the Contractor, with concrete placed at the same time and monolithic with the concrete above.
- C. Existing Utilities:
1. Locate existing underground utilities in the area of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
 2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of utility companies.

1.04 SITE CONDITIONS

- A. Site Information: No test borings or related subsurface information is available for the project area. Test borings and other exploratory operations may be undertaken by the Contractor at his own expense provided such operations are acceptable to the Owner.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Classification of Excavated Materials: Classification of excavated materials will be made as follows:
1. All materials excavated for this project, regardless of its nature or composition shall be classified as Unclassified Excavation, and shall be part of the lump sum price. No separate payment will be made for the excavation of rock or any unsuitable materials.
- B. Classification of Other Materials:
1. Satisfactory Subgrade Soil Materials: Soils complying with ASTM D 3282, soil classification Groups A-1, A-2-4, A-2-5, and A-3.
 2. Unsatisfactory Subgrade Soil Materials: Soils described in ASTM D 3282, soil classification groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also peat and other highly organic soils, unless otherwise acceptable to the Engineer.

3. Cohesionless Soil Materials: Gravels, sand-gravel mixtures, sands, and gravelly-sands.
4. Cohesive Soil Materials: Clayey and silty gravels, sand-clay mixtures, gravel-silt mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands.
5. Backfill and Fill Materials: Provide satisfactory soil materials for backfill and fill, free of masonry, rock, or gravel larger than 4" in any dimension, and free of metal, gypsum, lime, debris, waste, frozen materials, vegetable, and other deleterious matter. Use only excavated material that has been sampled, tested, and certified as satisfactory soil material.
6. Select Backfill: Select backfill is defined as backfill and fill material that is transported to the site from outside the project limits, and which meets the soil requirements specified above under "Backfill and Fill Materials." Material excavated in conjunction with the construction of this project cannot be considered as "select backfill" for payment purposes.
7. Pipe Bedding: Crushed stone or crushed gravel meeting the requirements of ASTM C 33, Gradation 67.
8. Inundated Sand: Sand for inundated sand backfill shall be clean with not more than 25% retained on a No. 4 sieve and not more than 7% passing a No. 200 sieve and shall have an effective size between 0.10 mm and 0.30 mm. Sand shall be deposited in, or placed simultaneously with application of, water so that the sand shall be compacted by a mechanical probe type vibrator. Inundated sand shall be compacted to 70% relative density as determined by ASTM D4253 and D4254.
9. Graded Gravel: Gravel for compacted backfill shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
1"	100
3/4"	85 - 100
3/8"	50 - 80
No. 4	35 - 60
No. 40	15 - 30
No. 200	5 - 10

The gravel mixture shall contain no clay lumps or organic matters. The fraction passing the No. 4 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5. Gravel backfill shall be deposited in uniform layers not exceeding 12" in uncompacted thickness. The backfill shall be compacted by a suitable vibratory roller or platform vibrator to not less than 70% relative density as determined by ASTM D4253 and D4254.

2.02 EQUIPMENT

A. Mechanical Excavation:

1. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.
2. Mechanical equipment used for trench excavation shall be of a type, design, and construction and shall be controlled, that uniform trench widths and vertical sidewalls are obtained at least from an elevation one foot above the top of the installed pipe to the bottom of the trench, and that trench alignment is such that pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

PART 3: EXECUTION

3.01 PREPARATION

A. Dewatering:

1. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
2. All excavations for concrete structures or trenches that extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations 12" or more below the bottom of the excavation.
3. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches without causing damage to adjacent property.
4. The Contractor is responsible for obtaining any required permits or permissions necessary for the disposal of groundwater that is removed. Any discharged groundwater shall be clean and free of sediment.
5. The Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
6. Where trench sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported in a manner which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment has been completed.

B. Stabilization:

1. Subgrades for concrete structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; free from mud and muck; and sufficiently stable to remain firm and intact under the feet of the workmen.
2. Subgrades for concrete structures or trench bottoms, which are otherwise solid but which become mucky on top due to construction operations, shall be reinforced with one or more layers of crushed rock or gravel. The stabilizing material shall be spread and compacted to a depth of not less than 6" below the bottom of the structure or pipe. Not more than 1/2" depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon. The finished elevation of stabilized subgrades for concrete structures shall not be above subgrade elevations indicated on the drawings.

C. Cutting Concrete or Asphalt Surface Construction:

1. All pavement cutting and repair shall be done in accordance with local ordinances. Cuts in concrete and asphaltic concrete shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be performed with a concrete saw in a manner which will provide a clean groove the complete thickness of the surface material along each side of the trench and along the perimeter of cuts for structures.
2. Concrete and asphaltic concrete over trenches excavated for pipelines shall be removed so that a shoulder not less than 12" in width at any point is left between the cut edge of the surface and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. 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.
3. Pavement or other surfaces removed for connections to existing lines or structures shall not be of greater extent than necessary for the installation.
4. 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. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and replaced between existing joints or between saw cuts as specified for payment.

D. Site Grade:

1. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finish the surface within specified tolerances; compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
2. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1

vertical to 4 horizontal so that fill material will bond with existing surface. Shape the subgrade as indicated on the drawings by forking, furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.

3.02 FIELD MEASUREMENTS

A. Alignment, Grade, and Minimum Cover:

1. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.
2. Where pipe grades or elevations are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation except where future surface elevations are indicated on the drawings.

- B. Limiting Trench Widths: Trenches shall be excavated to a width that will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment. For the purposes of quantity measurements and payments, maximum trench widths shall be no greater than the pipe outside diameter plus 24" (12" either side of pipe).

3.03 PROTECTION

- A. Temporary Protection: Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Sheeting and Bracing: Make all excavations in, accordance with Federal, State, and Local health and safety rules and regulations, including those promulgated by the Department of Labor, Occupation Safety and Health Administration, "Safety and Health Regulations for Construction". Furnish, put in place, and maintain such sheeting, bracing, etc., as may be necessary to support the sides of the excavation to comply with the above mentioned rules and regulations.
- C. Blasting:
1. The Contractor shall be responsible for all damage caused by blasting operations. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench.
 2. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

D. Care and Restoration of Property:

1. Enclose the trunks of trees which are to remain adjacent to the work with substantial wooden boxes of such height as may be necessary to protect them from piled material, equipment or equipment operation. Use excavating machinery and cranes of suitable type and operate the equipment with care to prevent injury to remaining tree trunks, roots, branches and limbs.
2. Do not cut branches, limbs, and roots-except by permission of the Engineer. Cut smoothly and neatly without splitting or crushing. In case of cutting or unavoidable injury to branches, limbs, and trunks of trees, neatly trim the cut or injured portions and cover with an application of grafting wax and tree healing paint as directed.
3. Protect by suitable means all cultivated hedges, shrubs and plants that might be injured by the Contractor's operations. Promptly heel in any such trees or shrubbery necessary to be removed and replanted. Perform heeling in and replanting under the direction of a licensed and experienced nurseryman. Replant in their original position all removed shrubbery and trees after construction operations have been substantially completed and care for until growth is reestablished.
4. Replace cultivated hedges, shrubs, and plants injured to such a degree as to affect their growth or diminish their beauty or usefulness, by items of kind and quality at least equal to the kind and quality existing at the start of the work.
5. Do not operate tractors, bulldozers or other power-operated equipment on paved surfaces if the treads or wheels of the equipment are so shaped as to cut or otherwise injure the surfaces.
6. Restore all surfaces, including lawns, grassed, and planted areas that have been injured by the Contractor's operations, to a condition at least equal to that in which they were found immediately before the work was begun. Use suitable materials and methods for such restoration. Maintain all restored plantings by cutting, trimming, fertilizing, etc., until acceptance. Restore existing property or structures as promptly as practicable and do not leave until the end of construction period.

E. Protection of Streams: Exercise reasonable precaution to prevent the silting of streams. Provide at Contractor's expense temporary erosion and sediment control measures to prevent the silting of streams and existing drainage facilities. The Contractor shall size structures and conform fully to the North Carolina Sedimentation Pollution Control Act.

F. Air Pollution:

1. Comply with all pollution control rules, regulations, ordinances, and statutes which apply to any work performed under the Contract, including any air pollution control rules, regulations, ordinances and statutes, or any municipal regulations pertaining to air pollution.
2. During the progress of the work, maintain the area of activity, including sweeping and sprinkling of streets as necessary, so as to minimize the

creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride or more effective dust control, furnish and spread the material, as directed, and without additional compensation.

3.04 TRENCH EXCAVATION

A. Length of Trench:

1. No more trenches shall be opened in advance of pipe lying than is necessary to expedite the work. One block or 400 feet (whichever is the shorter) shall be the maximum length of open trench on any line under construction.
2. Except where tunneling is indicated on the drawings, is specified, or is permitted by the Engineer, all trench excavation shall be open cut from the surface.

B. Trench Excavation:

1. General: Perform all excavation of every description and of whatever substance encountered so that the pipe can be laid to the alignment and depth shown on the drawings.
2. Brace and shore all trenches, where required, in accordance with Federal, State, and Local health and safety rules and regulations, including those promulgated by the Department of Labor, Occupation Safety and Health Administration, "Safety and Health Regulations for Construction".
3. Make all excavations by open cut unless otherwise specified or indicated on the drawings.
4. Width of Trenches: Excavate trenches sufficiently wide to allow proper installation of pipe, fittings and other materials. Measurement and payment quantities will be based on a maximum trench width of not more than 12" clear of pipe on either side at any point. Do not widen trenches by scraping or loosening materials from the sides.
5. Trench Excavation in Earth: Earth excavation includes all excavation of whatever substance encountered. In locations where pipe is to be bedded in earth excavated trenches, fine grade the bottoms of such trenches to allow firm bearing for the bottom of the pipe on undisturbed earth. Where any part of the trench has been excavated below the grade of the pipe, fill the part excavated below such grade with pipe bedding material and compact at the Contractor's expense.
6. Trench Excavation in Fill: If pipe is to be laid in embankments or other recently filled material, first place the fill material to the finish grade or to a height of at least one foot above the top of the pipe, whichever is the lesser. Take particular care to ensure maximum consolidation of material under the pipe location. Excavate the pipe trench as though in undisturbed material.
7. Trench Bottom in Poor Soil: Excavate and remove unstable or unsuitable soil to a width and depth, as directed by the Engineer, and refill with a thoroughly compacted gravel bedding.

8. Bell Holes: Provide bell holes at each joint to permit the joint to be made properly and to provide a continuous bearing and support for the pipe.

C. Trench Backfill:

1. General: Unless otherwise specified or indicated on the drawings, use suitable material for backfill which was removed in the course of making the construction excavations. Do not use frozen material for the backfill and do not place backfill on frozen material. Remove previously frozen material before new backfill is placed. Start backfilling as soon as practicable after the pipes have been laid, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, and proceed until its completion.
2. With the exception mentioned below in this paragraph, do not backfill trenches at pipe joints until after that section of the pipeline has successfully passed any specified tests required. Should the Contractor wish to minimize the maintenance of lights, and barricades, and the obstruction of traffic, he may, at his own risk, backfill the entire trench as soon as practicable after installation of pipe, and the related structures have acquired a suitable degree of strength. He shall, however, be responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair or replace leaking or defective joints or pipe.
3. Material: The nature of the materials will govern both their acceptability for backfill and the methods best suited for their placement and compaction in the backfill. Both are subject to the approval of the Engineer. Do not place stone or rock fragments larger than 4" in greatest dimension in the backfill. Do not drop large masses of backfill material into the trench in such a manner as to endanger the pipeline. Use a timber grillage to break the fall of material dropped from a height of more than 5 feet. Exclude pieces of bituminous pavement from the backfill unless their use is expressly permitted.
4. Zone Around Pipe: Place bedding material to the level shown on the Drawings and work material carefully around the pipe to insure that all voids are filled, particularly in bell holes. For backfill up to a level of 2 feet over the top of the pipe, use only selected materials containing no rock, clods or organic materials. Place the backfill and compact thoroughly under the pipe haunches and up to the mid-line of the pipe in layers not exceeding 6" in depth. Place each layer and tamp carefully and uniformly so as to eliminate the possibility of lateral displacement. Place and compact the remainder of the zone around the pipe and to a height of one foot above the pipe in layers not exceeding 6" and compact to a maximum density of at least 100 % as determined by ASTM D0698.
5. Tamping: Deposit and spread backfill materials in uniform, parallel layers not exceeding 12" thick before compaction. Tamp each layer before the next layer is placed to obtain a thoroughly compacted mass. Furnish and use, if necessary, an adequate number of power driven tampers, each weighing at least 20 pounds for this purpose. Take care that the material close to the

bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe, backfill may, on approval of the Engineer, be compacted by the use of suitable rollers, tractors, or similarly powered equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling and compacting as furnished by the Contractor.

6. Wet the material by sprinkling, if necessary, to insure proper compaction by tamping (or rolling). Perform no compaction by tamping (or rolling) when the material is too wet either from rain or applied water to be compacted properly.
7. Trench Compaction: Compact backfill in pipe trenches to the maximum density as shown on the drawings, or as listed in the subsection entitled COMPACTION, with a moisture content within the range of values of maximum density as indicated by the moisture-density relationship curve.

3.05 SITE GRADE

A. Placement and Compaction:

1. Place backfill and fill material in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to the required percentage of maximum density for each area classification. Do not place backfill or material on surfaces that are muddy, frozen, or contain frost or ice.
2. In areas not accessible to rollers or compactors, compact the fill with mechanical hand tampers. If the mixture is excessively moistened by rain, aerate the material by means of blade graders, harrows, or other approved equipment, until the moisture content of the mixture is satisfactory. Finish the surface of the layer by blading or rolling with a smooth roller, or a combination thereof, and leave the surface smooth and free from waves and inequalities.
3. Place backfill and fill materials evenly adjacent to structures, to the required elevations. Take care to prevent wedging action of backfill against structures. Carry the material uniformly around all parts of the structure to approximately the same elevation in each lift.
4. When existing ground surface has a density less than that specified under the subsection entitled COMPACTION for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

B. Grading Outside Building Lines: Grade to drain away from structures to prevent ponding of water. Finish surface free from irregular surface changes.

C. Planting Areas: Finish areas to receive topsoil to within not more than one inch (1") above or below the required subgrade elevations, compacted as specified, and free from irregular surface changes.

- D. Walks: Shape the surface of areas under walks to line, grade, and cross-section, with the finish surface not more than 0" above or 1" below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.
- E. Pavements:
1. Shape the surface of the areas under pavement to line, grade and cross section, with finish surface not more than 1/2" above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction.
 2. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material.
 3. Shape to line, grade, and cross section as shown on the drawings.
- F. Protection of Graded Areas: Protect newly graded areas from traffic and erosion, and keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- G. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather prior to acceptance of work, scarify surface, reshape, and compact to required density prior to further construction.
- H. Unauthorized Excavation:
1. Unauthorized excavation consists of the removal of materials beyond indicated elevations without the specific direction of the Engineer. Under footings, foundations, bases, etc., fill unauthorized excavation by extending the indicated bottom elevation of the concrete to the bottom of the excavation, without altering the required top elevation. Lean concrete fill may be used to bring elevations to proper position only when acceptable to the Engineer.
 2. For pipe trenches and elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by the Engineer.

3.06 BACKFILL AROUND STRUCTURES

- A. General: Unless otherwise specified or indicated on the drawings, use suitable material for backfill which was removed in the course of making the backfill and do not place backfill which was removed in the course of making the construction excavations. Do not use frozen material for the backfill and do not place backfill upon frozen material. Remove previously frozen material before new backfill is placed.
- B. Material: Approved selected materials available from the excavations may be used for backfilling around structures. Obtain material needed in addition to that of construction excavations from off-site borrow pits selected by the Contractor.

Furnish all borrow material needed on the work. Place and compact all material, whether from the excavation or borrow, to make a dense, stable fill. Use fill material which contains no vegetation, masses of roots, individual roots over 18" long or more than 1/2" in diameter, stones over 4" in diameter, or porous matter. Organic matter must not exceed negligible quantities.

- C. Placing Backfill: Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage. Make special leakage tests, if required, as soon as practicable after the structures are structurally adequate and other necessary work has been done. Use the best of the excavated materials in backfilling within 2 feet of the structure. Avoid unequal soil pressures by depositing the material evenly around the structure.

3.07 COMPACTION

- A. General: Control soil compaction during construction providing at least the minimum percentage of density specified for each area classification.
- B. Percentage of Maximum Density Requirements: After compaction, all fill will be tested in accordance with Method "C" of ASTM D-698, unless specified otherwise. Except as noted otherwise for the zone around pipe, provide not less than the following percentages of maximum density of soil material compacted at optimum moisture content, for the actual density of each layer of soil material-in-place:

Unpaved Areas	Compact Full Depth to 92%
Drives and Parking	Top 24" - 100%
Trench Backfill (Paved Areas)	Compact full depth to 100%
Trench Backfill (Unpaved Areas)	Compact full depth to 95%
All other Backfill	Compact full depth to 95%

- C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests.
- D. Disposal of Surface Material: Upon approval of the Engineer, haul all surplus materials not needed or acceptable for backfill off-site.

3.08 FIELD QUALITY CONTROL

- A. Soil Testing and Inspection Service: Compaction tests of all fill areas will be made by an independent testing laboratory. Such tests will be provided and paid for by the Owner, except that tests that reveal non-conformance with the specifications and all succeeding tests for the same area shall be at the expense of the

Contractor until conformance with the specifications is established. The Owner will be responsible for paying for only the successful tests.

END OF SECTION

SECTION 02221

ROCK EXCAVATION AND SELECT BACKFILL

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the removal and proper disposal of sound, solid rock of whatever nature, which occurs in its original position in ledges, bedded deposits or stratified and unstratified masses within the excavation limits shown on the plans, and which is of such hardness or texture that it cannot be loosened or broken down and removed without resort to drilling and blasting methods. This work shall be classified as rock excavation. Likewise, the removal of boulders, pieces of stone, and old masonry masses, one cubic yard in volume shall be classified as rock excavation.

1. At least 15 calendar days prior to bringing any explosives or blasting agents on the job site, submit a Blasting Plan to the ENGINEER for review and approval. Blasting shall only be used for rock removal. The Blasting Plan shall detail the CONTRACTOR'S proposals for compliance with the protection requirements of this section, shall detail the general concepts proposed to achieve the desired excavations, and their plan for storage and handling of blasting materials in compliance with local, state, and federal regulations and laws. This plan shall include a complete description of controlled blasting techniques to control noise, blasting vibrations, air blast pressures, and fly rock. It shall provide data necessary to support the adequacy of the CONTRACTOR'S proposed efforts regarding the safety of structures and slopes and to assure that an adequate foundation is obtained. The plan shall also describe procedures to be used to monitor blast vibrations and air blasts at facilities (maximum of 3) designated by the ENGINEER. The plan shall also include the resume of the person responsible for all blasting operations on the project. The Blasting Plan shall also outline provisions of the CONTRACTOR'S blasting safety plan, to include location and safety provisions for storing explosives on site. The blasting plan shall be prepared under the direct supervision of a professional ENGINEER (Blasting Engineer), assigned by the CONTRACTOR, experienced in the design of this Work and licensed in the State of North Carolina.

The blasting plan shall describe the proposed work sequence and schedule and include the sequence of blasting and excavation.

2. The CONTRACTOR shall employ the services of a professional to conduct a pre-blast survey of structures that have the possibility of being damaged in the vicinity of the work area where blasting will be undertaken. The pre-blast survey shall include private dwellings within 1100 feet of any blasting. These dwellings are not on City of Asheville property. The pre-blast survey shall be performed by a licensed Engineer in the state of North Carolina that has

experience in performing pre-blast surveys. The pre-blast survey shall be a comprehensive report to include at a minimum:

1. Latitude and Longitude of the dwelling
 2. Description of the structure, floors, foundation, and attachments (decks, chimneys, etc.)
 3. Photo-documentation of the exterior and interior of the dwelling.
 4. Other descriptions as deemed appropriate by the Engineer performing the survey to properly document the structure should concerns arise by the OWNER of the dwelling after blasting such as cracks, displacements, spalling, etc.
3. Submit a Blasting Report including all monitoring records to the ENGINEER within 7 days following each blast. The Blasting Reports shall provide actual values of explosives loading, distribution, pre-split intervals, delay periods, maximum pounds of explosive detonated per delay period, misfires, under or overloaded holes, water in holes, variations in stemmings, variations in drill rates, blast location, date and time of blast, distance from structures identified by the ENGINEER as critical, scaling time and approval of the scaling by the CONTACTOR'S safety representative, and evaluation of the blast indicating advance (length pulled) and areas of significant overbreak, planned adjustment to the blast design for the next blasts and other blast parameters that are required for quality control and construction record purposes. Seismic monitoring data shall include identification of instruments, monitoring locations, frequency of the ground motion, peak particle velocity, displacement, air blast, recorded waveforms, date, and time. The Blasting Report shall be prepared by a qualified blasting expert.
4. Approval by the ENGINEER of the blasting plan proposed by the CONTRACTOR will only be with respect to the basic principles and methods the CONTRACTOR intends to employ. Approval by the ENGINEER and compliance by the CONTRACTOR with provisions for protection of life and property does not relieve the CONTRACTOR of sole responsibility for the safety of persons and property.
- B. The work covered by this section shall also include the furnishing, delivery, and placement of select backfill material other than local material that is necessary to replace the rock excavation upon installation of any pipe or structures.
- C. SUPPLEMENTARY SPECIFICATIONS: Except as otherwise noted the STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES as prepared by the State of North Carolina Department of Transportation dated January 1, 1990, or latest revision thereof, shall govern all work to be performed under the Item.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Rock presplitting shall be in accordance with N.C.D.O.T. Standard Specifications Section 228.

2.02 QUALITY REQUIREMENTS

- A. Purchase all materials from reputable suppliers that can ensure sufficient quantities, delivery times, and quality of materials.
- B. Dewatering methods that cause a loss of fines from excavation slopes and foundations shall not be permitted.
- C. The CONTRACTOR shall assume sole responsibility for dewatering and surface water control systems and for loss or damage resulting from partial or complete failure of protective measures or erosion or resultant damage caused by ground water and surface water control operations.
- D. The CONTRACTOR shall comply with authorities having jurisdiction for the following:
 - 1. Drilling and abandoning of wells used for dewatering systems.
 - 2. Water discharge and disposal from pumping operations.
- E. The CONTRACTOR shall obtain all necessary Federal and State permits.

2.03 QUALIFICATIONS

- A. Engage a land surveyor registered in the State of North Carolina to perform required land surveying services.
- B. At least 15 calendar days prior to bringing any explosives or blasting agents to the job site, if allowed, submit qualifications of blasting personnel or specialty subcontractor to the ENGINEER.
- C. Include the name and qualifications of the Blasting ENGINEER and on-site personnel responsible for the blasting.
- D. Include a list of references from projects of a similar nature to that specified herein and written evidence of the licensing, experience, and qualifications of the blasters who will be directly responsible for the loading and firing of each slot.
- E. Include names, qualifications and references of the CONTRACTOR or subcontractor personnel, independent professional ENGINEER, or firm responsible for monitoring and reporting the blast vibrations.

2.04 DEFINITIONS

- A. Unclassified Excavation: – Unclassified excavation includes all earth materials, including topsoil, soil, and rock, which do not meet the requirements of rock excavation as defined below. All boulders or detached pieces of solid rock less than one cubic yard in volume shall be unclassified.
- B. Mass Rock Excavation: – For mass excavation, rock is defined as any material that cannot be dislodged by a Caterpillar Model No. D-8N heavy-duty tractor, or equivalent, equipped with a hydraulically operated, single-tooth power ripper without the use of hoe-ramming or blasting.
- C. Trench Rock Excavation: – For trenches and other areas wherein a Caterpillar Model No. D-8N cannot readily operate, rock excavation shall be defined in terms of a Caterpillar Model No. 330 hydraulic excavator, or equivalent.
 - 1. The excavator shall be operated so it pulls at the rock in four 90 degrees locations, if so directed by ENGINEER. The excavator is not expected to hammer on the rock but is expected to aggressively and frequently pull at the rock.
 - 2. The excavator's bucket shall not be wider than 30 inches and shall utilize rock teeth. The teeth shall be replaced once they have worn by ½ inch in length.
 - 3. This classification does not include materials such as loose rock, concrete, cemented gravel, or other materials that can be removed by means other than hoe-hammering or blasting, but which for reasons of economy in excavating, the CONTRACTOR chooses to remove by hoe-ramming or blasting.
 - 4. Rock does not include boulders less than one cubic yard in volume. Boulders larger than one cubic yard in volume will be considered rock for payment purposes.
- D. Dental Rock Excavation: – Rock excavation and trimming as directed by the ENGINEER to flatten slopes prior to placing soil backfill against rock slopes or to eliminate rock overhangs.
- E. Pay Limits: – Line in which that the limits of blast damage to rock should be limited and the limits of pay lines for removal of fractured rock due to blasting will be paid.

2.05 PRODUCTS

- A. General: - The CONTRACTOR shall be responsible for all costs associated with delays or material quantity shortfalls due to miscalculations or required rework resulting from not meeting material or placement specifications.

- B. Monitoring Equipment: - Select blast monitoring equipment to meet the specified requirements for blast vibration and sound pressure levels monitoring as specified herein.
- C. Blast Detonators: - Blast detonators shall be non-electric, as manufactured by Ensign-Bickford or the equivalent, to avoid accidental detonation due to stray electrical currents at the blast site.

PART 3: CONSTRUCTION REQUIREMENTS

3.01 EXAMINATION

- A. Prior to commencing excavation, the CONTRACTOR shall confirm that the areas to be excavated have been adequately surveyed and marked.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum, as shown on the Drawings.
- B. The CONTRACTOR is responsible for establishing stockpile locations. The CONTRACTOR is responsible for stabilizing these areas in accordance with state and local requirements and these specifications.

3.03 PROTECTION

- A. Comply with all safety requirements of OSHA, state, and federal regulations. Where there is a conflict between the requirements of this section and the requirements of the publication Construction Safety Standards, the more stringent requirements shall govern.
- B. When drilling in rock or other dust-producing material, the dust shall be controlled in accordance with Section 01 57 19, Temporary Environmental Controls.
- C. All percussion-type drilling shall be performed with drilling apparatus equipped with water or chemical dust-control systems or other equipment means of controlling the dust. Pressure tanks used in the suppression equipment shall conform to ASME Boiler and Pressure Vessel Code, Section VII, for Unfired Pressure Vessels. Equipment and solutions used shall be suitable for operation in freezing weather. Dust-control devices are not required on jackhammers, provided the operators wear approved-type dust respirators when dust concentration exceeds safe hygienic limits.
- D. Removal of water from excavations shall be accomplished in such a manner that erosion and the transmission of sediment and other pollutants are minimized. Diversion ditches shall be installed as required to prevent surface water and sediment from entering the excavated areas.
- E. Blasting will be permitted only after all efforts to excavate using mechanical methods have been effectively utilized by the CONTRACTOR and as approved by the ENGINEER. The CONTRACTOR shall notify the ENGINEER, OWNER, and all

residents, businesses, and utility Owners within one-half mile of the blast location at least 2 days prior to blasting. The OWNER uses "Everbridge" to contact its customers with important information. The CONTRACTOR should work with the OWNER to coordinate the dissemination of information associated with blasting. Notwithstanding full compliance with these Specifications, approval of the blasting plans, and successful limitation to maximum peak particle velocity, the CONTRACTOR shall be solely responsible for any damage, direct or indirect, arising from the blast and shall hold the OWNER and the ENGINEER harmless from any costs, liens, charges, claims or suits including the costs of defense, arising from such damage, real or alleged.

F. No blasting shall be done within 100 feet of concrete less than 7 days old.

G. Blasting Vibration Limit Criteria are as follows:

The Peak Particle Velocity (PPV) Limits at a distance of 200 feet or to the nearest structure, whichever is closer, are:

<u>Frequency (hertz)</u>	<u>Max PPV</u>
2.5 to 10	0.05 (in/sec)
11 to 40	0.05 x frequency* (in/sec)
>40	2.0 (in/sec)

H. The CONTRACTOR shall be completely responsible for all damages resulting from blasting operations and shall, as a minimum, take whatever measures are necessary to maintain peak particle velocities within the specified limits. Modifications to blasting and excavation methods required to meet these requirements shall be undertaken at no additional cost to OWNER.

3.04 FIELD QUALITY CONTROL

A. Blasting Monitoring:

1. The CONTRACTOR shall monitor PPV resulting from each blast, at locations adjacent to the nearest structures from the blast. At a minimum, three locations shall be monitored for each blast. One of the monitoring locations shall be at a fixed distance from each blast for purposes of verifying assumptions from the test blast. The ENGINEER may require the CONTRACTOR to monitor certain critical structures.
2. Blast monitoring may require that time of firing be precisely known so that the seismographs can be started just before firing. The CONTRACTOR shall cooperate with the ENGINEER and shall establish a signal system, which will allow independent records of blast vibrations to be made.

B. Blast Monitoring Instrumentation: – All instrumentation proposed for use on the project shall have been calibrated within the previous 6 months to a standard, which is traceable to the National Bureau of Standards. Characteristics of required instrumentation are listed below:

1. Measure the three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source
 2. Measure and display the maximum peak particle velocity component. These readings must be displayed and be able to be read in the field immediately after each blast.
 3. Furnish a permanent record of particle velocity components.
- C. The CONTRACTOR shall cooperate with the ENGINEER in permitting observation of the CONTRACTOR'S drilling and loading procedures, as well as in providing detailed information on blasting operations.

3.05 EXCAVATION

- A. The CONTRACTOR shall excavate and stockpile topsoil, demolition, and backfill material for reuse, if applicable. The removal and disposal of the rock after drilling and blasting shall be in accordance with Section 02220 of these Specifications.
- B. Excavate soils and rock to the lines and grades as shown on the Drawings or as directed by the ENGINEER. The lines and grades of rock line shown on the drawings are approximations based on subsurface investigations performed during design.
- C. Repair any damage to the work caused by the CONTRACTOR'S operations including disturbance of the material beyond the required excavation as required by the ENGINEER at no additional cost to the OWNER.
- D. The CONTRACTOR shall assume all responsibility for sequencing excavation, and stabilizing slopes. The OWNER and ENGINEER do not represent that the excavation slopes shown can be performed to or maintained at the neat lines described in these Specifications or as shown on the Drawings.
- E. Additional excavation or work and corresponding backfill with suitable materials approved by the ENGINEER caused by staking which is at variance with the ENGINEER'S approval or for the convenience of the CONTRACTOR shall be done at no additional cost to the OWNER.
- F. Any excavation beyond the lines and grades shown on the Drawings, or the Pay Limits as defined herein, unless approved by the ENGINEER, shall be brought back to grade by compacted earth fill at no additional cost to the OWNER.
- G. Excavation of blast damaged rock beyond Pay Limits shall be performed as directed by the ENGINEER. Any and all costs associated with excavation outside the Pay Limits, including excavation of rock materials and replacement with concrete or backfill, will be borne by the CONTRACTOR as stipulated in the Measurement and Payment Section.
- H. The installation of select backfill when deemed necessary shall be in accordance with N.C.D.O.T. Standard Specifications Section 300.

PART 4: METHOD OF MEASUREMENT

The quantity of rock excavation will be the actual number of cubic yards of rock removed, by drilling and blasting, and disposed of. There shall be no measurement made for the number of cubic yards of select backfill material as payment for this quantity shall be included in the unit bid price for rock excavation.

END OF SECTION

SECTION 02222 UNCLASSIFIED EXCAVATION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the excavation, placement, and compaction or satisfactory disposal of all unclassified materials encountered within the limits of the work.
- B. All materials excavated under this section, regardless of its nature or composition, shall be classified as Unclassified Excavation.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION

3.01 GENERAL

- A. All suitable material removed in the excavation shall be used as far as practical in the formation of embankments, subgrades, and shoulders and at such other places as may be indicated on the plans or directed by the Engineer. No excavation shall be wasted except as may be permitted by the Engineer.
- B. The Engineer will designate materials that are unsuitable and their disposal location.
- C. Where suitable materials containing excessive moisture encountered above grade in cuts, the Contractor shall construct above grade ditch drains prior to the excavation of the cut material when in the opinion of the Engineer such measures are necessary to provide proper construction.
- D. Widening of cuts or flattening of cut slopes will not be required in rock or material which requires ripping. When rock is unexpectedly encountered, any widening or flattening already begun shall be transitioned to leave the cut with a pleasing and safe appearance.
- E. Excavation in the earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved compacted earth fill, except that, if the earth is to become the subgrade for riprap, rock fill, sand or gravel bedding, or drain fill, the voids may be filled with material conforming to the specifications for the riprap, rock fill, bedding or drain fill.
- F. Slide and overbreaks which occur prior to final acceptance of the project due to natural causes shall be removed and disposed of by the Contractor as directed by the Engineer.
- G. Where slides or overbreaks occur due to negligence or carelessness on the part of the Contractor, the Contractor shall remove and dispose of the material at no cost to the Owner.

- H. Where it is necessary for existing utilities to remain in their original location, the Contractor shall conduct his earthwork operations in a manner which will not disturb these facilities.

END OF SECTION

SECTION 02223 ROCK EXCAVATION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the blasting and excavation of rock material in cut areas. Rock excavation shall be classified material which cannot be removed with normal construction equipment such as hydraulic excavators, bulldozers with "rippers" and requires the construction practice of blasting.

1.02 DEFINITIONS

- A. Rock is defined as being sandstone, limestone, flint, graphite, quartzite, slate, hard shale, or similar material that cannot be excavated without systematic drilling and blasting.
- B. Should rock be encountered in two or more ledges, each ledge being not less than 3" thick and with interlying strata of earth, clay or gravel not more than 12" thick in each stratum, the entire volume between the top of the top ledge and the bottom of the bottom ledge will be classified as rock.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

- A. Blasting: The use of explosives shall be in strict accordance with all Federal, State, County and local regulations and shall be approved by the Engineer before use. Suitable methods shall be employed to confine all materials lifted by blasting. The Contractor shall be responsible for any damage caused by blasting operations.
- B. When rock is encountered, all lines and grades will be held in accordance with the plans or adjusted only after approval of the Engineer.
- C. When rock is encountered within the limits of construction, the Contractor shall notify the Engineer prior to any removal. Upon the Engineer's authorization, the Contractor shall remove the rock. The Contractor shall not be paid for rock removed without prior approval from the Engineer.
- D. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

END OF SECTION

SECTION 02224 DITCH EXCAVATION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the excavation and satisfactory disposal of all material excavated in the construction of ditches.

1.02 QUALITY ASSURANCE

- A. The excavation shall be done to the lines, grades, typical sections and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Ditches shall be landscaped in accordance with Section 02931.
- B. The ditches shall be maintained by the Contractor until the final acceptance of the project.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION

3.01 PREPARATION

- A. Silt Detention: When directed by the Engineer or shown on the drawings, the Contractor shall excavate silt detention basins and silt ditches to the dimensions and at the locations established by the Engineer for the purpose of siltation control. Silt detention basins shall be cleaned out, when so directed by the Engineer, if necessary to maintain their effectiveness. Silt detention basins and silt ditches shall be backfilled and shaped for seeding and mulching prior to the completion of the project unless otherwise directed by the Engineer.
- B. All roots, stumps, and other foreign matter in the sides and bottom of ditches shall be cut one foot below finish grade. Care shall be taken not to over-excavate ditches below the grades indicated. Any excessive ditch excavation due to removal of roots, stumps, etc., or due to over-excavation shall be backfilled to grade either with suitable material, thoroughly compacted, or with suitable stone or cobble to form an adequate invert, as directed. The Contractor shall maintain all ditches excavated under this specification free from detrimental quantities of leaves, sticks, and other debris until final acceptance of the work.

3.02 DISPOSAL OF MATERIALS

- A. All excavated materials shall be utilized in the construction of embankments _ except where otherwise directed by the Engineer. Materials which are excess to the needs of the project may be deposited alongside the ditch, and spread to form a low, flat, inconspicuous spoil bank of sufficiently regular contour to permit seeding and mowing to be performed.

END OF SECTION

SECTION 02230 AGGREGATE BASE COURSE

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the construction of a base composed of an approved aggregate material hauled to the site, placed on the site, compacted, and shaped to conform to the lines, grades, depths, and typical sections shown on the plans or established by the Engineer.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Aggregate base course materials shall consist of crushed stone or uncrushed gravel, or other similar material having hard, strong, durable particles free of adherent coatings and a gradation of materials to provide both strength and durability along with cohesion and structure.
- B. The Contractor shall furnish aggregate base course material produced in accordance with the requirements indicated herein unless otherwise specified in the special provisions.
- C. All aggregates shall be from approved sources. Sources will not be approved unless the material has satisfactory soundness and satisfactory resistance to abrasion. Satisfactory soundness will be considered to be a weighted average loss of not greater than 15% when subjected to five (5) alternations of the sodium sulfate soundness test in accordance with AASHTO T104. Satisfactory resistance to abrasion will be considered to be a percentage of wear of not greater than 55% when tested in accordance with AASHTO T96.
- D. Aggregates shall be handled in such a manner as to minimize segregation.
- E. Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the ground surface shall be firm, smooth, and well drained. A cover of at least 3" of aggregate shall be maintained over the ground surface in order to avoid the inclusion of soil or foreign material. Stockpiles shall be built in such a manner as to minimize segregation. When it is necessary to operate trucks or other equipment on a stockpile in the process of building the stockpile, it shall be done in a manner approved by the Engineer.
- F. Stockpiles of different types or sizes of aggregates shall be spaced far enough apart, or else separated by suitable walls or partitions, to prevent the mixing of the aggregates.
- G. Any method of stockpiling aggregates which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has been operated, and failure of such samples to meet all grading

requirements for the aggregate will be considered cause for discontinuance of such stockpiling procedure.

- H. Gradation: All standard sizes of aggregates shall meet the gradation requirements when tested in accordance with AASHTO T27.

PART 3: EXECUTION

3.01 CONSTRUCTION OF STONE BASE

- A. The aggregate material shall be spread on the subgrade to a uniform loose depth and without segregation.
- B. Where the required compacted thickness of base is 8" or less the base material may be spread and compacted in one layer. Where the required compacted thickness of base is more than 8", the base material shall be spread and compacted in 2 or more approximately equal layers. The minimum compacted thickness of any one layer shall be approximately 4".
- C. Each layer of material shall have been sampled, tested, compacted, and approved prior to placing succeeding layers of base material or pavement. Such tests will be provided and paid for by the Owner, except that tests which reveal non-conformance with the Specifications and all succeeding tests for the same area, until conformance with the Specifications is established, shall be at the expense of the Contractor. The Owner will be responsible for paying for only the successful tests. The minimum compaction for each layer shall be 100% standard proctor.
- D. No base material shall be placed on frozen subgrade or base. Hauling equipment shall not be operated on subgrade or a previously completed layer of base material soft enough to rut or weave beneath the equipment.
- E. The maximum speed of trucks hauling or traveling over any part of the subgrade or base shall be 5 miles per hour.
- F. The Contractor shall utilize methods of handling, hauling, and placing which will minimize segregation and contamination. If segregation occurs, the Engineer may require that changes be made in the Contractor's methods to minimize segregation, and may also require mixing on the road which may be necessary to correct any segregated material. No additional compensation will be allowed for the work of road mixing as may be required under this provision. Aggregate which is contaminated with foreign materials to the extent the base course will not adequately serve its intended use shall be removed and replaced by the Contractor at no additional cost to the Owner. The above requirements will be applicable regardless of the type of aggregate placed and regardless of prior acceptance.

3.02 QUALITY CONTROL

- A. Tolerances:
 - 1. After final shaping and compacting the base, the Engineer will check the surface of the base for conformance to grade and typical section and will determine the base thickness.

2. The thickness of the base shall be within a tolerance of $\pm 1/2$ " of the base thickness required by the plans.
- B. Maintenance: Where the base material is placed in a trench section, the Contractor shall provide adequate drainage through the shoulders to protect the subgrade and base until such time as shoulders are completed. The Contractor shall maintain the surface of the base by watering, machining, and rolling or dragging when necessary to prevent damage to the base by weather or traffic.

END OF SECTION

SECTION 02241 SUBGRADE

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the preparation, shaping, and compaction of that portion of the roadbed upon which base or pavement, including base and paving for shoulders, is to be placed.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION

3.01 CONSTRUCTION

- A. The subgrade shall be shaped to the lines, grades, and typical sections shown on the plans. All unsuitable material, boulders, and all vegetative matter shall be removed and replaced with suitable material. Suitable material, when not available from the subgrade work, shall be taken from roadway excavation or borrow pits.
- B. Material excavated in preparing the subgrade shall be stored or stockpiled in such a manner as to not interfere with proper drainage or any of the subsequent operations of placing base or pavement.
- C. The subgrade shall be compacted at a moisture content which is approximately that required to produce the maximum density. The Contractor shall dry or add moisture to the subgrade when required to provide a uniformly compacted and acceptable subgrade.

3.02 QUALITY CONTROL

- A. A tolerance of plus or minus 1/2" from the established grade will be permitted after the subgrade has been graded to a uniform surface.
- B. Ditches and drains shall be provided and maintained when required to satisfactorily drain the subgrade. Where previously approved subgrade is damaged by natural causes, by hauling equipment, or by other traffic, the Contractor shall restore the subgrade to the required lines, grades, and typical sections and to the required density at no cost to the Owner.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENT CONTROL

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Erosion and sedimentation control shall be provided by the Contractor for all areas of the site denuded or otherwise disturbed during construction. The Contractor shall be responsible for all installation, materials, labor, and maintenance of erosion and sediment control devices, as well as removal of temporary erosion and sediment control devices shown on the plans or required to protect all downstream properties, natural waterways, streams, lakes, ponds, catch basins, drainage ditches, roads, gutters, natural buffer zones, and manmade structures.
- B. Erosion and sediment control procedures and facilities shall conform to the "Erosion and Sediment Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission, "Standard Specifications for Roads and Structures" latest edition, Sections 107 and 225, as published by the North Carolina Department of Transportation and to all applicable local codes or ordinances, whichever is more stringent. The work covered by this section consists of the construction of plain rip rap in accordance with the requirements of the plans and these specifications and at the locations designated by the Engineer.

PART 2: PRODUCTS

2.01 GENERAL

- A. Washed stone to be used in temporary sediment basins shall be of strong, durable nature, resistant to weathering and shall be graded to conform to Standard Size Number 57 per Section 1000 of the "Standard Specifications for Road and Structures" latest edition, as published by the North Carolina Department of Transportation.
- B. Plain Rip Rap: Plain rip rap shall consist of quarry run stone, or field stone or granite stone, etc., and shall be classified by size into Class 1, or Class 2. The class and thickness to be used will be called for on the plans.
- C. Refer to other sections within these specifications for other material specifications required in the installation of erosion and sediment control facilities.

PART 3: EXECUTION

3.01 GENERAL

- A. The Contractor is responsible for preventing erosion from the site and sedimentation of material off site, regardless of the issuance of an erosion and sedimentation control plan or the depiction of erosion and sedimentation control measures on the contract drawings.

- B. If provided, the Contractor shall follow the erosion control construction sequence schedule shown on the contract drawings, except that should circumstances dictate that extra precaution be taken to prohibit erosion and sedimentation on the project, the Contractor will, at his own expense, take preventative measures as needed.
- C. The Contractor is required to maintain all erosion and sediment control facilities to ensure proper performance throughout the construction phase and until such time all disturbed areas are permanently stabilized.
- D. Upon completion of construction or successful permanent stabilization of all areas which were disturbed before or during construction operations or as indicated on the construction drawings, whichever occurs last, the Contractor shall remove all temporary erosion and sediment control devices and facilities from the project site. The Contractor shall retain these items for future use or properly dispose of these items offsite.
- E. The Contractor shall provide temporary or permanent ground cover as called for on the construction plans within thirty (30) working days after disturbance of any areas on the site. Unless otherwise indicated or directed by the Engineer, the stone shall be placed upon a slope which shall be no steeper than the angle of repose. The stone shall be graded so that the smaller stones are uniformly distributed throughout the mass. The area and thickness shall be as shown on the plans or as designated by the Engineer.

END OF SECTION

SECTION 02271

RIP RAP

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the construction of plain rip rap in accordance with the requirements of the plans and these specifications and at the locations designated by the Engineer.

PART 2: PRODUCTS

2.01 DEFINITIONS

- A. Plain Rip Rap: Plain rip rap shall consist of quarry run stone, or field stone or granite stone, etc., and shall be classified by size into Class 1, or Class 2. The class and thickness to be used will be called for on the plans.
- B. Class 1 Rip Rap: Stone shall vary in weight from 5 to 200 pounds. At least 30% of the total weight of the rip rap shall be in individual pieces weighing a minimum of 60 pounds each. Not more than 10% of the total weight of the rip rap may be in individual pieces weighing less than 15 pounds each.
- C. Class 2 Rip Rap: Stone shall vary in weight from 25 to 250 pounds. At least 60% of the total weight shall be in individual pieces weighing a minimum of 100 pounds each and not more than 100 pounds each and not more than 5% of the total weight may be individual pieces weighing less than 50 pounds each. All equipment and materials of construction described in this specification shall meet the more stringent requirements of the applicable codes listed below.

PART 3: EXECUTION

3.01 PLACEMENT OF RIP RAP

- A. Unless otherwise indicated or directed by the Engineer, the stone shall be placed upon a slope which shall be no steeper than the angle of repose. The stone shall be graded so that the smaller stones are uniformly distributed throughout the mass. The area and thickness shall be as shown on the plans or as designated by the Engineer.

The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary, provided that when the rip rap is completed it forms a properly graded, dense, neat layer of stone.

END OF SECTION

SECTION 02272

STONE FOR EROSION CONTROL

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of the furnishing, stockpiling if directed, placing and maintaining an approved stone liner placed in or at ditches, swales, pipe inlets, pipe outlets, and at other locations designated on the plans or directed by the Engineer. The Contractor shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Stone for erosion control shall conform to Sections 851, 895 and 1042 of the "Standard Specifications for Roads and Structures" dated January 1, 2002, published by the North Carolina Department of Transportation.
- B. Stone for erosion control shall be resistant to the action of air and water, be of a hard, durable nature and shall range in size as follows:

Class	Size
A	2" to 6"
B	5" to 15"

All stone shall meet the approval of the Engineer. While no specific gradation is required, the various sizes of stone shall be equally distributed within the required size range. The size of an individual stone particle will be determined by measuring along its long dimension.

PART 3: EXECUTION

3.01 GENERAL

- A. Unless otherwise directed by the Engineer. The stone shall be placed on slopes less than the angle of repose of the material and to the line, grade and slope as indicated on the plans. The stone shall be placed so that the smaller stones are uniformly distributed throughout the mass. All stone shall be placed in a neat, uniform layer with an even surface meeting the approval of the Engineer.
- B. At locations where stone is required for channel changes and drainage ditches, the stone shall be placed prior to diverting the water into the channel changes and drainage ditches.
- C. At locations where stone is required at the outlet of pipe culverts, the stone shall be placed immediately after completion of the pipe culvert installation.

END OF SECTION

SECTION 02277 TEMPORARY SILT FENCE

PART 1: GENERAL

1.01 DESCRIPTION OF WORK

- A. This work covered by this Section of the furnishing, installing, maintaining, replacing as needed, and removing of temporary silt fence. The Contractor shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

1.02 RELATED WORK

- A. All applicable local state design manuals, codes and/or ordinances for Erosion and Sedimentation Control. Where local design manuals, codes and ordinances are more stringent than the State Department of Transportation, these codes and/or ordinances will control the erosion and sedimentation control procedures to be followed.
- B. The temporary silt fence shall conform to "Standards Specifications for Roads and Structures" latest edition, published by the North Carolina Department of Transportation and section 6.62 of the "Erosion and Sedimentation Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission.

PART 2: PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Temporary silt fence shall be a water permeable filter type fence for the purposes of removing suspended particles from the water passing through it.

2.02 POSTS

- A. Only steel posts may be used. Steel posts shall be at least 5 feet in length, approximately 1 3/8 inches wide measured parallel to the fence, and have a minimum weight of 1.25 lb/ft of length. The post shall be equipped with an anchor plate having a minimum area of 14.0 square inches, and shall have a means of retaining wire and fabric in the desired position without displacement.

2.03 WOVEN WIRE FENCE

- A. Wire fence fabric shall be at least 32 inches high, and shall have at least 6 horizontal wires. Vertical wires shall be spaced 12 inches apart. The top and bottom wires shall be at least 10 gage. All other wires shall be at least 12 1/2 gage.

2.04 SILT FENCE FILTER FABRIC

- A. The filter fabric shall meet the requirements of Type 3 Engineering Fabric, Class A or B, per section 1056 of the "Standard Specifications of Roads and Structures" dated January 1, 1990 published by the North Carolina Department of Transportation.
- B. Silt fence which incorporates filter fabric meeting the requirements of these State Specifications but which fail to perform in an acceptable manner shall be replaced with silt fences which are capable of acceptable performance. All silt fences shall meet the local governmental requirements as well as the State's requirements.

2.05 WIRE STAPLES

- A. Wire staples shall be a No. 9 staple and shall be at least 1 ½ inches long.

PART 3: EXECUTION

3.01 GENERAL REQUIREMENTS

- A. The Contract shall install temporary silt fence as shown on the plans. The silt fence shall be constructed at the locations shown on the plans and at all other locations necessary to prevent sediment transport, as directed by the Engineer.
- B. Class A synthetic filter fabric may be used only in conjunction with woven wire fence fabric backing. Filter fabric shall be attached to the wire fence fabric by wire or other acceptable means.
- C. Class B synthetic filter fabric may be used without the woven wire fence fabric backing, subject to the following conditions:
 - 1. Post spacing is reduced to a maximum of 6 feet.
 - 2. The proposed has been approved by the Engineer as being suitable for use without the woven wire fence fabric backing.
- D. Fence posts shall be inclined toward the runoff source at an angle of not more than 20° from vertical.
- E. Posts shall be installed so that no more than 3 feet of the post shall protrude above the ground. Where possible, the filter fabric from a continuous roll cut to the length of the barrier shall be used to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with overlap to the next post. At the time of installation, the fabric will be rejected if it has defects, rips, holes, flows, deterioration, or damage incurred during manufacture, transportation, or storage.

3.02 Maintenance and Removal

- A. The Contractor shall inspect temporary silt fences at least once a week and after each rainfall and shall make any required repairs and remove and dispose of silt

accumulation immediately. Should the fabric of the silt fence collapse, tear, decompose, or become ineffective, the Contractor shall replace it promptly at his own expense. The Contractor shall remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence.

- B. The Contractor shall remove all temporary silt fence and associated appurtenances once all disturbed areas upland of the fence are properly and satisfactorily stabilized as called for on the plans.

END OF SECTION

SECTION 02510 BITUMINOUS PAVING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section shall consist of the construction, production, delivery and placement of bituminous plant mix base and surface courses properly laid on a prepared aggregate base course, in accordance with these specifications and in conformity with the lines, grades, thickness, and typical sections shown on the plans.

1.02 SUBMITTALS

- A. The Contractor shall furnish copies of certified weight tickets for all asphalt placed on the project. The original of all tickets, including any voided tickets or tickets for rejecting mixture, shall become the property of the Engineer.

1.03 QUALITY ASSURANCE

- A. Quality control and quality assurance are provided for through use of the Quality Management System, as discussed in Section 1 of the latest edition Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
- B. All hot mix asphalt must be provided by a Certified Asphalt Plant, as covered in Section 5.3 of the latest edition Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
- C. Asphalt plant equipment and operations shall meet the Specifications set forth in Section 5 and 6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
- D. Delivery and Acceptance of Asphalt Materials must conform to Section 2.40.10 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
- E. The Engineer reserves the right to sample and test any shipment and to reject any material not meeting the requirements of the specifications.

1.04 DELIVERY AND STORAGE

- A. Transportation of Bituminous Mixture: Asphalt Mixtures shall be hauled in accordance with Section 6.9 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

PART 2: PRODUCTS

2.01 MATERIALS

- A. No recycled asphalt pavements are to be used.
- B. Composition of Mixtures
 - 1. In accordance with Section 4.6 of the latest edition of the Asphalt Mixtures shall be hauled in accordance with Section 6.9 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
 - 2. The job mix formula for each mixture will establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to the aggregate, and a single temperature at which the mixture is to be discharged from the plant and shall be within the design limits specified for the particular type of bituminous mixture.
 - 3. The job mix formula for each mixture shall be in effect until modified in writing by the Engineer.
 - 4. All mixtures furnished for the work shall conform to the job mix formula within the tolerance ranges specified for the particular mix involved as specified herein.
 - 5. Should a change in sources of aggregate materials be made, a new job mix formula will be required before the new mixture is produced.
 - 6. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job mix formula.
 - 7. Bituminous Base Course, Type B 25.0B
 - a. The bituminous base course mixture shall conform to Table 2 in Section 4.6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
 - 8. Bituminous Binder Course, Type 119.0B:
 - a. The bituminous binder course mixture shall conform to Table 2 in Section 4.6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
 - 9. Bituminous Surface Course (SF 9.5A and S 9.5B):
 - a. The bituminous surface course mixture shall conform to Table 2 in Section 4.6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
 - 10. Tack Coat
 - a. Tack Coat shall conform to Section 9.31 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction System. All equipment and materials of construction described in this specification

shall meet the more stringent requirements of the applicable codes listed below:

PART 3: EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Base Course, Type B 25.0B); Binder Course (I 19.0B); Surface Courses (SF 9.5A and S 9.5B):

1. General:

- a. All hot mix placement and compaction operations shall conform to Section 9.4 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

2. Spreading and Finishing:

- a. Spreading and finishing of asphalt pavements shall be done in accordance with Section 9.5 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

3. Compaction:

- a. Compaction of asphalt pavements shall be done in accordance with Section 9.7 of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

4. Joints:

- a. Transverse Joints: Transverse joints are to be constructed in accordance with Section 9.9 of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
- b. Longitudinal Joints: Longitudinal are to be constructed in accordance with Section 9.10 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

5. Weather, and Seasonal Limitations: Placement of asphalt is limited in accordance with Section 9.4.3 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

B. Tack Coat: Tack coat shall be applied in accordance with Section 9.3 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

3.02 QUALITY CONTROL AND TESTING

- A. Samples: Sampling and testing shall be in accordance with Section 7 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
- B. Surface Requirements:
1. Mat cross-slope and thickness shall be tested according to Section 10.1.8 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.
 2. Surface texture shall conform to Section 10.1.9 of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section. Smoothness shall conform to Section 10.2. Areas found to reveal non-conformance corrected by the Contractor by removal of the defective work and replacement with new material unless other corrective measures are permitted by the Engineer. The work and materials required in the correction of defective work shall be provided by the Contractor at no cost.
 3. The Contractor shall repaint and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.
 4. All existing manhole and valve covers shall be raised by the Contractor as necessary prior to paving so that the tops of the covers are flush with the final surface. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

END OF SECTION

SECTION 02580 PAVEMENT MARKINGS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Paint: The work under this section shall consist of furnishing all labor, equipment, materials and services for the proper placement and installation of all pavement markings in accordance with the requirements shown on the plans and the provisions of these specifications.
- B. Thermoplastic Paving Marking: This specification covers a retro-reflective pavement striping material of the type that is applied to a road surface in a molten state with premixed glass beads by spray or extrusion means, with a supplemental surface application of glass spheres. When applied properly and at the designated thickness and width the stripe shall, upon cooling, be retro-reflective and be able to resist deformation by traffic. The applied material shall be impervious to degradation by motor oil, diesel fuel, grease deposits and ice-preventative chemicals.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall deliver paint to site in sealed and labeled containers. Upon Engineer's request, the Contractor shall make containers available for inspection to verify acceptance of product. Paint shall be stored at a minimum ambient temperature of 45° F and a maximum of 90° F, in well ventilated areas, unless required otherwise by manufacturer's instructions.

1.03 RELATED DOCUMENTS

- A. All pavement markings shall be in accordance with the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration and the North Carolina Supplement to the MUTCD.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Standards: The following are minimum requirements and shall govern except all local, state and/or federal highway or transportation department standard specifications shall govern when their requirements are in excess thereof.
- B. Paint: Paint shall be chlorinated rubber-alkyd type meeting the requirements of AASHTO M 248 (FS TT-P-115), Type III factory mixed, quick drying and non-bleeding.
- C. Thermoplastic Materials: The thermoplastic pavement marking materials used in this contract shall meet the following specifications. This specification covers retro-reflective oil and grease impervious thermoplastic road marking materials which are (1) hot extrusion applied with a surface application of glass spheres and (2) heat fused applied. The properly applied markings shall be retro-reflective and able to durably resist degradation and deformation by traffic.

The thermoplastic materials shall be homogenously composed of pigment, filter, resins, and glass retro-reflective spheres and shall be available in both yellow and white.

1. Composition: The pigment, beads and filler shall be uniformly dispersed in the resin. The materials shall be free from all skins, dirt, and foreign objects and shall comply with requirements according to Table 1. Only new materials shall be acceptable for use on this project.

Table 1. Composition

Component	White	Yellow
Binder (See Note A)	18% min.	18% min.
Glass Beads (AASHTO M247 Type D)	30% to 40%	30% to 40%
Titanium Dioxide	10% min.	N/A
Yellow Pigments (See Note B)	N/A	2% min.
Calcium Carbonate	42% max	50% max

Note A: The alkyd binder shall consist of a mixture of synthetic resins (at least one of which is solid at room temperature) and a high boiling point plasticizer. At least one third of binder composition shall be solid malefic modified glycerol ester resin and shall be no less than 8% by weight of the entire material formulation. The alkyd binder shall not contain petroleum-based hydrocarbon resins.

Note B: The percentage of yellow pigment can be reduced if lead pigments are eliminated from the formulation.

2. Temperature: The molten material temperature shall be between 400° and 440° F unless otherwise recommended by the manufacturer and approved by the Engineer.
3. Primer: A primer shall be used if thermoplastic is applied to Portland cement concrete. Any primer used shall be compatible with the thermoplastic material.
4. Thickness: The pavement markings shall yield a solid thickness range of 80 to 95 mils above the roadway surface across the middle two-thirds of the line width when tested as specified in MSMT 729.
5. Glass Beads: Glass beads shall be uniformly applied to the surface of the molten thermoplastic at the minimum rate of 7 to 9 lb./100 ft² as specified in MSMT 729.
6. Color: The color of the dry markings shall match Federal Standard 595 (13538-yellow or 17886-white). The Contractor shall supply the specified color chips for the Engineer's use to visually determine that the thermoplastic material matches the specified color.

7. Retroreflectance: The millicandle/lux/square meter values taken anytime within the first 30 days shall conform to the following:

Table 2. Retroreflectance

Color	Retroreflectivity	Corrective Action
White	Equal to or greater than 250	None
Yellow	Equal to or greater than 150	None
White	Less than 250	Necessary corrective actions including grinding if necessary and re-tracing
Yellow	Less than 150	

The "Drop-on" glass beads shall conform to AASHTO specifications M-247-81. The glass beads shall have the following gradation:

Table 3. Gradation

US Sieve Number	Percent Passing
20	100
30	75 – 95
50	15 – 35
80	0 – 5
100	0

The "Drop-On"* glass beads shall be smooth, clear and free from air inclusions. The beads shall have a minimum refractive index of 1.50 and shall be a minimum of 80% true spheres overall and minimum 70% true spheres on each sieve. The beads shall be moisture proof coated and shall meet the requirements of AASHTO M-247-81 Section 4.4.2 to insure optimum embedment of 60-65 percent (60-65%) in various thermoplastic traffic marking systems. The material shall set to bear traffic in not more than 2 minutes when the air temperature is 50° F and not more than 10 minutes when the air temperature is 90° F.

8. Bond Strength: After heating the thermoplastic material for four hours at 425° F the bond strength to Portland Cement Concrete shall exceed 180 psi (1.24 MPa Method ASTM D4796-88).
9. Cracking Resistance: For at least 90 days after application the materials shall show no cracks other than with substrate cracking
10. Smear and Softening Resistance: During the life of the materials, the applied markings shall not smear or soften apart from substrate movement.

D. Traffic and Line Markings:

1. Unless otherwise noted, paint for traffic and line markings shall be white in color.
2. Dimensions and spacing of markings shall be in accordance with MUTCD and as indicated in the pavement markings detail included in the contract drawings.

PART 3: EXECUTION

3.01 SURFACE PREPARATION

- A. Contractor must insure that pavement surface to be painted shall be clean and dry before application. All surface contamination such as oil, grease, dirt, foreign matter, or other deleterious materials will be removed by the Contractor prior to application of paint.

3.02 INSTALLATION

A. Paint

1. No paint shall be applied when the atmospheric, surface, or material temperature is less than 40° F or when the relative humidity is greater than 85%.
2. No paint shall be applied until the layout and placement has been verified by the Engineer.
3. Paint shall be applied with mechanical equipment to produce uniform straight edges in strict compliance with the manufacturer's instructions. Paint shall be applied in two (2) coats at the manufacturer's recommended rates.

B. Thermoplastic Paving Markings

1. The molten applied thermoplastic material shall readily screed/extrude at temperatures between 400 degrees F and 440 degrees F from the approved equipment to produce a line which shall be continuous and uniform in shape having sharp dimensions. The application of additional glass beads by drop-on methods shall be at a minimum rate of 8 lbs. per 100 sq ft of marking. Ambient and surface temperatures shall be at least 50 degrees F and rising at the time of application.
2. Method of Application: The Contractor shall furnish and install machine-applied extruded and/or sprayed hot thermoplastic with glass spheres (premixed and drop-on) in the proper ratio to immediately produce a highly reflective marking as described elsewhere in these specifications, in accordance with the details in this contract and the following provisions.
3. Primer Sealer: It shall be the responsibility of the contractor to recommend to the Engineer and obtain the Engineer's concurrence as to whether primer-sealer is required on a given pavement in order to meet the material manufacturer's warranty conditions. Generally, on all Portland Cement concrete pavement surfaces and aged asphalt-concrete pavements having less than eighty percent (80%) bituminous concrete, primer-sealer shall be applied to the area where the thermoplastic pavement markings are to be

placed. Also, the Owner reserves the right to direct the Contractor to apply primer/sealer for any given markings. The primer/sealer shall be that recommended by the manufacturer of the thermoplastic material, and approved by the Engineer. The material shall form a continuous film which shall dry rapidly and adhere to the pavement. The material shall not discolor nor cause any noticeable change in the appearance of the pavement outside of the finished pavement markings. All solvents shall have evaporated from the primer/sealer prior to the application of the molten thermoplastic materials. A sample of the primer/sealer and the recommended method of application must be submitted to the Engineer, and shall have been approved by the Engineer and the manufacturer of the material before application. The Engineer has the authority to require the Contractor to apply the primer/sealer using a separate vehicle which may require additional traffic control. Payment for application of primer/sealer and any additional traffic control will be incidental to the marking item.

4. Removal of Existing Plastic or Pavement Markings: When called for in the contract or otherwise directed by the Engineer, removal of existing painted or plastic pavement markings shall be accomplished by the Contractor using equipment and methods specifically approved by the Engineer. Marking removal shall not be by the "painting out" with black paint method nor shall it result in excessive scarring of the pavement. No more than 1/8 inch depth of scarred pavement will be allowed. At least 90 percent of all markings shall be removed.

As directed by the Engineer, the Contractor shall be responsible for sweeping or otherwise adequately cleaning up debris after completion of markings required to be removed by the Engineer because they are improperly located or otherwise incorrect or improper. Unless permitted otherwise by the Engineer, where old markings are removed, the new markings must be applied the same day as the old markings are removed. Whenever grinding, scraping, sandblasting, or other operations are performed, the work shall be conducted in such manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect motorists. When these operations are completed, the pavement markings shall be cleaned to remove residue and debris resulting from the cleaning work.

Where cleaning and/or removal of pavement paint striping or objectionable material is being performed within ten (10) feet of a lane occupied by traffic, the residue removal shall be by method(s) approved by the Engineer.

Any damage to the pavement or pavement joint materials caused by pavement marking removal shall be repaired by the Contractor at no cost to the Owner by methods acceptable to the Engineer.

5. Pre-marking of Lines: When a line is required to be placed in the same location as an existing painted line, and existing painted markings not required to be removed are visible, they shall be retraced (i.e., new markings installed in exactly the same locations, patterns, and dimensions as the old markings). However, if the existing markings are to be removed or are not

visible, or if new roadway surface has been placed before markings installation occurs, or if the contract requires a line to be installed where none currently exists, the Contractor will be required to pre-mark as directed by the Engineer and subsequently shall install the required markings in accordance with the requirement of other sections of the specifications. The actual placement of the pavement markings at any such site shall not be performed until the pre-marking has been inspected and approved by the Engineer. Pre-marking is incidental to the pavement marking installation work and there will be no separate payment for pre-marking.

6. Traffic Maintenance: All work shall be performed in accordance with Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) and section 104 of the MSHA Standard Specifications for Construction and Materials. The Contractor shall furnish and place all warning devices, flag persons, and other traffic control devices required to direct, control and protect the traveling public while marking operations are in progress. Maintenance of traffic for this work will be paid under the Maintenance of Traffic item if an item is included in the bid proposal, otherwise it will be considered incidental to the work.

3.03 WARRANTIES

A. Thermoplastic Paving Markings

1. The Thermoplastic pavement marking materials and glass beads furnished under this contract shall assume the manufacturer's warranty for these materials and shall be guaranteed by the supplier against failure due to traffic oil degradation.
2. The contractor shall assume all costs arising from the use of patented materials, equipment, devices or processes used on or incorporated in the work, and agrees to indemnify and hold harmless the Commission and its duly authorized representatives from all suits at law or action of every nature for, or on account of, the use of any patented materials equipment, devices or processes. Further, the material shall meet the requirements of this specification for a period of one year.

END OF SECTION

SECTION 02640 WATER VALVES AND APPURTENANCES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This specification covers the requirements for furnishing and installing valves and other appurtenances for the various water system improvements shown on the Drawings.
- B. Furnish all labor, equipment, materials and incidentals necessary to install and complete water valve and appurtenance installation in accordance with the plans and specifications. All valves and appurtenance material shall be of the type and class specified herein.
- C. All water valve and appurtenance excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

1.02 SUBMITTALS

- A. The Contractor shall provide six (6) copies of shop drawings or submittals for the following:
 - 1. All valves, valve boxes, hydrants, air relief valves, tapping sleeves, meters, manholes, or any other items required for completion of the project.

1.03 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall unload valves and appurtenances so as to avoid deformation or other injury thereto. The Contractor shall store valves and appurtenances above storm drainage levels. All valves shall be drained and so stored as to protect them from freezing.
- B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

1.04 WARRANTY

- A. All materials shall be guaranteed to be free from defects in materials and workmanship for a period of one (1) year after final acceptance by the Owner.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Gate Valves: All gate valves shall be designed for a minimum working pressure of 200 psi unless otherwise specified. Valves shall have a clear waterway equal to the full nominal diameter of the pipe. Valves shall be opened by turning counterclockwise. Each valve shall have the initials or name of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel for above

ground installations or 2" square operating nut for below ground installations. Valves shall have an arrow cast in the metal indicating the direction of opening.

Valves to be installed underground (Buried) shall be of the non-rising stem type and shall have mechanical joint connections.

Valves installed above ground or in structures shall have rising stems with outside stem and yoke and 18" diameter minimum hand wheel and shall have flanged ends with 125# flanges unless others noted.

1. Gate Valves 2" and Smaller:

- a. Gate valves 2" and smaller shall be all brass, single disc type, double seat tapered wedge type built to manufacturer's standards with material and construction conforming to AWWA C-500.
- b. Each valve shall have a 2" operating nut. Valves shall have screwed ends conforming to NPT standards.

2. Resilient Seated Wedge Valve:

- a. Gate valves 3" through 24" diameter size shall be of cast iron or ductile iron body, resilient seated wedge type meeting the requirements set forth in AWWA C-509 and AWWA C-500. All valves shall be from one manufacturer and parts interchangeable.
- b. Gate valves shall have body, bonnet and gate manufactured of cast iron or ductile iron conforming to ASTM A-536. The shell thickness of all components shall conform to the thicknesses in Table 2, Section 4.4 of AWWA C-509 and C-500. The valve body and bonnet shall be coated on both the interior and exterior surfaces with a fusion bonded epoxy paint conforming to AWWA C-550.
- c. The gate shall be fully covered with a rubber cover over all exterior and interior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part which houses the stem nut. The gate and rubber coat shall conform to ASTM D429.
- d. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open and under pressure.
- e. Valves larger than 12" diameter shall be designed for horizontal installation with beveled gear boxes with reduction gears to reduce the number of turns required to operate valve.

3. Double Disc Type Gate Valves:

- a. Gate valves larger than 24" diameter size shall be of the ductile iron body, double disc parallel seat type meeting the requirements set forth in AWWA C-500. All valves shall be from one manufacturer and parts interchangeable. Valves shall have a working pressure of 150 psi.
- b. Gate valves shall have body, bonnet and gate manufactured of ductile iron conforming to ASTM A-536. The shell thickness of all components shall

conform to the thicknesses in C-500. The valve body and bonnet shall be coated on both the interior and exterior surfaces.

- c. The gates shall be high strength cast iron, sturdily proportioned without pockets on the backs. All cam surfaces shall open to the bottom. Gate rings shall be rolled into a dovetail groove under pressure to make a single insert able finish.
- d. Valves shall use bottom wedging type design with a two-part floating wedge contact. The wedge and hook shall be separate castings and not a single piece.
- e. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open and under pressure.,
- f. Valves shall be designed for horizontal installation with beveled gear boxes with reduction gears to reduce the number of turns required to operate valve. Valves shall have bronze rollers, tracks, and scrapers.
- g. All valves shall be supplied with a bypass as a part of the valve. Bypass shall be a minimum of 3" diameter with a 3" resilient seated wedge valve.

B. Valve Boxes: All valve boxes shall be cast iron and shall conform to ASTM A48. Valve boxes shall be of the adjustable screw type with a base to fit the valve yoke with a removable cover with the word "water" cast thereon.

C. Fire Hydrants:

- 1. Fire hydrants shall comply with all of the applicable requirements of the AWWA C-502, latest revision, for dry-barrel fire hydrants and with these specifications. Hydrants shall be of the traffic model type incorporating a break-away flange arrangement which will permit the upper section of the hydrant barrel to separate from the lower section upon impact. Each hydrant shall include an automatic system designed to lubricate the entire length of the threaded part of the valve stem each time the hydrant is operated. It shall be further equipped with "O"-ring seals to ensure that threads on the valve stem do not come into contact with water at any time.
- 2. Hydrants shall open counterclockwise with 4-1/2" compression base valve opening against pressure and be capable of withstanding 250 psi working pressures and 500 psi hydrostatic test pressures, unless otherwise specified. The pentagonal operating nut shall be 1-1/2" from the point to the flat. Hydrants shall be equipped with one (1) 4-1/2" pumper nozzle and two (2) 2-1/2" hose nozzles, all with National Standard Threads per Appendix a of AWWA C-502, and chained nozzle caps. Nozzles shall be reverse threaded into the fire hydrant barrel.
- 3. Unless otherwise indicated on the plans, all hydrants shall have 6" mechanical joint bottom connections, 4-1/2" valve openings and a bury to the bottom of the ditch plus the main line diameter. All hydrants shall be painted the manufacturer's standard red unless otherwise specified. Following

installation and testing all hydrants shall be painted with two (2) 6-mil coats of epoxy paint.

4. All fire hydrants shall be Mueller Super Centurion unless otherwise noted.
 5. All iron parts within fire hydrants shall be ductile iron.
 6. The bury length (distance from ground line to insert of the hydrant inlet) shall be 4'-0" unless ground conditions shown on plans warrant a deeper bury.
 7. The hydrant main valve shall be 4-1/2" minimum and shall be of the full compression design, opening against and closing with pressure. The valve seat ring shall thread into a bronze sub-seat, and all gaskets sealing the seat ring shall be a bronze-to-bronze surface.
 8. Drain valves shall be all bronze and allow complete draining of all residual water in the hydrant barrel.
 9. All bolting and fasteners below ground shall be stainless steel.
 10. The operating machine shall utilize two (2) "O"-ring seals between the revolving nut and bronze-sheathed upper section of the valve rod. The top of the rod shall also be fitted with a travel stop nut to limit downward travel of the rod. All-weather grease shall be used to provide permanent lubrication. A thermoplastic thrust washer shall be used to reduce friction in the thrust collar while opening the hydrant.
 11. The hydrant inlet shall be mechanical joint. Joint restraint, if specified, shall be accomplished for mechanical joint by use of mechanical joint gripper glands.
- D. Air Release Valve: Air release valves shall be rated for a working pressure of 150 psi and hydrostatic test pressure of 300 psi and shall automatically function to release to atmosphere small amounts of air that accumulate in the pipeline. Once the air has been exhausted, the valve shall seat tightly to prevent water leakage. Air release valves shall be Crispin or an approved equal, manufactured in accordance with AWWA C512.
- E. Manhole Sections and Appurtenances:
1. Precast concrete manhole bases, risers and cones shall conform to ASTM C478, latest revision, for precast reinforced concrete manhole sections. Tapered sections and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified. Cast iron manhole covers and assemblies shall be cast into slab tops for access into manholes.
 2. Minimum compressive strength of concrete shall be 4000 psi and the maximum permissible absorption shall be 6.5%. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square

inches for larger sizes. Precast manhole sections shall fit together readily and shall have a self-contained "O"-ring rubber gasket conforming to ASTM C443.

3. The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Engineer and his inspector. The manhole sections shall be perpendicular to their longitudinal axis, within the limits listed in ASTM C478.
4. Castings for manhole frames and covers shall be tough, even grained soft gray iron, free from burnt on sand and other injurious defects and conform to the requirements of ASTM A48, latest revision, Class 30, with "WATER" cast into the cover.
5. Brick for manholes and other structures shall conform to applicable requirements of ASTM C62, latest revision, Grade SW.

F. Tapping Sleeve and Valve:

1. Tapping sleeves shall be of two-piece split ductile iron construction, jointed by bolts manufactured of high strength cast iron and incorporating a longitudinal compound rubber gasket. The sleeves shall include split end gaskets and two-piece mechanical joint glands suitable for the class of pipe around which sleeves are to be placed. Glands will be joined by steel bolts and fastened to the bell openings of the sleeves to form totally enclosed rubber watertight seals around the periphery of the pipe and along the longitudinal joints.
2. The sleeves shall have flanged outlets which will accommodate the tapping valves. Valves will be identical to resilient wedge gate valves elsewhere specified with inlet and outlet ends adaptable to the tapping machine and to provide mechanical joint connections to discharge pipes.

G. Hydraulic Check Valve:

1. The hydraulic check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless-steel trim and a non-corrosive stem.
2. It shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating and must be shockless in operation. The seat ring must be renewable and shall be securely held in place.
3. The valve shall be a GA Industries, Inc., Fig. No. 2730-D or approved equal.

H. Altitude Control Valve:

1. The altitude control valve shall be hydraulically operated, pilot actuated diaphragm type globe or angle valve designed for ground level control of water in an elevated storage tank and reservoirs. The valve operates on a differential in pressure between the height of the water in the reservoir and an adjustable spring-loaded pilot control. The valve is to be non-throttling and will remain in the full open position until the shut-off point is reached.
2. The valve shall be constructed with a cast iron body (ASTM A126) with stainless steel stem or shaft and spring, bronze seat (ring) and upper stem

bushing, nylon reinforced diaphragms, bronze valve control pilots with stainless steel and Buna-N internal parts. It shall be designed for an internal working pressure of 175 psi and maximum differential pressure across the diaphragm of basic valve and pilots is not to exceed 300 psi.

3. The installation shall be designed for either one-way flow or two-way flow as indicated on the Contract drawings.
 - a. One-way flow: The valve will be used where pressure on the inlet side of the valve is greater than the pressure created by the maximum reservoir or tank head. The valve's sole Function is to fill an elevated tank or reservoir to a desired level.
 - b. Two-way flow: The valve will be used when pressure on the inlet side is variable. When inlet pressure falls below reservoir pressure the valve opens, allowing reverse flow from the reservoir and thus maintaining fluid pressure within the water distribution system.
 - c. The altitude control valve(s) shall be of the size and type indicated on the Contract drawings and as manufactured by GA Industries or approved equal.

PART 3: EXECUTION

3.01 INSTALLATION

A. Excavation:

1. The work covered by this section consists of the excavation and satisfactory disposal of all materials excavated in the construction of trenches.
2. Trenches will be defined as all excavation for the installation of storm sewers, sanitary sewers, water pipe, manholes, catch basins, hydrants, watergates, sewer services, water taps, drainage structures, drainage ditches and other unclassified excavation as may be deemed necessary by the Engineer.
3. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipelines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.
4. All excavation shall be by open cut unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with suitable bedding material thoroughly compacted in place. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The

excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary.

5. Sheeting, Bracing Trenches, and Trench Boxes: If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench, to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides of the pipe. Also, the Contractor may be required for the purpose of preventing injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place.
6. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom.
7. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.

B. Installing Valves and Appurtenances:

1. Thrust Blocks:

- a. All plugs, caps, tees, bends, reducers and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed. Thrust blocks shall be made of concrete having a compressive strength of 28 days of 3000 psi and shall bear directly against the undisturbed trench wall. Where possible, the backing shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a polyethylene film placed between the fittings and the poured concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

- b. Concrete for thrust blocks shall consist of a mix of Portland cement, Fine Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM C39 or C42. Sakrete or any similar material will not be permitted under any circumstances.
 2. Valves: Before setting each valve, the Contractor shall make sure the interior is clean and test opening and closing. Valves shall be set with stems plumb, unless horizontal installation is called for on the plans, and at the exact locations shown. Trench backfill shall be tamped thoroughly for a distance of 3'-0" on each side of valves boxes.
 3. Valve Boxes: A valve box shall be installed over each underground valve. All boxes shall be set plumb with their top flush with finished grade.
 4. Fire Hydrant: Fire hydrants shall be located as shown. Each hydrant shall be connected to the main with a 6" branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18" above the finished grade. Hydrants shall be thoroughly blocked with concrete or shall be rodded to the 6" branch tee. Unless otherwise specified, the backfill around hydrants shall be thoroughly compacted to the final grade immediately after installation in order to put the hydrant into service as soon as practicable. Not less than seven (7) cubic feet of clean crushed stone shall be placed around the base of the hydrant to insure drainage of the hydrant barrel. A cap block shall be set under the fire hydrant foot for a solid bottom.
 5. Air Relief Valves: Each air relief valve shall be installed at the exact location shown in a precast concrete manhole as shown in detail on the plans. Manhole sections shall be set plumb and on a firm' foundation. Each joint between sections and all wall openings shall be sealed inside and out with a 2:1 sand-cement mortar and made watertight. When so directed, the Contractor shall install a flat slab top, precast with a standard frame and cover. Flat slab tops shall be traffic bearing.
- C. Backfilling and Compaction:
1. Backfill trenches immediately after approval of the pipeline construction.
 2. Roadways and Road Crossings: Use select backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2'-0" of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and color as the adjacent roadway.
 3. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the Standard Proctor Test (100% for the top 2'-0" of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have

been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.

4. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
5. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.
6. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.
7. Cleanup: Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

3.02 QUALITY CONTROL

- A. Testing: Testing of valves and appurtenances shall be incidental to the testing of the water lines, and shall be performed as part of that testing. The Contractor shall confine all operations and personnel to the limits of construction as shown on the plans. There shall be no disturbance whatsoever of any areas outside the limits of construction nor shall the workmen be allowed to, travel at will through the surrounding private property.

END OF SECTION

SECTION 02660

WATER PIPE AND APPURTENANCES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of ductile iron and polyvinyl chloride (PVC) water lines in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein.
- B. All water pipe excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

1.02 SUBMITTALS

- A. Shop drawings or submittals shall be required for the following:
 - 1. All sizes and types of pipe on the project.
 - 2. Pipe fittings and appurtenances.

1.03 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a large size and shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe or other material is damaged during transporting, unloading, handling or storing, the undamaged portions of the pipe or material may be used or if damaged sufficiently, the Engineer will reject the material as being unfit for installation.
- B. If any defective material is discovered after delivery, it shall be removed and replaced with sound pipe.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Ductile Iron Pipe:
 - 1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout.

All materials shall be subject to the inspection of the Engineer at the plant, trench; or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
 - 2. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

3. Ductile Iron Pipe shall be manufactured in accordance with AWWA C151. All Ductile Iron Pipe shall be 350 psi class unless otherwise specified and shall be lined with a cement mortar lining not less than 1/16" thick conforming to AWWA C104. Pipe wall thickness for all Ductile Iron Pipe shall conform to "Thickness Design for Ductile Iron Pipe," AWWA C150. The standard laying condition shall be type 2. The exterior of all Ductile Iron Pipe shall have a protective coating of a coal tar or asphaltic material a minimum of 1 mil thickness conforming to AWWA C151.
 - a. Flanged Joints:
 - i. Flanged pipe shall have flanges with long hubs, shop fitted on the threaded end of the pipe.
 - ii. Where required, flanges shall be tapped for stud bolts. Flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true, and covered with coal tar pipe varnish or otherwise protected against corrosion of flange faces. Flange faces shall be cleaned to bare metal with wire brushed before installation of pipe.
 - iii. Ductile iron flanged joint pipe shall have a thickness of Class 53 minimum and shall conform to AWWA C110 and AWWA C115. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded or flanged in the field. All pipes shall have 125 lb. flanges conforming to AWWA C110 unless otherwise specified.
 - iv. Flanged joints shall be made up with through bolts of the required size. Bolts shall be zinc plated, with good and sound, well-fitting threads, so that the nuts may be turned freely by hand.
 - v. Flanged joints shall be made up using only full-face gaskets with a minimum thickness of 1/8". Ring gaskets are not acceptable. Gasket material shall be rubber or approved equal as recommended by the Manufacturer.
 - vi. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together.
 - b. Mechanical Joints:
 - i. All mechanical joint pipe shall be manufactured in accordance with AWWA C111. Pipe shall be manufactured in accordance with AWWA C151, and the pipe thickness shall be 350 psi class as determined by AWWA C150 unless otherwise noted.
 - ii. All bolts shall be tightened by means of torque wrenches in such a manner that the follower shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.

- iii. Bolts for mechanical joints shall be high grade steel, low alloy type, with tee or hex head and American Standard threads. Mechanical joint gland shall be gray iron and shall utilize a plain rubber gasket.

c. Slip Joints:

- i. Slip or "push-on" joints shall be manufactured in accordance with AWWA C111. Pipe thickness shall be 350 psi class as determined by AWWA C150.
- ii. Bells of "slip" joint pipe shall be contoured to receive a bulb shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until plain end makes full contact with the base of the bell. No joint may exceed a maximum deflection of eleven inches (11") in an 18-foot joint of pipe (3°).

4. Fittings:

- a. All ductile iron pipe fittings for pipe shall be mechanical joint type in accordance with AWWA C153 (ductile iron, compact type) for 3"-24", and AWWA C110 (ductile iron, full body type) for pipe larger than 24". Where flanged pipe is used ductile iron fittings shall be flanged in accordance with AWWA C153 or C110 where applicable for exposed piping. All flanges shall be Class 125 unless otherwise noted.
- b. All fittings shall be lined with cement mortar not less than 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.
- c. All mechanical joints shall be manufactured in accordance with AWWA C111.

B. Polyvinyl Chloride (PVC) Pipe:

- 1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
- 2. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

3. PVC pipe 4" in diameter and larger shall be manufactured in accordance with AWWA C900. All Pressure Rated PVC Pipe 3" diameter and smaller shall be manufactured in accordance with ASTM D2241 and have a standard dimension ratio (SDR) of 13.5 unless otherwise specified. All other Pressure Rated PVC Pipe shall have a minimum standard dimension ratio (DR) of 18 unless otherwise specified. The exterior of all PVC Pipe shall bear a stamp which shows the AWWA certification, SDR, size and NSF seal.
 - a. All pipes shall have slip or "push-on" joints which are manufactured in accordance with AWWA C900. Pipe shall have a bell with integral rubber gasket.
 - b. Bells of "slip" joint pipe shall be contoured to receive a bulb shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer and shall be NSF approved. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until the assembly mark on the pipe barrel is flush with the end of the bell. No joint may exceed a maximum deflection of eleven inches (11") in an 18- foot joint of pipe (3°).
4. Fittings:
 - a. Fittings for all PVC pipe shall be ductile iron pipe fittings, mechanical joint type in accordance with AWWA C110 and AWWA C111 for underground piping.
 - b. All fittings shall be lined with cement mortar not less than 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.
 - c. All mechanical joints shall be manufactured in accordance with AWWA C111. The Contractor shall provide suitable 3" plugs with stainless steel threaded nipples and sleeves for -connection of fittings for PVC pipe 2" in diameter and smaller. All equipment and materials of construction described in this specification shall meet the more stringent requirements of the applicable codes listed below:

PART 3: EXECUTION

3.01 INSTALLATION

A. Excavation:

1. Trenches will be defined as all excavation for the installation of water pipe, hydrants, valves, water services, water taps, and other unclassified excavation as may be deemed necessary by the Engineer.
2. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a

satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipelines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.

3. All excavation shall be by open cut unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with #67 washed stone. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary. Maximum trench width, unless as otherwise authorized by the Engineer, as measured at a depth of 2' above the top of the pipe shall be 30" or 10" clearance from each side of the pipe, whichever is greater.
4. If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides of the pipe. Also, the Contractor may be required for the purpose of preventing injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place. The Contractor shall provide all means necessary to comply with all Federal, State, and Local Health and Safety requirements.
5. No sheeting or bracing shall extend closer than 2' off the ground surface, or within sub grade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom.
6. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.
7. Materials which are excess to the needs of the project will be disposed of by the Contractor.

8. In order to protect existing pavement structures and to make cleanup easier the Contractor shall place a 6" layer of sand on all asphalt or concrete surfaces prior to placing excavated material.
9. Pipe Foundations:
 - a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being installed. Unless otherwise noted all pipe shall be installed using a Type 2 trench foundation as defined in AWWA C151.
 - b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustment will require the approval of the Engineer.
 - c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.
 - d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and #67 washed stone of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe.

In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.
 - e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". #67 washed stone shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
 - f. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within limits established on the plans, and backfilling with #67 washed stone as approved by the Engineer.
 - g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.

- h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on a washed stone foundation.

B. Installing Pipe and Appurtenances:

1. Laying Pipe:

- a. All piping is to be installed in strict accordance with the manufacturer's recommendations, AWWA C600, AWWA C605 and the contract material specifications. Installation manuals from various material suppliers will be furnished to the Engineer for his review and approval prior to installation of any materials. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.
- b. No pipe shall be laid except in the presence of the Engineer or his Representative, or with special permission from the Engineer.
- c. Proper tools, implements and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean and free of defects. It shall be laid on the prepared foundations, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line.
- d. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
- e. When cutting short lengths of pipe, a pipe cutter, as approved by the Engineer, will be used and care will be taken to make the cut at right angles to the center line of the pipe or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.
- f. All pipe joints shall be constructed in strict accordance with the pipe manufacturer's specifications and materials and any deviation must have prior approval of the Engineer.
- g. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer. However, at no time will a deflection greater than 3° (11") be allowed.
- h. All water lines shall have a minimum 12" vertical separation from storm sewer and shall have a minimum of 10' horizontal separation from sanitary sewer or 18" vertical separation with the water line over the sewer line. In the event these separations cannot be met, both water line and

sanitary sewer shall be constructed of ductile iron pipe as directed by the Engineer or as shown on the drawings.

2. Thrust Blocks:

- a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed by the Engineer. Thrust blocks shall be made of ready-mix concrete having a compressive strength of 28 days of 3,000 psi and shall bear directly against the undisturbed trench wall. Where possible, the concrete shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a 20-mil polyethylene film placed between the fittings and the concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.
- b. Concrete for thrust blocks shall consist of a ready mix of Portland Cement, fine and coarse aggregate, and water to produce concrete with a minimum compressive strength at 28 days of not less than 3,000 psi when tested in accordance with ASTM C39. Sakrete or any similar material will not be permitted under any circumstances.

3. Exposed Pipe:

- a. Exposed pipe to be installed inside tanks, wetwells, vaults and buildings shall be installed as shown on the Drawings and field painted as described below. All exposed ductile iron pipe shall utilize flanged joints unless otherwise noted.
- b. All exposed cast or ductile iron pipe, fittings and valves shall be field painted with two (2) coats of epoxy paint as recommended by the paint manufacturer. Color of paint shall be as selected by the Owner.

C. Backfilling and Compaction:

1. Backfill trenches immediately after approval of the pipeline construction.
2. Use backfill material carefully placed in uniform layers not exceeding 6" in thickness to a depth of 3' over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten as necessary; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2' over top of pipe to top of trench, shall be backfilled with material containing no rocks larger than 6" in the greatest dimension and shall be free of material with an

exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4" in diameter will be allowed.

3. If material excavated from the trench is unsuitable to be used as backfill, "Select Backfill" shall be transported to the site by the Contractor from outside the project limits to be used as backfill material. Material excavated in conjunction with the construction of the project is not considered "Select Backfill" for payment purposes.
4. Moisten backfill as necessary above 2' over the top of the pipe and place in 8" layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.
5. Use select backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2' of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and type as the adjacent roadway.
6. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the maximum dry density as determined by Standard Proctor Test (100% for the top 2' of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.
7. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
8. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.
9. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.
10. Cleanup:
 - a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold

water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

- b. Cleanup and seeding are part of the pipeline installation. No more than 3,000 L.F. of water line may be laid prior to completion of cleanup of the first section of pipeline laid. To facilitate this the Owner reserves the right to withhold up to 30% of the unit price bid for water line if in the opinion of the Owner and Engineer completed sections have not been properly cleaned.

3.02 QUALITY CONTROL

A. Testing:

1. After the pipeline has been satisfactorily constructed, complete with the required fire hydrants, services, and all other appurtenances, and the trench sufficiently backfilled, the newly constructed pipeline and valved sections shall be subjected to a hydrostatic pressure test. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. At no time shall more than 4,000 linear feet of main be tested. As the main is being filled with water in preparation of the tests, all air shall be expelled from the pipe.
2. The main shall be subjected to hydrostatic pressure of 150 psi or not less than 1.5 times the designed working pressure at the lowest point of the line and not less than 1.25 times the designed working pressure at the highest point in the line, whichever is greater. Test pressure shall be applied for a period of two (2) hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.
3. Air Removal: Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air valves are not located at all high points, corporation cocks shall be installed at these points to expel the air as the line is filled with water. At the conclusion of a successful pressure test, the corporation cocks shall be removed and the pipe plugged.
4. Examination: Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with reliable material, and the test shall be repeated until satisfactory results are obtained.
5. The test allowance shall be determined at 15-minute intervals by means of volumetric measurement of the water added during the test until the rate has stabilized at the constant value for three consecutive 15-minute periods.
6. Test Allowance is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified test pressure after the pipe has been filled with water and the air

expelled. No PVC or DIP piping installation will be accepted until the makeup water is less than calculated by the following formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

Where:

L = testing allowance (makeup water) in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches

P = average test pressure during the hydrostatic test, in psi

7. No leakage will be allowed under the above tests for piping under or in buildings and structures.
8. Cracked or defective pipe, joints, fittings, valves, or hydrants discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.
9. Tests of insulated and concealed piping shall be made before the piping is covered or concealed.
10. The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water, and materials, including meters and gauges shall be furnished by the Contractor at his own expense.

B. Sterilization:

1. After the pressure-leakage test is completed and before the use of water is permitted from any portion of newly constructed water line which will hold or carry potable water, it shall be flushed, cleaned, and chlorinated in the presence of and directed by the Engineer, or his Representative.
2. Pipelines may, at the option of the Contractor, be chlorinated in sections isolated by means of gate valves or other approved means.
3. Each unit of the completed water line shall be sterilized as specified below as prescribed by AWWA C651 "continuous feed" method. The unit to be sterilized shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall provide a chlorine dosage of not less than 50 parts per million and shall be introduced into the water line in an approved manner. The retention time shall be at least 24 hours and shall produce not less than 25 PPM of chlorine at the extreme end of the line at the end of the retention period. All valves on the lines being sterilized shall be opened and closed several times during the contact period.

4. Following chlorination, all treated water shall be thoroughly flushed from the pipe until the replacement water shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served to the public from the existing water supply system. The Contractor shall be responsible for taking the necessary precautions, such as dechlorination, to ensure that the flushing does not harm the environment and complies with all appropriate regulatory requirements. The Contractor shall pay all costs for bacteriological tests. Bacteriological tests shall be performed by a State Approved laboratory.
5. During the flushing period, each fire hydrant on the line shall be opened and closed several times. The Engineer or his authorized Representative will take samples of water in properly sterilized containers for bacterial examination. The sterilization procedure shall be repeated until tests indicate the absence of pollution for at least two full days. The unit will not be accepted until satisfactory bacteriological results have been obtained. The samples shall not be taken from a fire hydrant.
6. Final connections to existing mains shall be made where indicated on the drawings or as directed after satisfactory samples have been obtained.

END OF SECTION

SECTION 02662

DUCTILE IRON WATER PIPE AND APPURTENANCES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of ductile iron water lines in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein.
- B. All water pipe excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

1.02 SUBMITTALS

- A. Shop drawings or submittals shall be required for the following:
 - 1. All sizes and types of pipe on the project.
 - 2. Pipe fittings and appurtenances.

1.03 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a large size and shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe or other material is damaged during transporting, unloading, handling or storing, the undamaged portions of the pipe or material may be used or if damaged sufficiently, the Engineer will reject the material as being unfit for installation.
- B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Ductile Iron Pipe:
 - 1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
 - 2. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

3. Ductile Iron Pipe shall be manufactured in accordance with AWWA C151. All Ductile Iron Pipe shall be 350 psi Class unless otherwise specified and shall be lined with a cement mortar lining not less than 1/16" thick conforming to AWWA C104. Pipe wall thickness for all Ductile Iron Pipe shall conform to "Thickness Design for Ductile Iron Pipe," AWWA C150. The standard laying condition shall be type 2. The exterior of all Ductile Iron Pipe shall have a protective coating of a coal tar or asphaltic material a minimum of 5 mils thickness conforming to AWWA C110 and C115.
 - a. Flanged Joints
 - i. Flanged pipe shall have flanges with long hubs, shop fitted on the threaded end of the pipe.

Where required, flanges shall be tapped for stud bolts. Flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true, and covered with coal tar pipe varnish or otherwise protected against corrosion of flange faces. Flange faces shall be cleaned to bare metal with wire brushed before installation of pipe.
 - ii. Ductile Iron Flanged joint pipe shall have a thickness of Class 53 minimum and shall conform to AWWA C110 and AWWA C115. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded or flanged in the field. All pipes shall have 125 lb. flanges conforming to AWWA C110 unless otherwise specified.
 - iii. In general, flanged joints shall be made up with through bolts of the required size. Stud or tap bolts shall be used only where shown or required. Steel or tap bolts shall be cadmium plated, with good and sound, well-fitting threads, so that the nuts may be turned freely by hand. Cadmium plating shall be by an approved process with a plate thickness of 0.0003" to 0.0005".
 - iv. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together. Bolts and gaskets shall be furnished by the installer of piping for joints connecting the piping with equipment and piping is furnished by the installer or not.
 - b. Mechanical Joints
 - i. All mechanical joint pipes shall be manufactured in accordance with AWWA C111. Pipe shall be manufactured in accordance with AWWA C151, and the pipe thickness shall be 350 psi Class as determined by AWWA C150 unless otherwise noted.
 - ii. All bolts shall be tightened by means of torque wrenches in such a manner that the follower shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.

- iii. Bolts for mechanical joints shall be high grade steel, low alloy type, with tee or hex head and American Standard threads. Mechanical joint gland shall be gray iron and shall utilize a plain rubber gasket.
- c. Slip Joints
 - i. Slip or "push-on" joints shall be manufactured in accordance with AWWA C151. Pipe thickness shall be 350 psi Class as determined by AWWA C150.
 - ii. Bells of "slip" joint pipe shall be contoured to receive a bulb-shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until plain end makes full contact with the base of the bell. No joint may exceed a maximum deflection of 4%.

B. FITTINGS

- 1. All ductile iron pipe fittings for pipe shall be mechanical joint type in accordance with AWWA C110 and AWWA C111 for underground piping. Where flanged pipe is used ductile iron fittings shall be flanged in accordance with AWWA C110 for exposed piping. All flanges shall be Class 125 unless otherwise noted.
- 2. All fittings shall be lined with cement mortar not less than 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.
- 3. All mechanical joints shall be manufactured in accordance with AWWA C111.

PART 3: EXECUTION

3.01 INSTALLATION

A. Excavation:

- 1. Trenches will be defined as all excavation for the installation of water pipe, hydrants, valves, water services, water taps, and other unclassified excavation as may be deemed necessary by the Engineer.
- 2. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.
- 3. All excavation shall be by open cut unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any

materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with #67 washed stone. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary. Maximum trench width, unless as otherwise authorized by the Engineer, as measured at a depth of 2' above the top of the pipe shall be 30" or 10" clearance from the each side of the pipe, whichever is greater.

4. **Sheeting, Bracing Trenches, and Trench Boxes:** If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides of the pipe. Also, the Contractor may be required, for the purpose of preventing injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place. The Contractor shall provide all means necessary to comply with the latest OSHA requirements.
5. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom. If the Engineer is of the opinion, that at any point, sufficient or proper supports have not been provided, he may order additional supports put in at the Contractor's expense, but compliance with such orders shall not release the Contractor from responsibility for the sufficiency of such supports.
6. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.
7. Materials which are excess to the needs of the project will be disposed of by the Contractor.
8. In order to protect existing pavement structures and to make clean up easier the Contractor shall place a 6" layer of sand on all asphalt or concrete surfaces prior to placing excavated material.
9. Pipe Foundations:

- a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being installed. Unless otherwise noted all pipe shall be installed using a "Type 2" trench foundation as defined in AWWA C151.
- b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustment will require the approval of the Engineer. When an Inspector is present on the site and is so requested by the Contractor, he shall check the position of grades and lines but the Contractor shall be responsible for the finished work conforming to exact and proper line and grade.
- c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.
- d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and #67 washed stone of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.
- e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". #67 washed stone shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
- f. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within limits established on the plans, and backfilling with #67 washed stone as approved by the Engineer.
- g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.
- h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on a washed stone or concrete cradle foundation. Such foundations whether washed stone or a poured concrete cradle, shall be

placed by the Contractor and compensation will be allowed the Contractor for the work.

B. INSTALLING PIPE AND APPURTENANCES

1. Laying Pipe

- a. All piping is to be installed in strict accordance with the manufacturer's recommendations and AWWA C600 and the contract material specifications. Installation manuals from various material suppliers will be furnished the Engineer for his review and approval prior to installation of any materials. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.
- b. No pipe shall be laid except in the presence of the Engineer or his Inspector or with special permission from the Engineer.
- c. Proper tools, implements and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean and free of defects. It shall be laid on the prepared foundations, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line.
- d. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
- e. When cutting short lengths of pipe, a pipe cutter, as approved by the Engineer, will be used and care will be taken to make the cut at right angles to the center line of the pipe or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.
- f. All pipe joints shall be constructed in strict accordance with the pipe manufacturer's specifications and materials and any deviation must have prior approval of the Engineer.
- g. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer. However, at no time will a deflection greater than 4° be allowed.
- h. All water lines shall have a minimum 12" vertical separation from storm sewer and shall have a minimum of 10' horizontal separation from sanitary sewer or 18" vertical separation with the water line over the sewer line. In the event these separations cannot be met, both water line and sanitary sewer shall be constructed of ductile iron pipe as directed by the Engineer or as shown on the drawings.

2. Thrust Blocks

- a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed by the Engineer. Thrust blocks shall be made of ready-mix concrete having a compressive strength of 28 days of 3,000 psi and shall bear directly against the undisturbed trench wall. Where possible, the concrete shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a 20-mil polyethylene film placed between the fittings and the concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.
- b. Concrete for thrust blocks shall consist of a ready mix of Portland Cement, Fine Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3,000 psi when tested in accordance with ASTM C39 or C42. Sakrete or any similar material will not be permitted under any circumstances.

C. BACKFILLING AND COMPACTION

1. Backfill trenches immediately after approval of the pipeline construction.
2. Use backfill carefully placed in uniform layers not exceeding 6" in thickness to a depth of 2' over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten as necessary; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2' over top of pipe to top of trench, shall be backfilled with a material containing no rocks larger than 6" in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4" in diameter will be allowed.
3. If material excavated from the trench is unsuitable to be used as backfill, "select backfill" shall be transported to the site by the Contractor from outside the project limits to be used as backfill material. Material excavated in conjunction with the construction of the project is not considered "select backfill" for payment purposes.
4. Moisten backfill as necessary above 2' over the top of the pipe and place in 8" layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.

5. Roadways and Road Crossings: Use backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2' of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and type as the adjacent roadway.
6. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the maximum dry density as determined by Standard Proctor Test (100% for the top 2' of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.
7. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
8. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.
9. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.
10. Cleanup
 - a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.
 - b. Cleanup and seeding is part of the pipeline installation. No more than 3,000 L.F. of water line may be laid prior to completion of cleanup of the first section of pipeline laid. To facilitate this the Owner reserves the right to withhold up to 30% of the unit price bid for water line if in the opinion of the Owner and Engineer completed sections have not been properly cleaned.

3.02 QUALITY CONTROL

A. TESTING

1. After the pipeline has been satisfactorily constructed, complete with the required fire hydrants, services, and all other appurtenances, and the trench sufficiently backfilled, the newly constructed pipeline and valved sections shall be subjected to a hydrostatic pressure-leakage test. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. At no time shall more than 4,000 linear feet of main be tested. The Contractor shall install sufficient additional valves if not shown on the drawings to allow testing. Additional valves shall be paid for at the unit price bid for valves. As the main is being filled with water in preparation of the tests, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure of 200 pounds per square inch for a period of two (2) hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.
2. The rate of leakage shall be determined at 15-minute intervals by means of volumetric measurement of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.
3. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

No piping installation will be accepted until the makeup water is less than calculated by the following formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

Where:

L = testing allowance (makeup water) in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches

P = average test pressure during the hydrostatic test, in psi

4. No leakage will be allowed under the above tests for piping in buildings and structures.
5. Cracked or defective pipe, joints, fittings, valves, or hydrants discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.
6. Tests of insulated and concealed piping shall be made before the piping is covered or concealed. No leakage will be allowed under the above tests for piping under or in buildings.

7. The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water and materials, including meters and gauges shall be furnished by the Contractor at his own expense.

B. STERILIZATION

1. After the pressure-leakage test is completed and before the use of water is permitted from any portion of newly constructed water line which will hold or carry potable water, it shall be chlorinated and flushed or cleaned in the presence of and directed by the Engineer. The Contractor shall chlorinate the new water mains by the use of calcium hypochlorite granules. During construction, calcium hypochlorite granules shall be placed at the upstream end of the section to be tested, and at 500-foot intervals. The quantity of granules shall be as shown in the following table:

Ounces of Calcium Hypochlorite per 500'	
Pipe Diameter	Calcium Hypochlorite (oz.)
4"	1.0
6"	2.0
8"	4.0
12"	8.0
16" & larger	16.0

2. Pipelines may, at the option of the Contractor, be chlorinated in sections isolated by means of gate valves or other approved means.
3. Each unit of the completed water line shall be sterilized as specified below or as prescribed by AWWA C651. The unit to be sterilized shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall provide a chlorine dosage of not less than 100 parts per million and shall be introduced into the water line in an approved manner. The retention time shall be at least 24 hours and shall produce not less than 50 PPM of chlorine at the extreme end of the line at the end of the retention period. All valves on the lines being sterilized shall be opened and closed several times during the contact period.
4. Following chlorination, all treated water shall be thoroughly flushed from the pipe until the replacement water shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served to the public from the existing water supply system, and be approved by the Public Health Authority having jurisdiction. The Contractor shall pay all costs for bacteriological tests.
5. During the flushing period, each fire hydrant on the line shall be opened and closed several times. The Engineer will take samples of water in properly sterilized containers for bacterial examination. The sterilizing shall be repeated until tests indicate the absence of pollution for at least two full days.

The unit will not be accepted until satisfactory bacteriological results have been obtained. The samples shall not be taken from a fire hydrant.

6. Final connections to existing mains shall be made where indicated on the drawings or as directed after satisfactory samples have been obtained.

END OF SECTION

SECTION 02663

PRESSURE RATED PVC WATER PIPE AND APPURTENANCES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of pressure rated PVC water lines in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein. This specification applies to PVC water lines which are 2" diameter or less.
- B. All water pipe excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

1.02 SUBMITTALS

- A. Shop drawings or submittals shall be required for the following:
 - 1. All sizes and types of pipe on the project.
 - 2. Pipe fittings and appurtenances.

1.03 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a large size and shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe or other material is damaged during transporting, unloading, handling or storing, the undamaged portions of the pipe or material may be used or if damaged sufficiently, the Engineer will reject the material as being unfit for installation.
- B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Polyvinyl Chloride (PVC) Pipe:
 - 1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
 - 2. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding

specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

3. Pressure Rated PVC Pipe shall be manufactured in accordance with ASTM D2241. All Pressure Rated PVC Pipe shall have a standard dimension ratio (SDR) of 13.5 unless otherwise specified. The exterior of all PVC Pipe shall bear a stamp which shows SDR, size, and NSF seal.
 - a. All pipes shall have slip or "push-on" joints which are manufactured in accordance with AWWA C151. Pipe shall have a bell with integral rubber gasket.
 - b. Bells of "slip" joint pipe shall be contoured to receive a bulb shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until the assembly mark on the pipe barrel is flush with the end of the bell. No joint may exceed a maximum deflection of eleven inches (11") in an 18-foot joint of pipe (3°).
4. Fittings:
 - a. Fittings for all PVC pipe shall be ductile iron pipe fittings, mechanical joint type in accordance with AWWA C110 and AWWA C111 for underground piping.
 - b. All fittings shall be lined with cement mortar not less than 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.
 - c. All mechanical joints shall be manufactured in accordance with AWWA C111. The Contractor shall provide suitable 3" plugs with stainless steel threaded nipples and sleeves for connection of fittings.

PART 3: EXECUTION

3.01 INSTALLATION

A. Excavation:

1. Trenches will be defined as all excavation for the installation of water pipe, hydrants, valves, water services, water taps, and other unclassified excavation as may be deemed necessary by the Engineer.
2. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipelines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.

3. All excavation shall be by open cut method unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with #67 washed stone. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary. Maximum trench width, unless as otherwise authorized by the Engineer, as measured at a depth of 2' above the top of the pipe shall be 30" or 10" clearance from each side of the pipe, whichever is greater.
4. If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides of the pipe. Also, the Contractor may be required for the purpose of preventing injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place. The Contractor shall provide all means necessary to comply with all Federal, State and Local Health and Safety regulations.
5. No sheeting or bracing shall extend closer than 2' off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting there from.
6. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.
7. Materials which are excess to the needs of the project will be disposed of by the Contractor.
8. In order to protect existing pavement structures and to make cleanup easier the Contractor shall place a 6" layer of sand on all asphalt or concrete surfaces prior to placing excavated material.
9. Pipe Foundations:
 - a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being

installed. Unless otherwise noted all pipe shall be installed using a Type 2 trench foundation as defined in AWWA C900.

- b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustment will require the approval of the Engineer.
- c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.
- d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and #67 washed stone shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.
- e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". Sand or previously excavated material approved by the Engineer shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
- f. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within limits established on the plans, and backfilling with sand or previously excavated material approved by the Engineer.
- g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.
- h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on a washed stone foundation.

B. Installing Pipe and Appurtenances:

1. Laying Pipe:

- a. All piping is to be installed in strict accordance with the manufacturer's recommendations and AWWA C605 and the contract material specifications. Installation manuals from various material suppliers will be

furnished to the Engineer for his review and approval prior to installation of any materials. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

- b. No pipe shall be laid except in the presence of the Engineer or his Representative, or with special permission from the Engineer.
- c. Proper tools, implements and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean and free of defects. It shall be laid on the prepared foundations, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line.
- d. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
- e. When cutting short lengths of pipe, a pipe cutter, as approved by the Engineer, will be used and care will be taken to make the cut at right angles to the center line of the pipe or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.
- f. All pipe joints shall be constructed in strict accordance with the pipe manufacturer's specifications and materials and any deviation must have prior approval of the Engineer.
- g. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer. However, at no time will a deflection greater than 3° (11") be allowed.

All water lines shall have a minimum 12" vertical separation from storm sewer and shall have a minimum of 10' horizontal separation from sanitary sewer or 18" vertical separation with the water line over the sewer line. In the event these separations cannot be met, both water line and sanitary sewer shall be constructed of ductile iron pipe as directed by the Engineer or as shown on the drawings.

2. Thrust Blocks:

- a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed by the Engineer. Thrust blocks shall be made of ready-mix concrete having a compressive strength at 28 days of 3,000 psi and shall bear directly against the undisturbed trench wall. Where possible, the concrete shall be

so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a 20-mil polyethylene film placed between the fittings and the concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

- b. Concrete for thrust blocks shall consist of a ready mix of Portland Cement, Fine Coarse aggregate, and water to produce concrete with a minimum compressive strength at 28 days of not less than 3,000 psi when tested in accordance with ASTM C39. Sakrete or any similar material will not be permitted under any circumstances.

C. Backfilling and Compaction:

1. Backfill trenches immediately after approval of the pipeline construction.
2. Use backfill carefully placed in uniform layers not exceeding 6" in thickness to a depth of 3' over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten as necessary; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2' over top of pipe to top of trench, shall be backfilled with a material containing no rocks larger than 6" in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4" in diameter will be allowed.
3. If material excavated from the trench is unsuitable to be used as backfill, "select backfill" shall be transported to the site by the Contractor from outside the project limits to be used as backfill material. Material excavated in conjunction with the construction of the project is not considered "select backfill" for payment purposes.
4. Moisten backfill as necessary above 2' over the top of the pipe and place in 8" layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.
5. Use backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2' of subgrade beneath pavements). Replace removed paving and base course with new material of equal or material of equal or better quality and of the same texture and type as the adjacent roadway.
6. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the maximum dry density

as determined by Standard Proctor Test (100% for the top 2' of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.

7. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
8. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.
9. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.
10. Cleanup:
 - a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.
 - b. Cleanup and seeding is part of the pipeline installation. No more than 3,000 L.F. of water line may be laid prior to completion of cleanup of the first section of pipeline laid. To facilitate this the Owner reserves the right to withhold up to 30% of the unit price bid for water line if in the opinion of the Owner and Engineer completed sections have not been properly cleaned.

3.02 QUALITY CONTROL

A. Testing:

1. After the pipeline has been satisfactorily constructed, complete with the required fire hydrants, services, and all other appurtenances, and the trench sufficiently backfilled, the newly constructed pipeline and valved sections shall be subjected to a hydrostatic pressure test. Each completed section' of the pipeline shall be plugged at both ends and slowly filled with water. At no time shall more than 4,000 linear feet of main be tested. As the main is being filled with water in preparation of the tests, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure of 200 pounds per square inch (at the lowest point of the line section under test) for a period of

two (2) hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.

2. Air removal: Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed at these points to expel the air as the line is filled with water. After the air has been expelled, the corporation cocks shall be closed, and the test pressure applied. At the conclusion of a successful pressure test, the corporation cocks shall be removed, and the pipe plugged,
3. Examination: Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with reliable material, and the test shall be repeated until satisfactory results are obtained.
4. The test allowance shall be determined at 15-minute intervals by means of volumetric measurement of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.
5. Test allowance is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the makeup water is less than calculated by the following formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

Where:

L = testing allowance (makeup water) in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches

P = average test pressure during the hydrostatic test, in psi

6. No leakage will be allowed under the above tests for piping in buildings and structures.
7. Cracked or defective pipe, joints, fittings, valves, or hydrants discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.
8. Tests of insulated and concealed piping shall be made before the piping is covered or concealed. No leakage will be allowed under the above tests for piping under or in buildings.

9. The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water and materials, including meters and gauges shall be furnished by the Contractor at his own expense.
10. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

B. Sterilization:

1. After the pressure-leakage test is completed and before the use of water is permitted from any portion of newly constructed water line which will hold or carry potable water, it shall be flushed, cleaned and chlorinated in the presence of and directed by the Engineer or his Representative. The Contractor shall chlorinate the new water mains by the use of calcium hypochlorite granules.
2. Pipelines may, at the option of the Contractor, be chlorinated in sections isolated by means of gate valves or other approved means.
3. Each unit of the completed water line shall be sterilized as specified below as prescribed by AWWA C651 "continuous feed" method. The unit to be sterilized shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall provide a chlorine dosage of not less than 50 parts per million and shall be introduced into the water line in an approved manner. The retention time shall be at least 24 hours and shall produce not less than 25 PPM of chlorine at the extreme end of the line at the end of the retention period. All valves on the lines being sterilized shall be opened and closed several times during the contact period.
4. Following chlorination, all treated water shall be thoroughly flushed from the pipe until the replacement water shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served to the public from the existing water supply system. The Contractor shall be responsible for taking the necessary precautions, such as dechlorination, to ensure that the flushing does not harm the environment and complies with all appropriate regulatory requirements. The Contractor shall pay for all bacteriological tests. Bacteriological tests shall be performed by a State Approved Laboratory.
5. During the flushing period, each fire hydrant on the line shall be opened and closed several times. The Engineer or his Representative will take samples of water in properly sterilized containers for bacterial examination. The sterilization procedure shall be repeated until tests indicate the absence of pollution for at least two full days. The unit will not be accepted until satisfactory bacteriological results have been obtained. The samples shall not be taken from a fire hydrant.
6. Final connections to existing mains shall be made where indicated on the drawings or as directed after satisfactory samples have been obtained. Contractor shall confine all operations and personnel to the limits of construction as shown on the plans. There shall be no disturbance

whatsoever of any areas outside the limits of construction nor shall the workmen be allowed to, travel at will through the surrounding private property.

END OF SECTION

SECTION 02720 STORM DRAINAGE MATERIALS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This section covers providing and installing the storm drainage and underdrainage collection systems, including pipe culverts, French drains and appurtenant structures. Storm drainage systems shall be constructed as shown on the Contract drawings and as specified herein.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Unloading and Handling: All pipe and storm drainage material shall be unloaded and handled with reasonable care. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during unloading or handling, the undamaged portions of the joint or section may be used where partial lengths are needed, or if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation and the Contractor shall remove such rejected pipe from the project.

1.03 QUALITY ASSURANCE

- A. Pipe and drainage materials shall meet the following reference requirements:
 - 1. ASTM C76 Reinforced Concrete Pipe
 - 2. ASTM C55 Concrete Brick
 - 3. AASHTO M-36 Corrugated Metal Pipe
 - 4. ASTM F667 High Density Polyethylene

1.04 SUBMITTALS

- A. The Contractor shall submit for approval of the Engineer shop drawings which describe in detail the materials to be utilized. Six (6) copies of shop drawings shall be submitted. Prior to submittal all shop drawings are to be reviewed by the Contractor, and shall be stamped and signed as to compliance with the referenced specification. Any variance to the specification shall be noted.

The following shop drawings shall be submitted:

- 1. Drainage Pipe
- 2. Underdrain Pipe
- 3. Underdrain or Pipe Bedding
- 4. Drainage Structure Castings
- 5. Precast Drainage Structures

1.05 WARRANTY

- A. All pipe and materials shall be warranted for a period of one (1) year following installation and acceptance by the Owner.

PART 2: PRODUCTS

2.01 REINFORCED CONCRETE PIPE

- A. Reinforced concrete pipe shall conform to ASTM C-76, latest revision. Pipe shall be Class III with Wall B, unless otherwise noted. All pipe shall have interior surfaces free from roughness, projection, indentations, offset or irregularities of any kind.
- B. Joint material for reinforced concrete pipe shall be either "O" ring type joints utilizing a rubber "O" ring, or bell and spigot type utilizing a mastic joint material equal to Ram-Neck.

2.02 CORRUGATED METAL PIPE

- A. Corrugated metal pipe shall conform to AASHTO M-36, latest revision. Bituminous coating, where required by the drawings, shall consist of asphalt cement having a minimum thickness of 0.04" measured at the crest of the corrugations. Paved inverts in corrugated metal pipe, where required by the drawings, shall consist of asphalt cement applied on the inside of the pipe for one quarter of its circumference (bottom of pipe when installed). The pavement shall have a minimum thickness of 0.50" tapering to 0.1" at the sides.
- B. Corrugated metal pipe shall have 2-2/3" x 1/2" corrugations and shall be of the following minimum gauges:

18" and smaller pipes	16 gauge
21" – 30" pipes	14 gauge
36" – 48" pipes	12 gauge
56" and large pipes	10 gauge
- C. Corrugated Metal Pipe shall have rerolled ends to accommodate corrugated coupling bands. Coupling bands shall conform to NCDOT 932-3(A). Dimple bands shall not be used.

2.03 HIGH DENSITY POLYETHYLENE

- A. High density polyethylene (HDPE) corrugated storm sewer pipe shall have a minimum 15-inch nominal diameter and shall be used in areas outside of public right-of-way. HDPE pipe may be used in public right-of-way but must be approved prior to installation by the city engineer or their designee. No less than 18" pipe size will be allowed in public right-of-way. HDPE piping shall be installed according to the manufacture's specifications. Pipe material shall meet the product specifications of ASTM F667 and shall have a smooth interior.

2.04 CASTINGS

- A. Castings shall be sound and free from warp, holes and other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well-defined lines and arises. Machined joints, where required, shall be milled to a close fit. Provide all necessary lugs and brackets so that work can be assembled in a neat, substantial manner.

2.05 AGGREGATE FOR UNDERDRAINS

- A. Aggregate for underdrains shall be washed stone, standard size number 67 per North Carolina Department of Transportation specifications, Section 905.EQUIPMENT AND MATERIAL STANDARDS

PART 3: EXECUTION

3.01 PREPARATION OF PIPE FOUNDATION

- A. Lines and Grades: The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustments will require the approval of the Engineer. When an Inspector is present on the site and is so requested by the Contractor, he shall check the position of grades and lines; but the Contractor shall be responsible for the finished drain line being laid to exact and proper line and grade.
- B. Pipe Foundation:
 - 1. Whenever the nature of the ground will permit, the excavation at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe.
 - 2. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". A suitably tamped and shaped foundation of suitable earth shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
 - 3. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within the limits established on the plans, and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Engineer.

- C. Water in Trenches: The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing; and no pipes shall be laid until the water has been removed from the trench. The Contractor will not be permitted to drain water through the storm drain within a period of twenty-four (24) hours after the pipe has been laid, and the open end of the pipe in the trench shall be kept closed with a tight-fitting plug to prevent washing of dirt or debris into the trench. Water so removed from the trench must be disposed of in such manner as not to cause injury to work completed or in progress.
- D. Special Foundations: Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on timber or concrete cradle foundations. Such foundations whether of single plank, plank cradle, plank cradle supported on piles, or poured concrete cradle, shall be placed by the Contractor; and compensation will be allowed the Contractor for the materials so used.

3.02 LAYING PIPE

- A. General: All piping is to be installed in strict accordance with the manufacturer's recommendations. Installation manuals from various material suppliers shall be furnished the Engineer for his review and approval prior to installation of any material. The Engineer may augment any manufacturer's installation recommendations, if in his opinion it will best serve the interest of the Owner.
- B. Laying Pipe:
 - 1. No pipe shall be laid except in the presence of the Engineer or his inspector, or without special permission from the Engineer. Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be carefully given a final inspection to see that it is clean, sound and free of defects. It shall be laid on the prepared foundation to produce a straight line on a uniform grade, each pipe being laid as to form a close abutted joint with a preceding pipe, so as to form a smooth and straight inside flow line. Each pipe will be tested for its exact position after it is in its final position. The pipes shall be fitted together in order to insure sufficient space for joint gaskets, and other jointing material. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
 - 2. When cutting short lengths of pipe, a pipe cutter as approved by the Engineer will be used, and care will be taken to make the cut at right angles to the center line of the pipe, or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder, of course file to match the manufactured taper.

3. When coupling bands for annular or helical corrugated metal pipe are used, the pipe sections shall be joined and fully bolted so that the circumferential and longitudinal strength will be sufficient to preserve the alignment, prevent separation of the sections, and to prevent infiltration of backfill material.

3.03 BACKFILLING

- A. The backfill around the pipe shall be placed in layers not to exceed 6" loose and compacted to 95% Standard Proctor test for all areas directly beneath subgrade (100% for the top two (2) feet of subgrade beneath pavements). From the bottom of the trench to the centerline of the pipe the backfill material shall be compacted by approved hand tamps. From the centerline of the pipe to the top of the trench other mechanical tamps as approved by the Engineer may be used. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when called for on the plans.
- B. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable materials.
- C. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
- D. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

3.04 TESTING

- A. Upon completion, installed lines shall show a full circle of light when "Lamped" between catch basins. This test shall be performed by the Engineer.
- B. Other tests may be required by the Engineer, such as exfiltration. In this event the results shall meet the minimum standards that the manufacturer states are obtainable.

END OF SECTION

SECTION 02722

STROM DRAINAGE STRUCTURES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This section covers the construction of reinforced concrete or brick masonry inlets, catch basins, junction boxes, and other minor drainage structures, excluding headwalls, together with all necessary metal grates, covers, frames, and other hardware, in accordance with the requirements shown on the plans and the provisions of these specifications.

1.02 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations, and in a manner, which preserves the structural integrity of the materials.

1.03 QUALITY ASSURANCE

- A. All precast concrete structures and other fabricated materials shall be manufactured by suppliers with at least five (5) years of experience in the manufacture of similar materials.

1.04 SUBMITTALS

- A. The Contractor shall submit for approval of the Engineer shop drawings which describe in detail the materials to be utilized. Six (6) copies of shop drawings shall be submitted. Prior to submittal all shop drawings are to be reviewed by the Contractor, and shall be stamped and signed as to compliance with the referenced specification. Any variance to the specification shall be noted.

1.05 WARRANTY

- A. All materials and equipment shall be warranted for a period of one (1) year following installation and acceptance by the Owner.

PART 2: PRODUCTS

2.01 CONCRETE AND MASONRY

- A. Concrete and masonry shall meet the requirements of the appropriate section of NCDOT Standard Specifications for Roads and Structures (latest Edition). All concrete shall be Class A or B 4000 psi minimum unless otherwise indicated on the plans.
- B. Where necessary to fit field conditions, the dimensions of the structure and footings shall be varied as directed by the Engineer.

2.02 FITTINGS AND CONNECTIONS

- A. Where fittings enter the masonry, they shall be placed as the work is built up, thoroughly bonded, and accurately spaced and aligned.

- B. Pipe connections shall be cut off flush with the inside wall of the drainage structure and grouted as necessary to make smooth and uniform surfaces on the inside of the structure and to withstand any infiltration of ground water.
- C. Metal frames for grates and covers shall be set in full mortar beds or secured by methods approved by the Engineer.

2.03 BACKFILL

- A. After the structure has been completed, and all forms, falsework, sheeting, and bracing have been removed, the excavation shall be backfilled with approved material compacted to a density of 95% standard proctor for areas unpaved and 98% for areas under pavement, and 100% for the last 9" under paving. Backfilling shall not be done until the concrete or brick masonry has cured for at least seven (7) curing days, unless otherwise permitted by the Engineer.

2.04 PIPE COLLARS AND PIPE PLUGS

- A. Pipe collars and pipe plugs shall be constructed in accordance with the details shown on the plans or as directed by the Engineer.

2.05 FRAME, GRATE, AND HOOD

- A. Frame, grate and hood shall be Neenah R-3233 Type D, U.S. Foundry or approved equivalent. Drop inlet frame and grate shall be Neenah R-3433 or approved equivalent. Field inlet cover shall conform to NCDOT Standard Detail 840.04 with the opening facing upstream.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Drainage structures shall be built to the lines, grades and dimensions as shown on the plans. The Contractor shall adjust the final grades in the field as necessary to provide positive drainage to the structures or to match final pavement or grade elevation.
- B. Excavations for drainage structures shall be made with care so as not to disturb the surrounding areas more than necessary. All excavations shall be maintained water free until completion of the drainage structure, including backfilling. The Contractor shall provide adequate pumping capacity as required.
- C. Place 6 inches of #57 washed stone under structures. Where the foundation material is found to be of poor supporting value, the existing foundation material shall be removed by undercutting to the depth directed by the Engineer and backfilled with suitable material secured from locations along the project or from a borrow pit. The backfill placed in the undercut area shall be compacted to a degree satisfactory to the Engineer.
- D. For cast-in-place structures the Contractor shall use care in placing rebar and concrete. All rebar is to be approved by the Engineer prior to pouring concrete. Unless otherwise approved, the bottom slabs shall be poured separate from the walls. A minimum of seven (7) days cure time shall be provided between completion of pouring the bottom and the walls. Cast-in-place catch basins shall

conform to the requirements of NCDOT Standard Specifications for Roads and Structures (Latest Edition) Articles 840-1 through 840-3. Curb inlet catch basins shall conform to NCDOT Standard Details 840.02 through 840.04. Drop inlets shall conform to Standard Detail 840.14. Junction boxes shall conform to Standard Detail 840.31.

- E. When drainage structures are constructed with concrete brick, only new, sound "1 brick shall be used. Mortar mix shall be mixed on site using an approved mortar mix consisting of Portland Cement (Type S), and clean sand. Following construction of the drainage boxes, both the interior and exterior shall be plastered with a minimum 1/2" thick coat of Portland Cement and sand mixture.

3.02 QUALITY CONTROL AND FIELD TESTING

- A. The Contractor shall demonstrate to the Owner and Engineer that all drainage structures operate as intended and designed. All drainage structures shall be field tested by the Contractor in the presence of the Engineer prior to final acceptance. All drainage structures are to be free of debris before being turned over to the Owner.

END OF SECTION

SECTION 02730

SANITARY SEWER PIPE AND APPURTENANCES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, equipment, materials and incidentals necessary to install and complete the sanitary sewer and/or force main installation in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein.
- B. All sewer pipe and force main excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

1.02 SUBMITTALS

- A. Shop drawings or submittals shall be required for the following:
 - 1. All sizes and types of pipe on the project.
 - 2. Pipe fittings and couplings.
 - 3. All valves, valve boxes, manholes, manhole frames and covers, air relief valves or any other required for completion of the project.

1.03 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall unload pipe and appurtenances so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a larger size and shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the pipe and appurtenances on sills above storm drainage level and deliver for laying after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used as needed, or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Pipe:
 - 1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting materials which do not conform to the requirements of these specifications. Such material shall be marked by the Engineer and the Contractor shall remove it from the project site upon notice being received of its rejection.
 - 2. As particular specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to

superseding specifications under a new number except provisions in revised specifications which are clearly inapplicable.

3. Ductile Iron Sewer Pipe (DIP) – Gravity Sewer and Force Mains:

- a. Ductile Iron Pipe shall be as manufactured in accordance with ASTM A 746, ANSI Specification A21.50 and A21.51 and shall be Class 350 unless otherwise specified on the drawings or in the Bid Schedule.
- b. The pipe interior shall be cement mortar lined and seal coated, standard thickness, in accordance with ANSI Specification A21.4.
- c. The exterior of all pipe shall be coated with either a coal or asphaltic base bituminous pipe coating in accordance with ANSI Specification A21.8.
- d. Pipe shall be furnished with Slip Joints, Mechanical Joints, or Flanged Joints as indicated on the drawings and in accordance with the specifications described below:
- e. Slip Joints: This pipe joint shall be done by guiding the plain end of the pipe into the bell end until contact is made with a gasket and by exerting a sufficient compressive force to drive the plain end through the gasket until the plain end makes full contact with the base of the bell.
 - i. Bells of slip-joint pipe shall be contoured to receive a circular rubber gasket and plain ends shall have a slight taper to facilitate installation.
 - ii. The circular gasket shall be furnished by the pipe manufacturer and shall be manufactured in accordance with ANSI Specification A21.11.
 - iii. The pipe manufacturer shall also furnish the lubricant used to assist in the pipe installation.
- f. Mechanical Joints: This pipe joint is essentially the same as the slip joint except it is furnished with a cast iron clamp which acts as a retainer to hold circular rubber gasket in place. All mechanical type joints shall be furnished by the pipe manufacturer and manufactured in accordance with ANSI Specification A21.11.
 - i. All bolts shall be tightened by means of torque wrenches in such a manner that the following shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.
- g. Flanged Joints: The flanged pipe joint is composed of a flat steel plate shop fitted on the threaded end of the ductile iron pipe. The flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true.
 - i. Flanged joints shall be furnished with 125 lb. flanges drilled in accordance with ANSI Specification B16.1.

- ii. In general, flanged joints shall be made Lip with through bolts of the required size. Stud or tap bolts shall be used only where shown or required.
 - iii. Gaskets for flanged joints shall be the ring type of cloth inserted rubber or rubber with a minimum thickness of 1/8".
 - iv. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together. Bolts and gaskets shall be furnished by the installer of piping for joints connecting the piping with equipment, as well as for those between pipe and fittings, whether such equipment and piping is furnished by the installer or not.
 - h. Long Span Pipe: "Long span" type ductile iron pipe shall be used for unsupported spans greater than 20'-0". "Long span" ductile iron pipe and associated pipe joints shall be designed by the pipe manufacturer specifically for elevated crossings with unsupported spans shown on the drawings. The Contractor shall submit shop drawings from the pipe manufacturer for the long span pipe. Shop drawings shall include material specifications for the pipe and joints, and shall specify locations of joints with respect to the pier locations shown on the drawings. Long span ductile iron pipe shall be as manufactured by American, U.S. Pipe, or equal.
4. Polyvinyl Chloride Sewer Pipe (PVC):
- a. Gravity: Polyvinyl Chloride Pipe shall be as manufactured in accordance with ASTM D-3034, latest edition, and shall be suitable for use as a gravity sanitary sewer pipe. The standard dimension ratio (SDR) shall be 35 unless otherwise specified on the contract drawings.
 - b. All polyvinyl chloride pipe joints shall be of an integral bell and spigot of the same material as the pipe. It shall have a solid cross-section with rubber "O" ring securely locked in place at the point of manufacture.
 - c. Force Main: Polyvinyl chloride pipe shall be as manufactured in accordance with ASTM D-2241, latest edition, and shall be suitable for use as a sanitary sewer force main pipe. The standard dimension ratio (SDR) shall be 18 or 21 as shown on the contract drawings. PVC force main piping shall have a green exterior color. Under no circumstances shall pipe with a blue exterior color be accepted.
 - d. Where PVC pipe is installed in iron pipe size (IPS), an IPS gasket shall be furnished with each fitting to insure compatibility.
5. Reinforced Concrete Sewer Pipe (RCP):
- a. Reinforced concrete sewer pipe shall be furnished in accordance with ASTM C-76, latest edition, and shall be suitable for use as a gravity sanitary sewer pipe. The pipe shall be Class III, wall thickness B, with spigot groove joint. The rubber "O" ring gasket shall form a flexible water-tight seal at the assembled pipe joint and manufactured in accordance with ASTM C-443.

- b. The pipe manufacturer shall furnish to the Engineer certification from an independent laboratory that the alkalinity of the pipe is at least 90% calcium carbonate equivalent. Certification shall also be furnished by the pipe manufacturer stating the type of aggregate used in the pipe.
6. Galvanized Steel Pipe and Fittings:
- a. Galvanized steel (mill) pipe shall be manufactured in accordance with AWWA Standard C202 and ASTM A370.
 - b. The pipe is to be seamless (weldless) tubular steel pipe manufactured in straight standard length (21'-0"). Each length shall be subjected to an internal hydrostatic pressure test by the manufacturer. The Engineer may request certified copies of the testing results for the pipe purchased for this project.
 - c. Unless otherwise stated in the bid schedule or noted on the drawings, the diameter shall mean the nominal inside diameter of pipe as covered by the applicable section(s) of AWWA C-202.
 - d. The maximum working water pressure, including water hammer allowance, for this pipe material shall be taken as 250 psi.
 - e. All pipe lengths shall be threaded National Standard Thread (NSPT) at the point of manufacture. Where other end preparation is required, it shall be as specified on the contract drawings.
7. Fittings: Whenever the sanitary sewer force main has a significant change in alignment or grade it will be necessary to furnish and install a fitting made of either cast/ductile iron or galvanized steel.

The specifications for the force main fittings are described below:

- a. Cast Iron/Ductile Iron: All cast iron and ductile iron fittings shall be mechanical joint manufactured in accordance with ANSI Specification A-21.1 and AWWA Standard C-110 for underground piping.

The interior of the fittings shall be cement mortar lined and seal coated in accordance with ANSI Specification A21.4 and AWWA C-104.
 - b. Galvanized Steel: See Section 2.01.6 above.
8. Gate Valves: All gate valves shall be designed for a working pressure of 200 psi unless otherwise specified and shall have a clear waterway equal to the full nominal diameter of the pipe and shall be opened by turning counterclockwise. Each valve shall have the initials of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel or operating nut as herein specified and shall have an arrow cast in the metal indicating the direction of opening. Valves to be installed underground shall be non-rising stem type while valves installed above ground or in buildings and structures shall have rising stems. All gate valves 16" or larger shall have a 3" bypass with valve.

a. Gate Valves 2" and Smaller:

- i. Gate valves 2" and smaller shall be all brass, single disc type, double seat tapered wedge type built to manufacturer's standards with material and construction conforming to AWWA C-500.
- ii. Each valve shall have a 2" operating nut. Valves shall have screwed ends conforming to IVPT standards.

b. Resilient Seated Wedge Valve:

- i. Gate valves 3" through 24" diameter size shall be of the ductile iron body, resilient seated wedge type meeting the requirements set forth in AWWA C-509 and AWWA C-500. All valves shall be from one manufacturer and parts interchangeable.
- ii. Gate valves shall have body, bonnet and gate manufactured of ductile iron conforming to ASTM A-536. The shell thickness of all components shall conform to the thicknesses in Table 2, Section 4.4 of AWWA C-509 and C-500. The valve body and bonnet shall be coated on both the interior and exterior surfaces with a fusion bonded epoxy paint conforming to AWWA C-550.
- iii. The gate shall be fully covered with a rubber cover over all exterior and interior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part which houses the stem nut. The gate and rubber coat shall conform to ASTM D429.
- iv. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open and under pressure.
- v. Valves larger than 12" diameter shall be designed for horizontal installation with beveled gear boxes with reduction gears to reduce the number of turns required to operate valve.

c. Double Disc Type Gate Valves:

- i. Gate valves larger than 24" diameter size shall be of the ductile iron body, double disc parallel seat type meeting the requirements set forth in AWWA C-500. All valves shall be from one manufacturer and parts interchangeable. Valves shall have a working pressure of 150 psi.
- ii. Gate valves shall have body, bonnet and gate manufactured of ductile iron conforming to ASTM A-536. The shell thickness of all components shall conform to the thicknesses in C-500. The valve body and bonnet shall be coated on both the interior and exterior surfaces.
- iii. The gates shall be high strength cast iron, sturdily proportioned without pockets on the backs. All cam surfaces shall open to the bottom. Gate rings shall be rolled into a dovetail groove under pressure to make a single insertable finish.

- iv. Valves shall use bottom wedging type design with a two-part floating wedge contact. The wedge and hook shall be separate castings and not a single piece.
- v. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open and under pressure.
- vi. Valves shall be designed for horizontal installation with beveled gear boxes with reduction gears to reduce the number of turns required to operate valve. Valves shall have bronze rollers, tracks, and scrapers.
- vii. All valves shall be supplied with a bypass as a part of the valve. Bypass shall be a minimum of 3" diameter with a 3" resilient seated wedge valve.

9. Sewage Combination Air Relief Valves:

- a. Combination air valves shall be designed specifically for use on sanitary sewer pressure (force) mains and meet ANSI/AWWA C512 standards. Combination air valves shall be designed to exhaust large volumes of air from the system during filling of the main or on pump start-up and allow large volumes of air to enter the system during pipeline draining to prevent separation of the water column. In addition, the valve shall release small amounts of accumulated air while the system is in normal operation (under pressure).
- b. The valve design shall prevent exiting air velocity from forcing the float ball from slamming shut against the seat.
- c. The combination air valve shall be provided in a single body constructed of cast iron conforming to ASTM A126, Class B. The exterior of the valve body shall be coated with a primer system and epoxy coating. Inlet shall be NPT to 3" size and Class 125 flanged for 4" and larger. The float and stem and other internal parts shall be constructed of stainless steel. The seat shall be constructed of Buna-N. Valve outlet shall be NPT. Valve shall be equipped with flushing ports.
- d. Combination air valves shall be manufactured by APCO (Dezurik), Crispin, GA Industries, Val-Matic, or approved equal.

10. Flexible Couplings: Whenever it becomes necessary to join sewer pipelines of dissimilar materials or pipe sizes it shall be required to use a flexible coupling. The coupling shall be made of virgin polyvinyl chloride (PVC) and shall not harden and shall be impervious to all known soil conditions. The coupling shall provide a permanent leakproof seal approved by the Southern Building Code Congress and manufactured in accordance with ASTM #C-594-70. The couplings shall be as manufactured by Fernco Joint Sealer Company or an approved equal.

11. Manholes:

- a. Precast concrete manhole bases, risers and cones shall conform to ASTM C 478, latest revision of Precast Reinforced Concrete Manhole Sections. Tapered section and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified. Cast iron manhole covers and assemblies shall be cast into slab tops for access into manholes.
- b. Minimum compressive strength of concrete shall be 4,000 psi and the maximum permissible absorption shall be 6.5%. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one (1) line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square inches for larger sizes. Precast manhole section shall fit together readily and, shall have a self-contained "O" ring rubber gasket conforming to ASTM C-443.
- c. The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Engineer and his inspector. The manhole sections shall be perpendicular to their longitudinal axis within the limits listed in ASTM C 478.
- d. Frames and Covers:
 - i. Frames and covers shall be cast iron of superior quality, tough and even texture. Castings shall be gray iron conforming to ASTM A 48, size as indicated, free from blow holes, porosity, hard spots, shrinkage distortion, or other defects, well cleaned and coated with asphalt paint. This paint shall result in a smooth coating, tough and tenacious when cold, not tacky and not brittle. The bearing surface between frame and cover shall be machined to prevent rocking and rattling.
 - ii. The standard manhole casting shall be designed for heavy duty use with a 190-pound frame and 125-pound cover. Acceptable products include U.S. Foundry USF 669 ring and KL cover, or an approved equal. Frame and cover shall meet North Carolina DOT 840.54 standard unless otherwise noted.
 - iii. Special waterproof manhole frame and covers shall be installed only at those locations indicated on the contract drawings. Watertight rings and lids shall be U.S. Foundry 669-KL-BWTL with a 125-pound cover. Ring shall have a flat type gasket and cover shall be bolted down with a minimum of four (4) bolts.
 - iv. The frame and cover shall be properly set in a bed of mortar and aligned to fit the top section of the manhole. Concrete brick, set in mortar, shall be used to adjust the top of the frame and cover to

finished grade; however, no more than four (4) courses of brick will be used for adjustment.

e. Manhole Steps:

- i. Steps shall be a copolymer polypropylene plastic reinforced with a 1/2 inch diameter, grade 60 bar and have serrated tread and tall end lugs. Step pull out strength shall be a minimum of 2,000 pounds when tested according to ASTM C-497.
- ii. Steps shall be required in all structures with a depth greater than four (4) feet. Steps shall be vertically aligned and uniformly spaced for the entire depth of the structure. Steps shall be located in the structures along the vertical face of the eccentric cone and so as to land upon a bench.
- iii. Steps shall be vertically spaced no greater than sixteen (16) inches on center. Step width shall be a minimum of twelve (12) inches. Steps shall protrude from the wall of the structure a minimum of five (5) inches and a maximum of seven (7).
- iv. Secure steps to the wall with a compression fit in tapered holes. Steps shall not be vibrated or driven into freshly cast concrete. Steps shall not be grouted in place.

f. Manhole Inverts:

- i. Manhole inverts and benches shall be constructed in accordance with the standard details shown on the drawings. Invert shall be a U-shaped channel with a height of 0.8 of the diameter and be a smooth continuation of the pipe. The benches shall be constructed with a slope of 1" per foot to the channel.
- ii. The channel and invert shall be constructed with a minimum of 2000 psi concrete or brick fill with concrete finish minimum 1" thick. Where sewer changes directions at the manhole, channel shall be constructed with a smooth curve with as large a radius as the diameter of the manhole will allow.

g. Manhole Drops: Standard drop manholes will be constructed only at those locations shown on the drawings or as approved by the Engineer. The design of the drop connection shall be in accordance with the standard detail drawing. The cost of the extra pipe, labor, etc. required to construct a drop manhole will be included in the unit price for the drop manhole at the depths listed.

h. Manhole Vents:

- i. Where designated on the contract drawings, a 4" diameter vent pipe shall be installed as an integral part of the manhole. The vent pipe is to be tapped into the upper most section of the manhole, anchored in concrete and extended vertically to the elevation shown on the

drawings. The pipe shall have a reverse bend and screen to prohibit rain and foreign materials from entering pipe.

- ii. The pipe material shall be Schedule 40 Galvanized Steel with two (2) coats of epoxy paint approved by the Engineer.

PART 3: EXECUTION

3.01 INSTALLATION

A. Excavation:

1. The work covered by this section consists of the excavation and satisfactory disposal of all materials excavated in the construction of trenches.
2. Trenches will be defined as all excavation for the installation of storm sewers, sanitary sewers, water pipe, manholes, catch basins, hydrants, watergates, sewer services, water taps, drainage structures, drainage ditches and other unclassified excavation as may be deemed necessary by the Engineer.
3. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.
4. All trenches shall be excavated in accordance with all Federal, State, and Local Health and Safety regulations having jurisdiction at the project site.
5. All excavation shall be by open cut unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with sand thoroughly compacted in place. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary.
6. Sheeting, Bracing Trenches, and Trench Boxes:
 - a. If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench, in such manner as to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides of the pipe. Also, the Contractor may be required for the purpose of preventing

injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place. Sheeting and bracing shall be provided in accordance with all applicable Federal, State and Local safety and health regulations.

- b. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom
7. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance. Materials which are excess to the needs of the project will be disposed of according to the section on "Waste Material Disposal."
8. Pipe Foundations:
- a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being installed.
 - b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustment will require the approval of the Engineer. When a representative of the Engineer is present on the site and is so requested by the Contractor, he may check the position of grades and lines but the Contractor shall be responsible for the finished work conforming to exact and proper line and grade.
 - c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.
 - d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.

- e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". A suitably tamped and shaped foundation of approved material shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
- f. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within limits established on the plans, and backfilling with either an approved material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Engineer.
- g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.
- h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on a washed stone foundation per detail. Foundation stone shall be placed by the Contractor and compensation will be allowed the Contractor for the work, based on the unit prices provided in the bid schedule for undercut excavation if greater than 6" below the bottom of the pipe. Class I embedment for DIP shall be used only for wet conditions and only as directed by the Engineer. Compensation shall be based on unit prices. No additional payment for Class I embedment shall be made for PVC sewer pipe.

B. Installing Pipe and Appurtenances:

1. Laying Pipe:

- a. The layout of gravity sanitary sewer lines and invert elevations at governing points are as shown on the drawings.
- b. The Contractor shall do all layout work for lines and grades from that information shown on the drawings or as furnished by the Engineer.
- c. When a laser beam instrument is used to set line and grade, the unit must be maintained in good working order, and the calibration checked daily for both alignment and percent grade. In the event the required accuracy of alignment and grade is not adhered to, the Engineer will prohibit the use of laser beams.

- d. Pipe shall be laid with bell ends facing in the direction of pipe laying, unless directed otherwise by the Engineer. In all cases, pipe is to be installed in strict accordance with the manufacturer's recommendations and the contract material specifications. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.
- e. Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean, sound and free from defects. It shall be laid on the prepared foundation, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
- f. When cutting short lengths of pipe, a pipe cutter, as approved by the Engineer, will be used and care will be taken to make the cut at right angles to the centerline of the pipe or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder, or coarse file to match the manufactured taper.
- g. During times when pipe laying is not in progress, the open ends of pipe shall be closed and no trench water or other material shall be permitted to enter the pipe.
- h. Where the pipe is laid on a grade of 20% or greater, the laying shall start at the bottom of the slope and proceed upward with the bell end of the new pipe upgrade. All pipe laid on a grade of 20% or greater shall require thrust blocking or keying as shown on the drawings and standard details.
- i. Where pipelines of different materials are joined together, a standard sewer repair coupling shall be used. The couplings shall be Eastern Standard Sewer Repair Couplings (Mission Rubber Company), the Fernco Joint Sealer Company or an equal product approved by the Engineer.
- j. All gravity sewers shall have minimum 12" vertical separation from storm sewer and shall have minimum 10'-0" horizontal separation from water mains or 18" vertical separation below the bottom of the water main. In the event these separations cannot be met, sanitary sewer and the water main, if applicable, shall be constructed of ductile iron pipe as directed by the Engineer or as shown on the drawings. In addition, all gravity sewers shall have a minimum 100'-0", horizontal separation from wells or other water supplies.

2. Manholes:

- a. Sanitary sewer manholes shall be installed at each break in line or grade in each sanitary sewer line as shown on the contract drawings.
 - b. The manhole foundation shall be prepared so as to provide a firm, level area on which to place the precast concrete manhole base section. When poor foundation soil is encountered or excess groundwater exists, the foundation shall be excavated 12" below the final subgrade elevation backfilled with washed stone to provide a proper foundation.
 - c. The manhole sections shall be lifted from the side of the excavation to the bottom of the trench with equipment and support slings capable of safely handling the heavy concrete pieces. The manhole shall be set plumb and adjusted to the final finished surface grade with brick and mortar.
 - d. Pipe openings shall be exactly aligned to that of the pipe entering and leaving the manhole. The gravity sanitary sewer pipe lines shall be placed in the manhole openings, properly aligned, and set to grade. Sanitary sewer shall be connected to the manholes using lock joint flexible manhole sleeves or equal.
 - e. For large diameter pipe where a flexible rubber sleeve is not available, the pipe line shall be sealed into the manhole using an expanding type or non-shrink type grout.
 - f. For manhole steps, refer to the precast manhole section above.
3. Manhole Frames and Covers: The frame and cover shall be properly set in a bed of mortar and aligned to fit the top section of the manhole. Concrete brick, set in mortar, shall be used to adjust the top of the frame and cover to finished grade; however, no more than four (4) courses of brick will be used for adjustment.
4. Manhole Inverts:
- a. Manhole inverts and benches shall be constructed in accordance with the standard details shown on the drawings. Invert shall be a U-shaped channel with a height of 0.8 of the diameter and be a smooth continuation of the pipe. The benches shall be constructed with a slope of 1" per foot to the channel.
 - b. The channel and invert shall be constructed with a minimum of 2000 psi concrete or brick fill with concrete finish minimum 1" thick. Where sewer changes directions at the manhole, channel shall be constructed with a smooth curve with as large a radius as the diameter of the manhole will allow.
5. Manhole Drops: Standard drop manholes will be constructed only at those locations shown on the drawings or as approved by the Engineer. The design of the drop connection shall be in accordance with the standard detail drawing. The cost of the extra pipe, labor, etc. required to construct a drop manhole will be included in the unit price for the drop manhole at the depths listed.

6. Manhole Vents:

- a. Where designated on the contract drawings, a 4" diameter vent pipe shall be installed as an integral part of the manhole. The vent pipe is to be tapped into the upper most section of the manhole, anchored in concrete and extended vertically to the elevation shown on the drawings. The pipe shall have a reverse bend and screen to prohibit rain and foreign materials from entering pipe.
- b. The pipe material shall be Schedule 40 Galvanized Steel with two coats of epoxy paint approved by the Engineer.

7. Fittings (Force Main):

- a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed. Thrust blocks shall be made of concrete and shall bear directly against the undisturbed trench wall. Where possible, the backing shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a polyethylene film placed between the fittings and the poured concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer.
- b. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.
- c. Concrete for thrust blocks shall consist of a mix of Portland Cement, fine and coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM Specifications C 39 or C 42. Sakrete or any similar material will not be permitted under any circumstances.

8. Gate Valve and Valve Box (Force Main):

- a. When shown on the contract drawings, a standard gate valve shall be installed in the sanitary sewer force main. Before setting each valve, the Contractor shall make sure the interior is clean and shall test the valve for proper opening and closing. Valves shall be set with stems plumb, unless horizontal installation is called for on the drawings, and at the exact location(s) shown on the drawings.
- b. A standard type valve box shall be installed over each underground sanitary sewer force main valve. All valve boxes shall be set plumb with their top set flush with the finished grade.
- c. Trench backfill shall be properly tamped for a distance of 3'-0" on each side of the valve and valve box.

9. Sewage Combination Air Relief Valve (Force Main):

- a. A sanitary sewage combination air relief valve shall be installed at the locations shown on the contract drawings and the actual high points in the line.
- b. A combination air relief valve installation, as shown in detail in the contract drawings, shall consist of the force main tap, air relief valve, precast concrete manhole sections, and standard heavy duty iron frame and cover.

10. Exposed Pipe:

- a. Exposed pipe to be installed inside tanks, wetwells, vaults and buildings shall be installed as shown on the Drawings and field painted as described below. All exposed ductile iron pipe shall utilize flanged joints unless otherwise noted.
- b. All exposed cast or ductile iron pipe, fittings and valves shall be field painted with two (2) coats of epoxy paint as recommended by the paint manufacturer. Color of paint shall be as selected by the Owner.

C. Backfilling and Compaction:

- 1. Backfill trenches immediately after approval of the pipeline construction.
- 2. Pipes:
 - a. PVC pipe shall be installed using Class I embedment for 6" below the pipe and to the spring line per the standard detail. Class I embedment shall be defined as #67 washed stone or approved equal per NCDOT Standard Specifications. No additional payment shall be made for Class I embedment for PVC pipe.
 - b. For DIP pipe with backfill material other than Class I embedment, use backfill carefully placed in uniform layers not exceeding 6" in thickness to a depth of 2'-0" over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2'-0" over top of pipe to top of trench, shall be backfilled with a material containing no rocks larger than 6" in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4" in diameter will be allowed.
 - c. Moisten backfill above 2'-0" over the top of the pipe and place in 8" layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.
 - d. Foundation stone as required for wet or unstable conditions per the details, shall be defined as #57 or #67 stone per NCDOT Standard Specifications or approved equal. Foundation stone shall be used only as

directed by the Engineer and payment shall be per the contract unit prices for undercut.

3. If material excavated from the trench is unsuitable to be used as backfill, "select backfill" shall be transported to the site by the Contractor from outside the project limits to be used as backfill material. Material excavated in conjunction with the construction of the project is not considered "select backfill" for payment purposes.
4. Roadways and Road Crossings: Use backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2'-0" of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and color as the adjacent roadway.
5. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the Standard Proctor Test (100% for the top 2'-0" of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.
6. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
7. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.
8. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.
9. Cleanup:
 - a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.
 - b. Cleanup and seeding is part of the pipeline installation. No more than 3,000 LF of sewer line may be laid prior to completion of cleanup of the first section of pipeline laid. To facilitate this the Owner reserves the right

to withhold up to 30% of the unit price bid for sewer line if in the opinion of the Owner and Engineer completed sections have not been properly cleaned.

3.02 QUALITY CONTROL

A. Testing:

1. Line Cleaning:

- a. Prior to inspection of any section(s) of gravity sanitary sewer pipe or force main the Contractor shall completely clean the lines of all debris, silt, etc. The pipe line shall be ready for use by the Owner and shall be proved to be in first class condition and constructed properly in accordance with the drawings and specifications,
- b. The Contractor shall maintain the project, insofar as his construction work is concerned, in first class condition for such time as is necessary to satisfy the Engineer that all installations are correct and acceptable.

2. Inspection and Testing (Gravity Sewer):

- a. Alignment and grade between manholes shall be tested by the Engineer by flashing a light between manholes. A full circle of light shall be seen when reviewed from the adjoining end of the line. All defects disclosed as a result of this test shall be corrected by the Contractor at his expense.
- b. PVC pipe shall pass a go-no go Mandrel sized to 95% of the pipe diameter with the pipe in place and properly backfilled. All pipe which will not pass the Mandrel shall be relaid or replaced by the Contractor at no additional cost. The allowable deflection (less than 5%) shall be calculated using the pipe stiffness formula in ASTM D 2321. The mandrel test shall not take place until the final backfill has been in place for 30 days (minimum).
- c. When the sewers are completed they shall be inspected by the Engineer for conformance with the provisions of the plans and specifications, particularly line and grade, and tested to determine the amount of ground water infiltration into the sewer. All visible and audible leaks will be stopped and the remaining infiltration will be measured using a V-notch weir and/or other devices, which shall be furnished by the Contractor. The Contractor shall also furnish all required assistance for measuring the infiltration.
- d. If infiltration into the whole system or any segment thereof exceeds 100 gallons per 24 hours per inch of diameter per mile of sewer, necessary corrective measures shall be taken by the Contractor to limit the infiltration to the maximum specified above. The Engineer shall decide the number and length of segments of sewer line on which the testing shall be performed.
- e. All gravity sanitary sewer lines shall be subjected to a low-pressure air test to determine the presence of damaged pipe or faulty installation. The

Contractor will furnish all facilities and personnel for conducting the test(s).

- f. The acceptance air test shall be made after backfilling has been completed and compacted and in the presence of the Engineer. The test shall be performed as described under ASTM C 828, latest edition, Standard Practice for Low Pressure Air Testing of V.C. Pipe lines.
- i. Compressor capacity shall be sufficient to pressurize the sewer main to 4 PSIG within a time equal to or less than the required test time. The following equation may be used to ensure compliance with this requirement:

$$C = \frac{0.17 \times D^2 \times L}{T} + Q$$

Where: C=Required Compressor Capacity (cfm)

T=Required Test Time (min)

D=Pipe Internal Diameter (feet)

L=Length of Test Section (feet)

Q=Allowable Air Loss Rate (cfm)

Pipe Size	Q (cfm)	Pipe Size	Q (cfm)
4"	2.0	15"	4.0
6"	2.0	18"	5.0
8"	2.0	21"	5.5
10"	2.5	24"	6.0
12"	3.0		

- ii. The sewer section shall be plugged at both ends and air pressure shall be applied until the pressure inside the pipe reaches 4 PSIG. When a stable condition has been reached, the pressure shall be bled back to 3.5 PSIG. At 3.5 PSIG, the time and pressure shall be observed and recorded. If groundwater is present at the sewer, the height of the groundwater above the top of the pipe shall be added to the above air pressure readings (height of water in feet X 0.433 = air pressure in psig). A minimum of five (5) readings will be required for each test.
- iii. If the time for the air pressure to decrease from 3.5 PSIG to 2.5 PSIG is equal to or greater than that shown in the following table, the pipe shall be presumed to be free from defect. When these times are not attained, pipe breakage, joint leakage, or leaking plugs are indicated and the cause must be determined and corrected. After repairs have been made, the sewer sections shall be retested. This process shall be repeated until all sewer sections pass the air tests.

Minimum Test Time for Pipe									
Length Tested	Pipe Size								
	4"	6"	8"	10"	12"	15"	18"	21"	24"
25	0:04	0:10	0:17	0:22	0:26	0:31	0:36	0:44	0:53
50	0:09	0:20	0:35	0:44	0:53	1:02	1:12	1:29	1:47
75	0:13	0:30	0:53	1:06	1:20	1:34	1:48	2:14	2:40
100	0:17	0:40	1:11	1:29	1:47	2:05	2:24	2:58	3:33
125	0:22	0:50	1:29	1:51	2:13	2:36	3:00	3:43	4:27
150	0:26	1:00	1:47	2:13	2:36	3:00	3:43	4:27	5:20
175	0:31	1:10	2:04	2:35	3:07	3:39	4:12	5:12	6:14
200	0:35	1:20	2:22	2:58	3:33	4:10	4:48	5:57	7:07
225	0:40	1:30	2:40	3:20	4:00	4:41	5:24	6:41	8:00
250	0:44	1:40	2:58	3:42	4:27	5:13	6:00	7:26	8:54
275	0:49	1:50	3:16	4:05	4:53	5:44	6:36	8:10	9:41
300	0:53	2:00	3:33	4:27	5:20	6:15	7:12	8:55	10:41
325	0:58	2:10	3:51	4:49	5:47	6:47	7:48	9:40	11:34
350	1:02	2:20	4:09	5:11	6:14	7:18	8:25	10:24	12:29
375	1:06	2:30	4:27	5:34	6:40	7:49	9:01	11:09	13:21
400	1:11	2:40	4:45	5:56	7:07	8:21	9:37	11:54	14:14
425	1:15	2:50	5:02	6:18	7:34	8:52	10:13	12:38	15:08
450	1:20	3:00	5:20	6:40	8:00	9:23	10:49	13:23	16:01
475	1:24	3:10	5:38	7:03	8:27	9:54	11:25	14:07	16:55
500	1:29	3:20	5:56	7:25	8:56	10:26	12:03	14:52	17:48
525	1:33	3:30	6:14	7:47	9:21	10:57	12:37	15:37	18:42
550	1:38	3:40	6:31	8:09	9:47	11:28	13:13	16:21	19:35
575	1:42	3:50	6:49	8:32	10:14	12:00	13:49	17:06	20:28
600	1:47	4:00	7:07	8:54	10:41	12:31	14:25	17:51	21:22

- iv. For testing a sewer system with one or more installed service lateral pipes, an effective pipe length shall be added to the total sewer main pipe length. The equation used to calculate Effective Pipe Length is as follows:

$$L_e = \frac{d^2 \times L}{D^2}$$

Where: L_e = Effective Pipe Length (added to Total Test Length)

d = Diameter of Service Lateral Pipe

L =Length of Sewer Lateral

D =Diameter of Sewer Main Pipe being Tested

- g. Failure of any section of the pipeline to meet the requirements of this test shall cause the Contractor to determine, at his own expense, the source(s) of leakage, and repair or replace all defective materials or workmanship. The repaired section(s) of line shall be re-tested to insure conformance with the requirements of these contract specifications.

3. Inspection and Testing (Force Main):

- a. When the sanitary sewer force main is completed, the Engineer shall inspect the line for conformance with the provisions of the drawings and specifications, particularly with respect to alignment and depth.
- b. All newly constructed sanitary sewer force main and valved sections shall be subjected to a hydrostatic pressure-leakage test. Force mains shall be tested in sections not to exceed 4,000 lineal feet per test section. The Contractor shall install sufficient additional valves if not shown on the drawings to allow testing.
- c. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. As the main is being filled with water in preparation of the test, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure of 100 pounds per square inch for a period of two hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.
- d. The rate of leakage shall be determined at 15-minute intervals by means of volumetric measure of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.
- e. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the leakage is less than ten (10) gallons per inch of pipe diameter per mile of pipe per 24 hours.
- f. Cracked or defective pipe, joints, fittings, or valves discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.
- g. Tests of insulated and concealed piping shall be made before the piping is covered or concealed. No leakage will be allowed under the above tests for piping in buildings, structures or on bridges.
- h. The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water and materials, including meters and gauges, shall be furnished by the Contractor at his own expense.

4. Inspection and Testing (Manholes): Manholes shall be constructed to provide a true circular inside diameter with properly corbeled tops, satisfactory inverts and properly placed steps and castings. Any visible leaks in the manholes shall be completely stopped to the satisfaction of the Engineer.

B. Final Acceptance:

1. The Engineer will notify the Contractor, in writing, as to the satisfactory completion of the work in any or all sections of gravity sanitary sewer pipe, force main and manholes, included in the project.
2. Upon such notification, the Contractor shall immediately remove all construction equipment, excess materials, tools, debris, etc. from the site(s) and leave the same in a neat, orderly condition acceptable to the Engineer.
3. Final landscaping requirements and restoration of surfaces shall then be completed by the Contractor in accordance with their respective specifications and as shown on the drawings.

END OF SECTION

SECTION 02731

SANITARY SEWER SERVICE CONNECTION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered under this section shall consist of furnishing all materials, labor, equipment, and services for the complete installation of a sanitary sewer service connection from the sanitary sewer (gravity) main line to the edge of the property to be served as shown on the project drawings.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Main line connections shall use a "wye" branch constructed by the same material as the main line.
- B. Sewer service lines shall be constructed of either PVC (Schedule 40) or Ductile Iron (CL350) as shown on plans.
- C. When joining pipes of different materials, a flexible, watertight, rubber transition coupling shall be used.

PART 3: EXECUTION

3.01 INSTALLATION

A. Connection to Main:

The standard sewer service connection shall be 4" in diameter unless shown otherwise on the drawings, and shall connect to the main at a "wye" branch connection installed with the pipe line as it is being laid. The "wye" branch shall be of the same material as the main pipe line. Direct taps into the sewer main will not be acceptable unless approved by the Engineer prior to the laying of the main line.

B. Connection to Manhole:

When shown on the drawings or directed by the Engineer, a sewer service connection shall be made into a manhole. The connection shall be made at the manhole invert. The invert shall be rebuilt so as to provide a smooth transition from service connection to main line. Inverts and benches shall be constructed in such a way as to prevent the deposition of solids in the manhole.

C. Service Lines:

The service line shall be installed from the "wye" branch connection to the edge of the public or utility right-of-way as shown on the plans.

Less than 3'-0" of cover will require the use of ductile iron pipe.

D. Cleanout And Plug:

At the edge of the public or utility right-of-way, a "cleanout" shall be installed. The cleanout shall consist of a "wye" branch connection, 45° bend, riser pipe, and threaded plug installed flush with finished ground elevation.

The end of the utility owner's sewer service connection shall terminate at the end of the pipe which will normally extend five feet beyond the "wye" branch for the cleanout. A watertight plug shall be installed at the end of this line until such time as the property owner directs the utility owner to connect his facilities to the sewer system.

END OF SECTION

SECTION 02740

BORE AND JACK INSTALLATION FOR UTILITIES

INCLUDING GUIDED AUGER BORING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this Section includes furnishing all labor, materials and equipment required to bore and jack casings, including guided auger boring, and to properly complete pipeline installation inside casings as described herein and/or shown on the Drawings.
- B. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable.

1.02 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Material Submittals: The Contractor shall provide shop drawings and other pertinent specifications and product data as follows:
 - 1. Shop drawings for casing pipe showing sizes, wall thicknesses and yield strengths.
 - 2. Design mixes for concrete and grout.
 - 3. Casing Spacers and End Seals.
 - 4. Joint Restraint System for carrier pipe

1.03 STORAGE AND PROTECTION

- A. All materials shall be stored in accordance with the manufacturer's recommendations and as approved by the Engineer.

PART 2: PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

- A. Casing:
 - 1. The casing shall be new, unused pipe. The casing shall be made from steel plate having a minimum yield strength of 35,000 psi. The steel plate shall also meet the requirements of ASTM A 36.

2. The thicknesses of casing shown in paragraph B below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired by the Contractor.

Minimum Casing Sizes

Casing Pipe Diameter	Minimum Wall Thickness (Roadways)	Minimum Wall Thickness (Railways)
10"	0.188	0.188
12"	0.188	0.251
16"	0.250	0.312
18"	0.250	0.313
20"	0.250	0.375
24"	0.250	0.407
30"	0.312	0.469
36"	0.375	--

- B. Casing Spacers: Casing spacers shall meet one of the following requirements:
1. Casing spacers shall create a non-metallic contact between the casing pipe and carrier pipe. Spacer segments shall be secured around carrier pipe by stainless steel bands. Each casing spacer shall have full length, integrally molded skids. Skids shall be of a material to create a non-metallic contact between the casing pipe and carrier pipe.
- C. Joint Restraint System for Carrier Pipe: Joint restraint systems shall be EBBA IRON Megalug, Ford Uni-Flange, Romac RomaGrip or an approved equal.
- D. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall iron pins.
- E. End seals shall be modular elastomer sealing systems with stainless steel bolts driving stainless steel force dispersion plates such as LinkSeal. Ends seals shall create a non-metallic contact between the casing pipe and carrier pipe.

PART 3: EXECUTION

3.01 GENERAL

- A. Interpretation of soil investigation reports and data, investigating the site and determination of the soil conditions is the sole responsibility of the Contractor. Any subsurface investigation performed by the Contractor must be approved by the appropriate authority having jurisdiction over the site.
- B. Casing construction shall be performed so as not to interfere with, interrupt, or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore all property to its original or better condition.
- C. Face Protection: The face of the excavation shall be protected from the collapse of the soil or from debris entering the casing space.
- D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be coordinated with Engineer and shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required.
- E. Highway Crossings:
 - 1. The Contractor shall be responsible and accountable for the coordinating and scheduling of all construction work within the highway right-of-way.
 - 2. Work along or across the NCDOT rights-of-way shall be subject to inspection by NCDOT.
 - 3. All installations shall be performed to leave free flow in drainage ditches, pipes, culverts or other surface drainage facilities of the highway, street or its connections.
 - 4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway.
 - 5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight.
- F. Railroad Crossings:
 - 1. The Contractor shall secure permission from the Railroad to schedule work so as not to interfere with the operation of the Railroad.

2. The Contractor shall satisfy all permitting and insurance requirements of the railroad prior to beginning any work.
3. All work on the Railroad right-of-way including necessary support of tracks, safety of operations and other standard and incidental operation procedures may be under the supervision of the appropriate authorized representative of the Railroad affected and any decisions of this representative pertaining to construction and/or operations shall be final and construction must be governed by such decisions.
4. The Contractor shall be responsible for maintaining an executed copy of the bore permit from the appropriate authority at all times.
5. Contractor shall be responsible to pay for all railroad permit and inspection fees.

3.02 GROUNDWATER CONTROL

- A. The Contractor shall control the groundwater throughout the construction of the casing.
- B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect the settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.
- C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Contractor shall be responsible for managing dewatering operations in compliance with applicable rules.

3.03 SURFACE SETTLEMENT MONITORING

- A. Provide and monitor surface settlement markers, placed as specified.
- B. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the direction of the project Engineer or jurisdictional owner.
- C. Promptly report any settlement or disruption to surface features to the Engineer.

- D. Injection grouting into the annular space around the casing pipe may be considered by the Engineer and jurisdictional authority as a mitigating measure for settling.

3.04 BORING AND JACKING

A. Shaft:

1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.
2. The shaft shall be rectangular and excavated to a width and length required for ample working space. Provide sheeting and shoring and other safety measures abiding by common safety requirements including OSHA. Keep preparations dry during all operations. Perform dewatering operations as necessary.
3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel or concrete sub-base to accommodate soil conditions.

B. Jacking Rails and Frame:

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the installing.
2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.
3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

- C. Boring and jacking of casing pipes shall be accomplished by the auger boring method without jetting, sluicing or wetboring.

- D. Auger the hole and jack the casing through the soil simultaneously. Execute boring ahead of the casing pipe with extreme care, in proportion with the rate of casing pipe penetration.

- E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe installed.
- F. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed and the alignment and grade checked at minimum intervals of 60 feet.
- G. Any casing pipe damaged in jacking operations shall be repaired or removed and replaced.
- H. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire circumference, in accordance with American Welding Society and applicable ASTM recommended procedures, Making watertight seal. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square and clean.
- I. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.
- J. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.
- K. Care shall be taken to ensure that casing pipe installed by the boring and jacking method will be at the proper alignment and grade.
- L. All surplus material shall be removed from the site and legally disposed of at the Contractor's expense. The excavation shall be finished flush with the surrounding ground.

3.05 GUIDED AUGER BORING AND JACKING (GUARANTEED BORE)

- A. Where line and grade accuracy is required or where Guided Auger Boring is specified, either pilot tube or steerable head methods may be utilized.
- B. Where indicated, line and grade shall be controlled with a guiding system including, at a minimum, a guided boring machine, targeting and guiding systems, a computer controlled digital monitor, and a steering head.
- C. The steering system shall be capable of horizontal and vertical accuracy of 0.25 inch over 400 feet.

- D. GUARANTEED BORE shall mean that the tolerance listed in paragraph C above is met.

3.06 ROCK EXCAVATION

- A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the Engineer, cannot be removed through the casing, the project Engineer may authorize the Contractor to complete the crossing using an alternate method.
- B. At the Contractors option the Contractor may continue to install the casing, and remove the rock through the casing.

3.07 INSTALLATION OF CARRIER PIPE

- A. After construction of the casing is complete, and has been accepted by the Engineer, install the pipeline in accordance with the Drawings and Specifications.
- B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper grade without any sags.
- C. The carrier pipe shall be held in the casing pipe by the following method:
 - 1. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a casing spacer within 1 foot of each side of pipe bell and in the center of each carrier pipe joint (three spacers per pipe segment). A casing spacer shall also be placed within 1 foot of each end of the casing pipe. Casing spacers shall be attached to the pipe per the manufacturer's instructions.
 - 2. Carrier Pipe Restraint: Each joint of carrier pipe shall be equipped with joint restraint as described Under Products section. Joint restraint shall be installed per manufacturer's instructions.

END OF SECTION

SECTION 02750

DUPLEX SUBMERSIBLE SEWER PUMP STATION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This specification covers the requirements for furnishing and installing a duplex submersible sewer pump station along with all appurtenances and auxiliary systems.
- B. Furnish all labor, equipment, materials and incidentals necessary to install and complete duplex submersible sewer pump station installation in accordance with the plans and specifications. All materials and equipment shall be of the type and class specified herein.
- C. All excavation, bedding, assembly, and backfilling shall be completed as described herein.

1.02 SUBMITTALS

- A. The Contractor shall provide six (6) copies of shop drawings or submittals for the following:
 - 1. Precast concrete items.
 - 2. Electrical and controls equipment.
 - 3. SCADA and/or telemetry equipment.
 - 4. Pumps and auxiliary equipment.
 - 5. Generator and auxiliary equipment including Automatic Transfer Switch.
 - 6. Pipe, fittings, valves, appurtenances.
 - 7. Control panel rack design, including rain hood.
 - 8. Lighting equipment.
 - 9. Fencing and security equipment (may be specified elsewhere in project manual.)
 - 10. Odor control equipment if specified.

1.03 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall unload equipment so as to maintain and protect its originally manufactured quality and integrity. Contractor shall be responsible for procuring a suitable area for unloading and storing equipment and keeping it secure.
- B. If any defective material is discovered, it shall be removed and replaced and shall not become part of the constructed infrastructure.

1.04 WARRANTY

- A. All materials shall be guaranteed to be free from defects in materials and workmanship for a minimum of one (1) year after final acceptance by the Owner unless otherwise specifically noted.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Pumps: Pumps shall be submersible, non-clog type with recessed vortex style impeller and FM listed explosion proof submersible motor. Pumps shall be provided from one manufacturer, of the same model number, and possess the same duty point on their operating curve.

Cited examples of equipment brand names and/or manufacturers are used only to set forth and convey to bidders the general style, type, character and quality of product desired; equivalent products may be accepted as determined by the Engineer.

Pumping conditions shall be: 90 GPM @ 100' TDH
Selected pump will possess operating point nearest the optimum efficiency for the selected pump.

Power conditions shall be: 3-phase, 480V
***Contractor shall confirm power availability and coordinate with power company to bring service to the site.**

Each pump shall operate on a dual guiderail system and shall be designed for automatic connection to discharge elbow. All openings shall be designed to pass a 3" diameter sphere. Discharge flange shall be 4" standard.

Pump on/off levels shall be set such that the pumps cycle between 2 and 8 times per hour. Controls shall include an alternating relay switch (with LED indicator) such that the pumps alternate between cycles. Run time meters for each pump shall be included.

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be type 304 stainless steel construction. All metal surfaces coming into contact with sewage, other than stainless steel or brass, shall be coated with a factory applied epoxy coating system.

1. Factory Tests: The pumps shall be tested at the factory under simulated field conditions for vibration, leaks, and operation of all automatic systems. For each unit, a certified pump performance curve shall be produced from the factory testing, identifiable by serial numbers of pumps and motors.

2. Warranty: Pump manufacturer shall warrant the supplied units against defects in workmanship and material for a period of five (5) years or 10,000 hours under normal use, operation and service. The warranty shall be provided in writing.
3. Sealing Design: Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Seal shall be obtained by controlled compression of rubber O-rings without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.
4. Cooling System: Each unit shall be provided with an adequately designed cooling system. The water jacket shall encircle the stator housing; thus, providing heat dissipation for the motor regardless of the type of installation. Impeller back vanes shall provide the necessary circulation of the cooling liquid through the water jacket. The cooling media channels and ports shall be non-clogging. Provisions for external cooling and seal flushing shall also be provided. The cooling system shall provide for continuous pump operation in liquid temperature of up to 104 °F.
5. Cable Entry Seal: The cable entry seal system shall provide a competent watertight seal without specific torque requirements. The cable entry shall be of the poured seal cap type. The cable entry junction chamber and motor shall be separated by a terminal board, which shall seal off the pump/motor interior.
6. Motor: The motor and the pump shall be produced by the same manufacturer and UL and FM approved. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180 °C (356 °F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing.
 - a. Heat Sensor: A heat sensor thermostat shall be imbedded in top of winding and be connected in series with the motor starter coil in control box to stop motor if temperature rises in motor to over 220° F for any reason. Thermostat to reset automatically when temperature drops to a safe limit.

- b. Moisture Sensor: Motors shall be equipped with a moisture sensor which signals an alarm if moisture is present between the two seals.
7. Continuous Duty Design: The motor shall be designed with a 1.15 service factor and for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. Rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. Wire nuts or crimp-type connectors shall not be accepted.
8. Voltage Tolerance: The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.
9. Power Cable: The power cable shall be UL and FM approved and sized according to the NEC and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet. Power cable length for each pump shall be sufficient for each pump to operate in either position in the wet well.
10. Motor Horsepower: The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.
11. Bearings: The pump shaft shall rotate on at least two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single roller bearing. The lower bearing shall be a two row angular contact ball bearings to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.
12. Mechanical Seal: Each pump shall be provided with a tandem mechanical shaft seal system consisting of two independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower (primary) seal unit shall contain corrosion resistant silicon-carbide rings. The upper (secondary) seal unit shall contain silicon-carbide seal rings. Each seal interface shall be held

in contact by its own spring system. The seals shall require neither maintenance nor adjustment.

13. Lubricant Chamber: Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication.
14. Pump Shaft: Pump and motor shaft shall be the same unit. Shaft couplings shall not be acceptable. The pump shaft shall be of carbon steel C1035 and shall be completely isolated from the pumped liquid.
15. Impeller: The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long throughlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be keyed to the shaft, retained with an expansion ring and shall be capable of passing a minimum three (3) inch diameter solid. Impellers shall be coated with an acrylic dispersion zinc phosphate primer.
16. Wear Rings: A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet. The pump shall also have a stainless steel impeller wear ring heat-shrink fitted onto the suction inlet of the impeller.
17. Volute: Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

Provide the following spare parts at a minimum: any and all special tools required for maintaining or working on the pump, name of the authorized motor rewind shop for the supplied pump motor, impeller trimmed same as original equipment, mechanical seal, wear ring, etc.

Pumps pre-approved for use are Grundfos SE/SL series and Flygt N-pump series.

- B. Motor Starters: Square D NEMA-rated motor starters shall be used. Furnish and install across the line type magnetic motor starters, unless otherwise specified or recommended by the selected pump supplier and approved by the Engineer. Motor starters shall be sized and provided by pump/motor manufacturer or supplier and warranted by same. Starter shall be 3 pole, with three electronic

overloads, for 480V three phase motor. There shall be provided a red run indicator light, a three position "Hand/Off/Auto" selector switch and a run-time meter. Cover shall also include yellow "seal fail" and "thermal overload" lights for each pump.

NOTE: Motor starters, wiring, conduits and other affected pump controls shall be sized so that pumps, up to twice the horsepower specified herein, may be installed without the need to upgrade these components.

1. Variable Frequency Drives (VFDs): Where required to achieve 3-phase power, provide VFDs for phase/voltage conversion.

Service available from grid:	3-phase, 480V
Service required for pumps:	3-phase, 480V (no VFD required)

- C. Wet Well and Valve Vault Construction: Wet wells and vaults shall be pre-cast concrete, manufactured in accordance with ASTM C478, minimum compressive strength 4,000 psi. Wet wells shall be cylindrical and minimum 6-foot diameter.

The bottom circumference shall be filleted to keep settled solids toward the middle of the wet well.

Joints shall be sealed with butyl rubber mastic per ASTM C990. The exterior of the joints shall be sealed with 6-inch butyl mastic tape. The interior of the joints shall be sealed neatly with non-shrink grout.

Interior surfaces of wet wells shall be completely coated with an approved epoxy liner system. Epoxy system shall be 100% solids, solvent-free two-component epoxy resin with select fillers to minimize permeability and provide sag resistance per the following minimum requirements:

Hardness, Shore D	ASTM D-2240	88
Tensile Strength	ASTM D-638	>7000 psi
Flexural Strength	ASTM D-790	>10000 psi

Epoxy liner shall be Raven 405, manufactured by Raven Lining Systems or approved equal.

Adequate wet well ventilation shall be included. Ventilation shall be through the top of the wet well. Vent shall be installed flush with bottom of wet well top, not protruding into wet well. Vent pipe shall include a stainless steel mesh screen.

The valve vault shall be of adequate size to house all piping, equipment and appurtenances, providing minimum 12-inch clearance between vault walls and floors and all working parts and all flange bolts. The valve vault shall be

constructed so that flooding of the vault will not occur. The vault top shall include an integrally cast aluminum access hatch, such as by Halliday Products, sized adequately for service/removal/replacement of equipment.

- D. Piping Connections to Wet Wells: All piping connections to wet wells shall be performed in a manner consistent with standards for piping connections to manholes. Preferably, wet wells shall be ordered with factory fabricated and booted holes for piping connections. If field connections must be made, then holes shall be professionally cored and piping shall be booted or professionally grouted securely into place.
- E. Access Hatches: Access hatches shall be of high quality aluminum angle frame construction bearing a 300psf rating and a locking hasp. Access hatches shall be by Halliday Products or an approved equal.
- F. Pump Hoist: If specified, a pump hoist shall be provided. The hoist shall be tall enough to remove the pumps fully from the wet well. The hoist and crank shall be sized to lift at least 2 times the weight of the pumps installed in the new pump station or 2 times the weight of largest size pump expected to be needed at the site. The hoist and all associated parts, mechanisms and accessories shall be of stainless steel.
- G. High Level Alarms: High level floats and indicators shall be set per the standards of 15A NCAC 2T .0200. Pump station controls shall be configured to initiate a horn/buzzer and light beacon in the event of high wet well levels. The control panel shall be configured such that the high water alarm initiates an auto dialer to alert the Town of Pittsboro of the high water situation. A placard with an emergency phone number shall be placed in plain view on the pump station site.
- H. Pump Station and Wet Well Appurtenances: Materials and equipment used on pump station sites, especially those within wet wells, shall be quality stainless steel and aluminum materials manufactured for outside use and use within corrosive environments. Galvanized and carbon steel materials will not be accepted where better quality stainless steel, aluminum or other corrosion/rust resistant materials are available. Wet well components shall be located and installed such that normal routine maintenance activities may be performed without the necessity of physically entering the wet well.

Within wet wells, stainless steel materials shall be used wherever possible, such as for rails and chains, nuts and bolts, connectors, etc.

Above ground equipment shall be constructed or enclosed to protect from weather. NEMA (3R or better) enclosures shall be used for electric and control panels. Electrical components including conduit shall be designed and installed in accordance with NEC and NEMA standards for outdoor installations.

- I. Pump Guide Rails: Pump guide rails shall be Schedule 40 stainless steel and shall be installed straight and plumb. The Contractor shall be required to demonstrate removal and replacement of each pump prior to the accepting the work as complete. Pump removal and replacement shall be performable with reasonable ease.
- J. Pump Station and Discharge Piping and Fittings: All piping and fittings within pump stations and discharge structures shall be ductile iron, conforming to the same standards as those for water distribution. Fittings shall be appropriately and adequately restrained.

Uniflanges shall NOT be used in wet wells. Dresser couplings shall not be used in wet wells without approval of the Engineer. If Dresser couplings are approved, standard mechanical joint Dressers shall be used.

- K. Bypass Pumping Connection: A minimum 4-inch quick disconnect fitting for connecting bypass pumping equipment shall be integral to the design and construction of discharge piping. Quick disconnect fittings shall be located such that they are easily accessed for use. The bypass piping shall connect to the discharge force main downstream from the isolation valve and check valve.
- L. Controls and Control Panels: Pump controls shall be housed in a stainless steel NEMA 3R minimum enclosure with locking hasp. The panel shall include a 3-pole circuit breaker for each pump and a magnetic contactor with quick trip ambient compensated overload block for each pump. Incoming power shall be 480 volt, 3 phase (unless otherwise specified), connected to a terminal strip at the panel entry. Control power shall be 120 volts. If required, provide a properly sized control power transformer with primary over current protection. Individual 20 amp single pole breakers shall be provided in the panel for the pump controls and condensation heater. All circuit breakers, selector switches, pilot lights and control devices shall be visible and operable from an interior deadfront panel.

All electrical and control panels shall be equipped with permanent, weatherproof labels attached with stainless steel screws. Adhesive labels shall not be accepted.

- 1. Lower voltage circuits for accessories including but not limited to alarm dialer (if required), utility receptacles, generator battery charger and block heater, area and panel lights, etc. shall be provided on a separate 120 volt branch (mini power zone). If required to form the mini power zone, provide a properly sized transformer with primary over current protection. These circuits shall not be served by the control transformer.
- 2. Float Switches: Provide 24 volt intrinsically safe DC power for the four float switches mounted in the wet well. Float switch activation shall energize 24 volt DC coil relays in the pump control panel. These relays shall seal in the

float position and shall be used for control operations, panel door pilot lights and reporting to the alarm dialer, telemetry or SCADA system.

3. Alternating Pumps: The lead pump shall be alternated after each pump cycle. The lead pump shall be started when the “Lead Pump On” float is activated and shall run until the level drops below the “Pumps Off” float switch. If the inflow wastewater continues to rise to the “Lag Pump On” float level, the second pump shall be started, and both pumps shall run until the level drops below the “Pumps Off” float switch.
4. The “High Water Alarm” float shall be positioned below the “Lag Pump On” float, as indicated on the plans. When the “High Water Alarm” is activated, a flashing red light on top of the panel shall be energized. The “High Water Alarm” shall be wired to the alarm dialer, telemetry or SCADA system to initiate an alert of the alarm situation.
5. Time Delay Relays: The pump control panel shall have adjustable 0.1 to 1 minute time delay relays to prevent simultaneous restarting of pumps after a power outage.
6. Thermal Switches: Each pump shall have thermal switches in the windings of each motor. The pump control panel shall be designed to interrupt the control power to the pump starter to stop the pump when one of the thermal switches opens. The panel shall also have pilot lights in the panel door to indicate the high temperature conditions. The “Thermal Overload Alarm” shall be wired to the alarm dialer, telemetry or SCADA system to initiate an alert of the alarm situation.
7. Seal Chamber Moisture Detection: Each pump shall be equipped with a sensing system to detect moisture in the seal chamber. When moisture is detected in the seal chamber, a pilot light in the panel door shall be energized. The “Seal Failure Alarm” shall be wired to the alarm dialer, telemetry or SCADA system to initiate an alert of the alarm situation.
8. Elapsed Time Meters: Elapsed time meters shall be provided in the pump control panel to record pump run times. A relay or auxiliary contacts shall be provided for each pump that will be energized when the starter is closed. These contacts shall be used for the elapsed time meters and the pump run lights in the panel door.
9. H-O-A Switches: H-O-A switches shall be provided for each pump. A three-way switch shall be provided to control the pump alternations with the positions, “Pump 1 Only”, “Duplex Alternation” and “Pump 2 Only”. The switch shall allow the operator to select Pump 1 or Pump 2 only to respond to the “Lead Pump On” float switch or to have both pumps alternate as lead pump. The switch will normally remain in the “Duplex Alternation” position unless one pump is out of service.

10. Indicator Lights: Provide a red “run” light for each pump. Provide a yellow “seal fail” light for each pump.
11. Alarm Buzzer and Light: A weatherproof buzzer and flashing red light shall be provided to indicate an alarm situation. An alarm “Normal-Test-Silence” switch shall be provided to allow the operator to test the buzzer/light and to allow the buzzer to be silenced even if the alarm situation is present. The light shall be mounted atop the rain hood and visible from off site.
12. Lightning Protection: The pump control panel shall be equipped with a lightning arrester. The arrester shall be silicon oxide varistor type, having minimum current rating of 60,000 amperes and 1500 joules. The case material shall be PVC and the arrester shall be designed for panel service entrance voltage.
13. Phase Failure Relays: Each starter shall be provided with overload and phase failure protection. Devices shall be located between the control transformer and the starter. Each device shall monitor all 3 phases. Phase failure relays shall be Square D. The pump control panel shall have pilot lights in the panel door to indicate phase failure of pump(s). The “Phase Failure Alarm” shall be wired to the alarm dialer, telemetry or SCADA system to initiate an alert to the Owner of the alarm situation.
14. External Wiring Connections: The pump control panel shall be pre-wired so that all external wiring connections can be made on a terminal strip located at the top or bottom of the panel with appropriately sized terminals. Terminal strips shall be located at least 4 inches from the walls of the panel box. A schematic wiring diagram shall be attached to the panel door interior.
15. Condensation Heater: A condensation heater shall be provided inside the pump control panel on its own 15 amp circuit.
16. Alarm Dialer: The alarm dialer shall consist of remote terminal units, cellular communications, central server, alarm notification system and secure web-based user interface. The system shall communicate with central server via cellular radio transmitting data through Transmission Control Protocol (TCP) socket connection, provide encrypted and end-to-end acknowledged transmissions and accommodate radios from various cellular carriers.

The system shall transmit data through cellular radios with private IP addresses that communicate through third and fourth generation GSM and, or CDMA cellular networks. The system shall be capable of communicating via multiple cellular providers, switchable between networks based on signal strength and reliability.

The system provider shall install and initiate the service and provide turn-key service including ongoing relationships with cellular providers, annual managed service, cellular data contracts with cellular carriers and interface with carrier when technical support is required. The system provider shall provide continuous technical support, at all times.

Provider shall obtain approval from cellular providers, accepting cellular radios for use on respective cellular networks in accordance with FCC requirements. This service shall be provided in a continuous, renewable annual service agreement.

The alarm dialer shall initiate an auto dialer to alert of the following events: 1) high water in the wet well; 2) pump thermal overload; 3) pump seal failure; and 4) phase failure. On-board telemetry shall report AC voltage, battery voltage, signal strength and printed circuit board temperature, hourly and dispatch alarms for AC failure, low battery voltage, elevated and low temperature, and loss of communications.

The alarm dialer shall be configured within the pump control panel enclosure unless otherwise approved by the Engineer, in which case the alarm dialer shall be housed in a NEMA 4x enclosure.

An example product meeting these specifications is MyDro150 by Mission Communications. Products meeting or exceeding these specifications may be accepted.

17. Conduit Seal Offs: Conduit connections shall be professionally sealed so as to permanently prevent sewer gases, vapors and moisture from entering control panels or junction boxes. An approved explosion-proof sealant resistant to corrosive sewer gases and vapors shall be used to create a poured seal at all connections.
18. Emergency Power and Automatic Transfer Switch: The control panel shall be integrated with an automatic transfer switch to activate the emergency power generator in the event of a power outage, undervoltage, overvoltage, phase reversal or phase loss.
19. Panel Rack and Rain Hood: Controls panels shall be constructed with an aluminum or stainless steel panel backboard and weather hood covering. The sides and top of the hood shall consist of 1/8-inch aluminum sheets; the back of the hood shall consist of a 3/16-inch aluminum sheet. The top front edge of the rain hood shall incorporate a gutter or no-drip edge. The rain hood and electrical/control enclosures shall be mounted to the posts using 1-5/8" Unistrut channels and Unistrut hardware.

The panel rack hood shall shelter, at a minimum, the transfer switch, pump station control panel, main breaker, alarm dialer and auxiliary outlets. Hood

shall provide a minimum 7-foot clearance. Braces, clamps and connectors shall be stainless steel with plastic washers. Posts shall be 4-inch round galvanized fence posts with maximum 4-foot spacing.

20. Junction Boxes: Electrical connections or junction boxes shall not be placed within vaults or wet wells. Junction boxes shall comply with NEC. Conduit shall be professionally sealed using an approved sealant resistant to corrosive sewer gases and vapors shall be used to create a poured seal at all connections.

Power and control cable connections between the control panel and the wet well shall include a junction box on the outside top or side of the wet well lid. The power cord and control cable junction box shall be stainless steel, NEMA 3R or better and mounted to the concrete structure with Unistrut channel and hardware. Kellam grips shall be used below the box to restrain the power cord.

- M. Emergency Power Generator: If specified, diesel-powered emergency power generators shall be provided, housed in an outdoor-rated enclosure. The generator shall provide sufficient amperage to sequentially start all pumps and operate all equipment onsite.

NOTE: Emergency power generator and automatic transfer switch shall be sized so that pumps up to twice the horsepower specified herein may be installed without the need to upgrade these components.

An integral automatic transfer switch, by the generator manufacturer, shall be supplied and integrated into the control systems.

The generator set engine shall be certified by the Environmental Protection Agency (EPA) to conform to Tier 4 Final nonroad emissions regulations.

The unit shall include or incorporate the following:

1. Heavy-duty air cleaner with air restrictor indicator.
2. Lockable battery disconnect switch.
3. Low coolant level shutdown.
4. Durable steel, sound-attenuating housing with quiet operation of 71 dB(A) log average @ 7 m (23 ft.) with full load at the prime rating.
5. Stainless steel hinges and lockable latches on doors.
6. 125% environmental containment basin for oil and coolant.
7. 110% secondary containment tank for fuel.

8. UL 142 listed subbase fuel tank for 24-hour run time with full load at the prime rating (minimum).
9. Fuel fill and Diesel Exhaust Fluid (DEF) fill with lockable caps.
10. Connection panel with main circuit breaker, remote start connection, and emergency stop switch.

The alternator shall include the following:

1. NEMA MG1, IEEE, and ANSI compliance for temperature rise and motor starting.
2. Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
3. Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
4. Self-ventilated and drip-proof construction.
5. Vacuum-impregnated windings with epoxy varnish for dependability and long life.
6. Rare-earth, permanent-magnet-excited alternator

Generators pre-approved for use are Kohler and Caterpillar.

- N. Potable Water Source: If specified, pump stations shall include a 1-inch potable water service on site. The water service shall be metered and shall be constructed to the standards cited in Water Main Construction specifications. The water service shall terminate with a frost-proof yard hydrant. An approved double backflow preventer shall be included in an approved insulated fiberglass enclosure.
- O. Fencing: The site shall be fully encompassed by a 6-foot tall chain link security fence. Fencing shall be 2-inch mesh fabric of 9-gauge, hot dipped galvanized wire with minimum 1.2 oz. per sq. foot zinc coating. Posts shall be standard O.D. steel pipe (Schedule 40) as follows:

Line posts	1-1/2" weighing not less than 2.72#/foot
Corner & gate posts	3" weighing not less than 5.76#/foot
Top rails, braces, frames	1-5/8" weighing not less than 1.12#/foot

Posts shall be hot dip zinc coated not less than 1.8 oz. per sq. foot. Fence shall be constructed with a bottom tension wire, fastened every 2 feet. Three strands of zinc-coated 12-1/2 gauge wire with 14 gauge 4-point barbs every 5 inches shall be installed at the top of the fence and gate using heavy pressed steel supporting arms.

A double swinging, 12-foot wide gate shall be installed providing easy access from to the pump station site and pump hoist.

- P. Odor Control and Spill Containment: If specified, approved odor control facilities shall be provided. Chemical feed storage tanks shall be constructed or provided with adequate spill containment considerations.
- Q. Lighting: Adequate area lighting shall be provided at the pump station site. The lamp shall be mounted on a pole at least 15 feet high. The pole and mounting method shall be in accordance with the lamp manufacturer's recommendation and normally recognized standards such as those of local power utility. The lamp shall be a box-style lamp, casting light downward and limiting light spread.

The area light circuit shall include a photocell and a toggle switch. The switch shall be located at the panel rack on the 120V circuit. The switch wiring and switch enclosure shall be weather proof and shall meet the minimum NEC requirements.

Panel rack hood light shall include LED lighting under the hood on a dedicated circuit with a weather-proof toggle switch.

- R. Manufacturers: Manufacturer and model information supplied herein are provided for information purposes only, to assist Contractor in selecting equipment that conforms to the Specification and Drawing requirements. In case of any conflict between model numbers provided and the descriptive requirements specified herein, the descriptive requirements shall govern.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Excavation:
1. The work covered by this section consists of the excavation and satisfactory disposal of all materials excavated.
 2. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. The site shall be maintained in a satisfactory condition so that adequate drainage is provided at all times.
 3. The bottom of excavations shall provide a uniform and sufficient bearing surface. If this cannot be attained, the excavation shall be over-excavated at least 6" below the designated grade and backfilled with suitable material thoroughly compacted in place.
 4. Sheeting, Bracing, and Trench Boxes: the Contractor will be required to keep the sides of excavations vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides, to protect installed equipment and to prevent injury.

5. Structures shall be installed and constructed plumb and level.

B. Backfilling and Compaction:

1. All backfill shall be compacted so as not to damage project components and shall be compacted to 95% of the Standard Proctor Test (100% for the top 2'-0" of subgrade beneath pavements) for the various types of backfill material. Select backfill material shall be used when directed by the Engineer.
2. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the project area.
3. Cleanup: Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

3.02 QUALITY CONTROL

- A. Testing: Testing of valves and appurtenances shall be incidental to the testing of the water lines, and shall be performed as part of that testing. The Contractor shall confine all operations and personnel to the limits of construction as shown on the plans. There shall be no disturbance whatsoever of any areas outside the limits of construction nor shall the workmen be allowed to, travel at will through the surrounding private property.
- B. Pump Station Start-Up: Authorized representatives from each major equipment supplier shall be on site for pump station start up. All systems shall be tested and proper operation of each system shall be demonstrated.

END OF SECTION

SECTION 02760

ELECTROMAGNETIC FLOW METER

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This specification covers the requirements for furnishing and installing an electromagnetic flow meter and all appurtenant materials and equipment. Electromagnetic flow meters shall be suitable for domestic and process wastewater, complete and operable in accordance with requirements of the Contract Documents and in conformance with the manufacturer's recommendations.
- B. Furnish all labor, equipment, materials and incidentals necessary to complete electromagnetic flow meter installation in accordance with the plans and specifications. All materials and equipment shall be of the type and class specified herein.

1.02 SUBMITTALS

- A. The Contractor shall provide six (6) copies of shop drawings or submittals for the following:
 - 1. Detailed Bill of Materials for all equipment and components, listing: manufacturer's name, quantity, size, description, and catalog/part number.
 - 2. Identification and contact information for the technical sales representative.
 - 3. Manufacturer's product literature, specifications, performance capabilities, features and accessories, materials of construction, illustrations, and data in sufficient detail to demonstrate compliance with Specification requirements. Manufacturer's literature and data shall be marked to clearly delineate all applicable information and crossing out all inapplicable information.
 - 4. Dimensional drawings for materials and equipment provided.
 - 5. Electrical wiring schematics for flow sensor and signal converter/transmitter. Interconnection wiring diagrams between signal converters/transmitters and related equipment and materials.
 - 6. Diagrams showing meter grounding recommendations and grounding conductor/connection requirements (conductor size and connection type), including: connection from meter terminal box or signal converter (if integrally mounted) to grounding ring(s), connection between grounding rings, and connection from grounding rings to ground rod.
 - 7. Installation instructions and Operation and Maintenance Manual for all equipment and components. O&M manual shall include troubleshooting and repair guidance and spare parts list.
 - 8. Certified calibration report.
 - 9. Warranty information.

PART 2: PRODUCTS

1.02 ELECTROMAGNETIC FLOW METER

- A. The electromagnetic flow meter shall consist of a flow sensor and a signal converter/transmitter. The flow sensor shall utilize Faraday's Law of Electromagnetic Induction, to produce an electrical voltage that is proportional to the velocity of the flow of liquid through the sensor. The signal converter/transmitter shall be micro-processor based. Unless specified otherwise, the signal converter/transmitter shall be remote mounted.

1.02 FLOW SENSOR

- A. Each flow sensor shall be provided with a flanged end flow tube and a non-conductive liner suitable for the liquid being metered. Unless specified otherwise, the flow tube shall be constructed of Type 304 stainless steel with stainless steel or carbon steel flanged ends. Flanges shall be ANSI Class 150 for meter sizes up to 24", and AWWA Class D for meter sizes larger than 24". Unless specified otherwise, liner material shall be hard rubber or polyurethane. Liner material shall be appropriately matched with the fluid type per manufacturer recommendations.
- B. The field coils of the flow sensor shall be supplied with a precisely adjusted bi-polar direct current. Coil drive power shall be supplied by the signal converter/transmitter. The output signal from the flow sensor shall be fed through cable to the signal converter/transmitter. There shall be no electronic components in the flow sensor.
- C. The flow sensor coil enclosure and cable connection housing shall be epoxy coated steel or epoxy coated aluminum. Plastic housings will not be acceptable.
- D. Flow sensors shall be weatherproof NEMA 4X at a minimum. Meters installed underground or in a below grade vault shall be manufactured to NEMA 6P standards to enable the meter to be submerged up to 30 feet for 48 hours and up to 10 feet with continuous submersion. Meters rated NEMA 6P shall have remote transmitters in separate NEMA 4X enclosures. The interconnecting cables shall be installed at the factory and the termination box filled with a non-setting, transparent potting material.
- E. When installed in metallic piping, the flow sensor shall be provided with integral grounding electrodes. When installed in lined or non-metallic piping, the flow sensor shall be provided with Type 304 stainless steel grounding rings (grounding electrodes will not be acceptable).
- F. When installed in piping conveying raw sewage or sludge, the flow sensor shall be certified for use in Class I, Division 2 hazardous locations.
- G. Flow sensor grounding electrode and sensing electrode material shall be compatible with the process fluid. Unless specified otherwise, electrodes shall be constructed of Type 316 stainless steel or Hastelloy C.
- H. The flow sensor, including liner material, shall be certified in accordance with National Sanitation Foundation Standard 61 for use with potable water. Accuracy shall not be affected by cuts or scratches in the flow sensor liner.
- I. The flow sensor shall be provided with multiple sensing electrodes to accurately measure mean velocity. The flow sensor shall be capable of accurately measuring slurries and

water with entrained air. Accuracy of the flowmeter system shall be $\pm 0.2\%$ of rate. Accuracy shall be guaranteed for applications including drinking water, raw sewage, and similar media, even with a permanent coating of raw sewage or similar on the electrodes. A calibration certificate from a certified testing agency shall be provided with each flowmeter.

- J. The flow sensor shall incorporate an empty pipe detection feature, which shall cause the meter to register zero flow when the sensor is not full.
- K. Unless specified otherwise, the flow sensor shall be rated for a minimum working pressure of 150 psig.
- L. The flow sensor shall be suitable for operating temperatures ranging from -4°F to $+122^{\circ}\text{F}$ (minimum).

1.03 SIGNAL CONVERTER/TRANSMITTER

- A. Unless specified otherwise, the signal converter/transmitter shall be remote mounted from the flow sensor. Where special signal cable is required, the cable shall be integrally supplied by the meter manufacturer. Supplier shall confirm the length and installation requirements. Where signal converter/transmitter location is not shown on the Drawings, each flowmeter shall be furnished with a minimum of 100 feet of signal cable.
- B. The signal converter/transmitter shall be suitable for outdoor exposure and shall be rated NEMA 4X.
- C. The signal converter/transmitter shall be provided with an alphanumeric, 3-line, 16-character (minimum), backlit display to indicate flow rate, totalized values, settings, and faults. Unless specified otherwise, the display shall indicate flow in gallons per minute and total flow in gallons. All programming shall be accomplished through an integrated keypad or touch screen. Programming shall be protectable by a user defined password. The signal converter/transmitter shall include a fault and status log.
- D. The signal converter shall be coordinated with the flow sensor selection for accurately measuring potable water, raw sewage, slurries, and water with entrained air.
- E. The signal converter/transmitter shall be capable of measuring bi-directional flow and shall have three individual totalizers.
- F. The signal converter/transmitter shall operate on 120V, 60 Hz supply power.
- G. The signal converter/transmitter shall produce a 4-20 mA DC output signal into a minimum load of 800 ohms, linear to flow. Output shall be selectable as unidirectional or bi-directional. In addition, the signal converter/transmitter shall provide a digital scaled pulse output for external display/recording of flow rate or total flow.
- H. If specified, the signal converter/transmitter shall be provided with a positive zero circuit to register zero flow when pumping units are not operating. A closed external dry contact (generated by pump "off" or other similar equipment control signal) input to the signal converter/transmitter shall drive the meter output to zero.
- I. The signal converter/transmitter shall be suitable for operation in ambient temperatures ranging from -4°F to $+140^{\circ}\text{F}$ (minimum).
- J. Where located outdoors, signal converter/transmitter shall be suitable for mounting inside a NEMA 4X stainless steel enclosure. The enclosure shall be provided with a

swing-out door panel and back panel, 120V supply power circuit breaker for the signal converter and air supply fan, and fuses for each. The signal converter/transmitter shall be flush mounted on the swing-out door panel or back panel mounted with a cut-out in the swing-out door panel for the display.

- K. The signal converter/transmitter shall be capable of verifying the performance of the measuring system in the field without removing the meter tube from the process. The field verification feature shall be integral to the signal converter/transmitter and shall be capable of continuously monitoring electronic parameters within the flow meter and signal converter/transmitter. If any value deviates from an acceptable range, the signal converter/transmitter shall acknowledge the event and a relay shall be activated. A summary report shall be downloadable directly through the service port of the signal converter/transmitter or while logged onto the manufacturer's webserver for an Ethernet/IP capable signal converter/transmitter.
- L. Local service communication with the meter shall be capable via a RJ45 port and an Ethernet cable regardless of the output. Where specified, the signal converter/transmitter shall have integral webserver capabilities with a unique IP address.

1.04 MANUFACTURERS

- A. Siemens SITRANS F M MAG 5100 W, Rosemount Model 8750W, or an approved equal.
- B. Manufacturer and model information supplied herein are provided for information purposes only, to assist Contractor in selecting equipment that conforms to the Specification and Drawing requirements. In case of any conflict between model numbers provided and the descriptive requirements specified herein, the descriptive requirements shall govern.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation of magnetic flowmeters and signal converters/transmitters shall be in accordance with manufacturer's written instructions.
- B. Wiring between flow sensors and remote mounted signal converters shall be supplied by the meter manufacturer.
- C. All magnetic flowmeters shall be grounded per manufacturer's requirements. Contractor shall coordinate grounding between signal converter, flow sensor, grounding rings, and ground rod to ensure compliance with the manufacturer's recommended grounding procedures. Prior to start up, manufacturer shall provide written certification that the meter installation is in accordance with their requirements, including grounding.

- D. Unless specified or shown otherwise, outdoor signal converters/transmitters shall be remote mounted within NEMA 4X stainless steel enclosures. The enclosures shall be mounted on stanchions adjacent to the respective meters.
- E. Conductors and conduits shall be sized and installed by a licensed electrician and in accordance with NEC.

3.02 MANUFACTURER'S WARRANTY

Manufacturer shall guarantee all equipment against defects in material and workmanship for a period of two years from date of project acceptance. During the warranty period, manufacturer shall provide all labor and material required to repair or replace defective equipment at no cost.

END OF SECTION

SECTION 02780

HORIZONTAL DIRECTIONAL DRILLING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this Section includes furnishing all labor, materials and equipment required to install underground pipelines using the horizontal directional drilling (HDD) method of installation.
- B. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable.

1.02 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Material Submittals: The Contractor shall provide shop drawings and other pertinent specifications and product data as follows:
 - 1. HDD pipe showing sizes, wall thicknesses, pipe classification and yield strengths.
 - 2. Directional drilling equipment
 - 3. Drilling fluid
 - 4. Fusing equipment and strengths
 - 5. Fittings and/or couplings to connect to mainline pipe
 - 6. Layout drawing of proposed entry and exit points

1.03 STORAGE AND PROTECTION

- A. All materials shall be stored in accordance with the manufacturer's recommendations and as approved by the Engineer.

PART 2: PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

- A. General:
 - 1. The horizontal directional drilled pipe shall be the size, material, and Dimension Ratio shown on the Drawings.

2. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback of the pipe, a drilling fluid mixing & delivery system of sufficient capacity to successfully complete the installation, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
- B. Drilling Rig: The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. The hydraulic system shall be free of leaks. The rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations.
- C. Drill Head: The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets. If applicable, the drill head shall be able to bore through rock.
- D. Guidance System: The guidance system shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system. The guidance system shall allow for accurate horizontal and vertical location of the bore head.
- E. Drilling Fluid (Mud) System:
1. Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. The drilling fluid reservoir tank shall be sized for adequate storage of the mud. Mixing system shall continually agitate the drilling fluid during drilling operations.
 2. Drilling Fluids: Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with characteristics per mixing requirements of the manufacturer. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of the bore wall.

F. High Density Polyethylene Pipe (HDPE):

1. Classification: HDPE pipe shall meet or exceed the requirements of ASTM D3350 for PE4710 material with a cell classification of 445574C, or better. The pipe manufacturer shall be listed with the Plastic Pipe Institute as meeting the recipe and mixing requirements of the resin manufacturer for the resin used to manufacture the pipe in this project.
2. Joining: Joining shall be performed by thermal buttfusion in accordance with the manufacturer's recommendations. Butt-fusion joining shall be 100% efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe.
3. Standards: HDPE pipe shall meet or exceed the requirements of AWWA C906 and NSF 61 (for potable water applications). Appropriate AWWA and NSF designation/seals shall be printed on the exterior of the pipe.
4. Color: Sanitary sewer pipe exterior shall be green in color or contain green striping. Potable water pipe exterior shall be blue in color or contain blue striping.

PART 3: EXECUTION

3.01 GENERAL

- A. Interpretation of soil investigation reports and data, investigating the site and determination of the soil conditions is the sole responsibility of the Contractor. Any subsurface investigation performed by the Contractor must be approved by the appropriate authority having jurisdiction over the site.
- B. Spill Protection: The Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other areas designated for such protection by the Contract Documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. The Contractor shall adhere to all applicable environmental regulations.
- C. Pipe Preparation: The pipe shall be welded/fused together in one length, if space permits. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.
- D. Pilot Hole:
 1. Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over the length of 100 feet. In the event that the pilot does deviate

from the bore path more than 5% of depth in 100 feet, the Contractor must notify the Engineer and the Contractor may be required to pull-back and re-drill from the location along the bore path before the deviation. In all cases, depth of bore must meet minimum clearances from obstacles or waterways as shown on the Drawings.

2. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, the Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, the Contractor must cease operations and notify the Engineer. The Engineer and Contractor will discuss additional options and work then will proceed accordingly.
- E. Reaming: Upon successful completion of the pilot hole, the Contractor will ream bore the hole to a minimum of 25% greater than outside diameter of the pipe using the appropriate tools. The Contractor shall not attempt to ream, at one time, more than the drilling equipment and mud system are designed to safely handle
- F. Pull-Back:
1. After successfully reaming the bore hole to the required diameter, the Contractor will pull the pipe back through the bore hole. In front of the pipe will be a swivel to prevent torsional stresses occurring in the pipe. Once pull-back operations have commenced, operations must continue without interruption until the pipe is completely pulled into the bore hole. During pull-back operations the Contractor shall not apply more than the maximum safe pipe pull pressure at any time.
 2. In the event that the pipe becomes stuck, the Contractor will cease pulling operations to allow any potential hydro-lock to subside and will then continue pulling operations. If the pipe remains stuck, the Contractor must immediately notify the Engineer. The Engineer and Contractor will discuss options and work then will proceed accordingly.

3.02 GROUNDWATER CONTROL

- A. The Contractor shall control the groundwater throughout the construction of the casing.
- B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect the settlement or displacement of surface facilities due to dewatering. Should settlement or

displacement be detected, notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.

- C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Contractor shall be responsible for managing dewatering operations in compliance with applicable rules.

3.03 TOLERANCES & RECORD KEEPING

- A. Tolerances: Each exit point shall be located as shown with an over-length tolerance of 10 feet for directional drills of 1,000 linear feet or less and 40 feet for directional drills of greater than 1,000 linear feet and an alignment tolerance of 5 feet left/right with due consideration of the position of the other exit points and the right-of-way or permanent easement.
- B. Record Keeping: The Contractor shall plot the actual horizontal and vertical alignment of the pilot bore at intervals not exceeding 30 feet. This "as built" plan and profile shall be updated as the pilot bore is advanced.

3.04 QUALITY CONTROL

- A. Hydrostatic Testing:
 - 1. After completion of the HDD installation, the pipe shall be hydrostatically tested for leaks and defects. Test procedures shall meet the requirements of ASTM F2164.
 - 2. The pipe shall be allowed to thermally stabilize and equalize before pressurizing for the test procedure. Prior to the test procedure, the pipeline shall be slowly filled, not pressurized, with water at ambient temperature. Remove air from the line at high points. After filling, allow 3-hours to 24-hours for the system to equalize and allow for any dissolved air to vent.
 - 3. The pipe shall be tested at 1.5 times the design pressure rating for the application as measured at the lowest point in the test section. The maximum allowable time for the pipe to be pressurized to this level is eight (8) hours. If the test is not completed due to leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow it to relax for at least eight (8) hours before pressurizing the test section again.
 - 4. Gradually pressurize the test section to test pressure, and add make-up water as necessary to maintain maximum test pressure for four (4) hours. During the initial expansion phase, polyethylene pipe will expand slightly due

to elasticity and Poisson effects. Additional test liquid will be required to maintain pressure. The amount of additional test liquid will vary because expansion in the PE pipe is not linear. It is not necessary to monitor the amount of water added during the initial expansion phase. If test pressure cannot be attained, or if it takes an unreasonably long time to reach test pressure, there may be faults such as excessive leakage, entrapped air, or open valving, or the pressurizing equipment may be inadequate for the size of the test section. If such faults exist, discontinue pressurizing and correct them before continuing.

5. Immediately following the initial expansion phase, reduce test pressure by 10 psi and stop adding test liquid. Monitor the pressure for 1 hour. If no visual leakage is observed and test pressure remains steady (within 5% of the target value) for one (1) hour, no leakage is indicated.
- B. Disinfection: The pipeline shall be disinfected per AWWA C651 as described in other Sections.

END OF SECTION

SECTION 02900 LANDSCAPING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This section covers the furnishing of all labor, equipment and materials necessary for the installation of all trees, shrubs, ground covers, herbaceous plants and bulbs. Also included is the seeding or sodding of lawn areas.
- B. References
 - 1. ANSI Z60.1 -- "American Standard for Nursery Stock", current edition.
 - 2. NAAS -- National Arborist Association "Standards", current edition.
 - 3. "Hortus Third", Macmillian Publishing Company, current edition.

1.02 QUALITY ASSURANCE

- A. The landscape installer shall have at least five years of satisfactory experience including at least two completed jobs of dollar value and scope similar to this work.
- B. No substitutions will be permitted without the prior written approval of the Engineer.
- C. The Engineer may inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size and quality. The Engineer retains the right to further inspect trees and shrubs for size and conditions of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any item during progress of work. Contractor shall remove rejected trees or shrubs immediately from project site.
- D. The landscape installer should be familiar with the quality of materials available from suppliers in order to minimize the likelihood that unacceptable products will be rejected.
- E. Tagging of plants prior to digging at the nursery is recommended.

1.03 SUBMITTALS

- A. Certificates of Inspection as required by law or governing authorities to accompany shipments.
- B. Vendors certified analysis for soil amendments, fertilizer materials, and grass seed.
- C. Evidence of State certification for sod.
- D. Certificates indicating nursery source of each plant.
- E. Soil analysis report for existing soil and proposed supply of soil, if needed. Also indicate location of source.

- F. Source of mulch for approval and five-gallon bucketful physical sample.
- G. Proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
- H. Written instructions for the Owner's maintenance of landscaping. Include initial maintenance recommendations, 12-month, and long term recommendations. Submit prior to acceptance of landscaping.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Products shall be packed and shipped in a manner which will not damage them.
- B. Damaged products shall be rejected upon delivery and promptly removed from the site.
- C. Products which must be stored prior to installation shall be protected from damage and theft.
- D. Time delivery of sod so that it will be placed within 36 hours after harvesting. Protect sod against drying and breaking of rolled strips.
- E. Schedule delivery of plant material to avoid storage on site. If planting does not occur on same day as delivery, store in a location protected from sun and weather. Protect from vandalism.
 - 1. Do not prune trees and shrubs before delivery.
 - 2. Cover to protect stock during transport. Wind burned or wilted plants will not be accepted.
 - 3. Bind stock to protect branches, bark, and overall shape during transport.
 - 4. Provide freshly dug balled and burlapped or container grown stock unless otherwise approved.
 - 5. Do not drop stock. Load and unload with care.
 - 6. Delivery stock only after soil has been prepared. Schedule harvesting and delivery in quantities suitable for immediate planting upon arrival. Plant immediately. If planting cannot be accomplished immediately, provide shade, protect from wind, protect balls or roots from drying by covering at all times with moist saw dust, wood chips, shredded bark, peat moss, or other similar mulching material.

1.05 PROJECT CONDITIONS

- A. Schedule and coordinate work with all trades involved.
- B. Verify that the areas of work have been properly contoured prior to beginning work.
- C. Consult record drawings and installers to determine actual underground utility and drainage system locations in the vicinity of this work. Damage to known or unrecorded utilities will be repaired at the Contractor's expense.

- D. Notify the Engineer of any unforeseen conditions which will affect plant installation or growth.
- E. Test internal drainage of soils at representative planting locations by digging a hole 12' deep and approximately 12" in diameter, then filling the hole with water. If the water drains away within 24 hours, the drainage should be adequate.
- F. The results of the soil tests may indicate recommendations which will affect the type and analysis of soil amendments.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Applicator must be properly trained to use all herbicides and must be licensed to purchase and use restricted herbicides, if any.

1.07 WARRANTY OF LANDSCAPE WORK

- A. Following the date of acceptance plants shall be warranted for one year excluding conditions of vandalism, theft, accident, acts of God and Owner's negligent maintenance.
- B. Replace each unacceptable plant as soon as season requirements permit.
- C. Only one replacement per plant will be required, except for losses due to failure to comply with specifications.

PART 2: PRODUCTS

2.01 MATERIALS

A. Manufacturers

- 1. When a manufacturer's name and product are identified, the purpose is to set a standard of quality and/or design and is not intended to limit competition.
- 2. If a substitution is desired, see Quality Assurance above.

B. Imported Soil

- 1. Table and homogenous locally occurring soil obtained from a well-drained, arable site and not delivered in a muddy or frozen condition. It shall be reasonably free of subsoil, stones, clods, sticks, roots, or other extraneous matter and shall contain no toxic materials. Soil is subject to approval by Engineer.

C. Lime

- 1. Free flowing dolomitic agricultural grade lime in compliance with state, federal and local regulations.

All lime shall contain at least 75% calcium carbonate and 10% magnesium carbonate and shall be crushed so at least 90% will pass the No. 10 sieve and 50% through a No. 100 mesh sieve.

D. Fertilizer

- 1. Conforming to state and federal standards, dry, free flowing, granular or pellet form commercial product. Ratio indicates N-P-K requirements.

2. Fertilizer tablets: Agriform Planting Tablets 20-10-5 as manufactured by Sierra Chemical Company, 1001 Yosemite Drive, Milpitas, CA 95035, or equal, telephone (408) 263-8080. May be used at installer's option.
3. Encapsulated fertilizer: Osmocote 19-6-12 as manufactured by Sierra Chemical Company, or equal. May be used at installer's option.

E. Organic Matter

1. Sawdust: Well-rotted sawdust, free of chips, stones, sticks, soil or toxic substances and with 7.5 lbs. nitrogen uniformly mixed into each cubic yard.
2. Manure: Well-rotted, unleached stable or cattle manure not less than 8 months or more than 2 years old, containing not more than 25% by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

Commercial Bagged Manure Such as "Black Cow": or "Baa Baa Doo," or equal.

F. Grass Seed

Comply with State Department of Agriculture requirements. Obtain seed from most recent crop.

G. Sod

Provide Certified or Approved Turfgrass sod so labeled.

H. Plant Materials

1. Plants shall conform to applicable sections of ANSI-Z60.1 and to any more stringent requirements which may be stated herein or on the Drawings.
2. Plants shall be true to type and name; typical of their species or variety; densely foliated when in leaf, with a normal well-developed branch structure and a fibrous root system; possess a normal balance between height and spread; be free from defects, disfiguring knots, sun scald, injuries, abrasions of the bark, plant diseases and insect eggs, borers or infestations and of acceptable appearance.
3. Plants shall have been nursery grown under climatic conditions similar to the location of this project, for at least one growing season prior to this work.
4. Perennial: dense, well-rooted, type as indicated (bare-root, cell-pack, pot or container #).

5. Bulbs

a. Definitions

- i. "Bulb" is used below as a generic term to describe true bulbs, bulbets, corms, cormels, tuberous root and rhizomes.
- ii. "Bulb size" is a measurement of circumference in centimeters.
- iii. "Top size" is a trade term used to indicate the largest size available for a specific variety during the present growing season.

- b. There is no bulb trade standard. Buy from a reputable dealer.
 - c. Bulb quality will be approved by the Designer prior to planting. Bulb quality will be judged by the following characteristics;
 - i. Firm and free from deep blemishes, cuts or soft spots.
 - ii. Heavy for their size.
 - iii. Have a solid and firm basal plate.
- 6. The greater quantity shall take precedence if discrepancies occur between the quantities designated on the materials list and those indicated on the drawings.
- 7. Nomenclature shall conform to "Hortus III".
- 8. At least 10% of each species delivered to the site shall bear a tag showing the genus, species, and variety of the plant.
- 9. Substitutions will be allowed only on the basis of prior written approval by the Engineer and may be granted if the installer can demonstrate that plants of a specific type, size or quality are not available within a 200-mile radius of the site.
- 10. Plants larger than those specified on the plant list may be used, but use of such plants shall not increase the contract price.
- I. Materials For Planting Trees
 - 1. Tree wrap: 4" wide corrugated or crepe paper tape, specifically manufactured for tree trunk wrapping, and weatherproof twine.
 - 2. Guy wire encasement trunk protection: 2-ply fabric-bearing rubber hose having an inside diameter of not less than 1/2".
 - 3. Stakes: 2"x 2"x8'-0" lumber capable of withstanding above ground and underground conditions during the guarantee period.
 - 4. Guy wire: malleable, single strand, galvanized iron wire 12-gauge minimum.
 - 5. Manufactured guying system may be used in lieu of the above if they provide adequate stability for the trees.
- J. Mulch Materials for Plants
 - 1. Hardwood bark: Shredded long fibers, free of extraneous and harmful matter.
- K. Mulch For Seeded Areas
 - 1. Straw: Most recent crop of rye, oats or wheat.
 - 2. Wood Fiber: Moisture content of 10% ($\pm 2\%$); organic Matter 99.4% ($\pm 0.2\%$); ash content 0.6% ($\pm 0.2\%$) water holding capacity of 1050 grams water/100 grams dry fiber.
- L. Herbicides

1. To selectively eradicate existing vegetation choose an herbicide which will not be toxic to vegetation to be saved or to new landscaping.
2. For pre-emergence vegetation control choose an herbicide which will not harm plants to be saved on new landscaping.

PART 3: EXECUTION

3.01 PREPARATION

- A. Layout individual tree and shrub locations with stakes or flags. Flag outlines of planting beds and secure landscape architect's approval prior to beginning soil preparation. Make adjustments as directed.
- B. Herbicide Application
 1. In the buffer planting area apply a minimum of three (3) applications of "Round-up" or other approved herbicide at two-week intervals. Protect neighbor's proportion and vegetation to remain.
 2. Use herbicides to eradicate vegetation before tilling plant seed and sod beds.
 3. Use herbicides to control emerging weeds in shrub and ground cover beds and around trees
- C. Preparation Of Planting Bed Soil
 1. Excavate all planting beds to a depth of 12" minimum. Loosen subsoil to allow water to percolate freely. Stockpile excavated soil for landscape architect's approval for reuse.
 2. Upon approval of excavated soil, prepare a mixture of two (2) parts excavated soil and one (1) part organic material. Replace the soil, till in additional soil amendments as required; lightly compact and rake out smooth. Dispose of extra soil offsite or at an Owner approved location on-site.
 3. If excavated soil is not approved, bring in clean low clay content backfill and mix with organic matter as above.
- D. Shrub Planting
 1. Scoop out a shallow hole for each plant root ball. Set balled and burlapped (B&B) or container stock on layer of compacted planting soil mixture, plumb and in center of pit with top of ball approximately 1"-2" above adjacent finished landscape grades. Remove burlap from top 2/3 of ball. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.
 2. Set container grown stock as specified for balled burlapped stock. Split the sides of the root ball prior to planting.
 3. Mulch pits, and planted areas. Provide not less than a 4" thickness of mulch and work into top of backfill and finish level with adjacent finish grades.

4. Apply anti-desiccant, if required, using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.
 5. Prune, thin out and shape shrubs in accordance with standard horticultural practice. Prune shrubs to retain natural character.
- E. Preparation Of Lawn and Sod Areas of Slopes 3:1 Or Less
1. Thoroughly and uniformly till the soil amendments into the subsoil to a depth of 6" below finished grade.
 2. Rake stones and other debris out of the top 3" of the amended soil and smooth it to remove ridges and fill depressions as required to meet finished grades.
 3. Roll the area with a lawn roller half filled with water ballast.
 4. Verify that all areas have positive drainage and that there is no ponding.
- F. Preparation Of Slopes in Excess Of 3h:1v
1. Scarify slope to 4" depth with a chain harrow, grader or dozer with chisels attached or by hand so that pitting or trenching will be approximately 4" apart for seeds to lodge within and germinate.
 2. Remove stones and other debris from the slope surface.

3.02 INSTALLATION

A. Tree Planting

1. Till and loosen to a depth of 12", an area four times the diameter of the root ball. Organic matter may be added if it is mixed uniformly throughout the loosened area
2. Scoop out a shallow hole in the middle of the loosened area for the root ball. Set the root ball on undisturbed or compacted soil, with the top of the ball 2"-4" above the finished grade.
3. Remove at least the top two-thirds of the wire basket and burlap. Remove all nylon straps or cords.
4. Place native soil backfill in 2"-3" layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plant in a plumb position during backfilling.
5. When backfilling is approximately two-thirds complete,, sprinkle evenly with 1/1 cup of superphosphate per inch of each per size. Saturate backfill with water and complete backfilling, then water and water again.
6. Once water has been absorbed, place not less than a 4" thickness of mulch and work into the top of the backfill. Finish level with adjacent finished grade.

B. Tree Support

1. Trees requiring support shall be staked or guyed on the same day as planting.
2. Do not support trees with a caliper less than 3/4".

3. Staking for trees less than 3" caliper: Double stake each tree vertically with 180° stake separation and outside the root ball. Place stake and wires parallel to walks, drives and buildings. In open areas stakes perpendicular to the predominant wind direction. The top of each stake shall be driven to at least 3-1/2 feet below the tip of the plant's main leader. Tie the tree 36" from the top of the rootball. Protect the trunk with rubber hose encased wire and secure the rubber hose by twisting the wire back onto the stake.

C. Pruning Woody Plants

1. After planting, neatly prune plants to enhance their form and character.
2. Limit pruning to the minimum necessary such as to remove injured twigs and rubbing branches (NAAS Class I fine pruning).

D. Planting Perennial

1. Soak bare-root plants in water for about one-half hour before planting them.
2. Soak the planting bed and let it drain prior to planting.
3. Set plants to the depth at which they were grown allowing the soil settlement.
4. Spread out bare roots, then firm backfill over them by hand.
5. If rootballs are very densely packed, slice the rootball across the bottom and spread out the halves firmly against the soil, then firm backfill around and over them leaving no air pockets.

E. Bulbs And Bulb-Like Plants

1. Store bulbs in a cool place or in a refrigerator
2. Do not store bulbs in closed plastic bags.
3. Verify schedule for planting with supplier's instructions.
4. Late planting: If planting must be delayed until late in the season mulch the planting bed well in advance of planting time in order to protect it from freezing. If the soil under the mulch is not frozen, plant the bulbs and replace the mulch.
5. Bulbs, except iris, are normally planted in a depth equal to three times their diameter at the widest point. Verify with the suppliers instructions.
6. For large planting beds excavate the entire bed to the required depth.
7. For smaller plantings dig individual holes to the required depth, at the required spacing, with a special bulb planting tool or mattock.
8. Incorporate bonemeal or superphosphate in accordance with the manufacturer's instructions. Place the bulb upon firm soil and avoid creating an air pocket beneath the bulb. Cover each bulb with soil and compact it by hand.
9. Water the planted area thoroughly after the covering bulbs, unless ground is rain soaked.

F. Fertilizing Plants

1. Trees: 1/2 cup superphosphate per inch of caliper size.
2. Shrubs: 1/4 cup superphosphate per gallon size of container.
3. Groundcover and Perennial: Broadcast 4-8-6 fertilizer at rate of 2 lb. per 100 SF.

G. Mulching Plants

1. Mulch planting areas promptly after planting.
2. Trees and shrubs: 4" depth of bark mulch. Do not allow mulch to be in contact with tree trunks.
3. Groundcover and Perennial Beds: 1" depth of bark mulch.
4. Bulb Beds: 2" depth of bark mulch.

H. Seeding And Mulching - General

1. Verify that graded areas to be seeded are acceptable. Beginning seeding signifies acceptance of the grading by the seeding installer.
2. Refer to the schedule for mixtures, types and application rates.
3. Apply seed uniformly by hand, cyclone seeder, drill, cultipacker seeder or hydraulically (slurry may include fertilizer, seed and cellulose fiber mulch). On sloping land, seeding operation should be performed across the slope.
4. Cover seed with soil 1/8" to 1/4" deep, except when hydro-seeder is used.
5. When a hydro-seeder or cultipacker type seeder is not used, firm the seedbed following seeding using such equipment as a cultipacker, roller, or light drag spread spenitred mulch to form a continuous blanket of not less than 1-1/2" loose measurement overseeded areas.

I. Sodding

1. Do not lay dried or broken sod. Use only fresh, properly protected sod.
2. Lightly moisten the soil bed prior to laying the sod.
3. Lay first and subsequent rows parallel and in a straight line with sides and ends tightly butted together. Do not overlap ends or leave voids.
4. As sodding is completed in any one section of the work, the entire area shall be lightly rolled and then thoroughly watered to a depth sufficient that the underside of the sod pad itself and the soil underneath are thoroughly wet.

J. Cleaning

1. Restore damaged, soiled or stained improvements to acceptable condition.
2. Remove excess and waste materials from the site.

K. Protection

1. Protect buildings and other improvements from damage which could result from landscape work.

2. Protect landscape work from damage by erecting and maintaining suitable signs and/or barricades.

3.03 MAINTENANCE

A. Maintenance Of Plants

1. Completely maintain plantings from time of installation until time of acceptance; thereafter the Owner will provide maintenance during the warranty period.
2. To be acceptable each plant shall be in apparent good health and condition. This means that any plant which is not acceptable shall be replaced prior to acceptance, and such replacement does not diminish warranty requirements.

B. Maintenance Of Seeded Areas

1. Protect seeded areas against disturbance immediately after seeding has been completed by placing warning signs and barricades.
2. Take sufficient precautions to prevent mulch from entering drainage structures and promptly remove any blockage which occurs.
3. The first two mowings of lawn areas shall be provided as part of maintenance; thereafter, the owner will perform mowing.
 - a. Maintenance also includes all necessary watering, erosion repair, mulching, reseeding and weeding to produce uniform coverage of seeded areas.
 - b. Interim maintenance shall be terminated upon final inspection and approval of the work by the landscape architect.
4. Requests for inspection of individual sections will be allowed provided that the section is substantial in size relative to the entire job and has clearly defined boundaries.
5. To be acceptable:
 - a. Total lawn grass coverage shall uniformly well established and in control of erosion within the seeded area.
 - b. Total vegetative cover on slopes shall be uniformly well established and in control of erosion.

C. Maintenance Of Sodded Areas

1. During the first week, soil on sod pads shall be kept moist at all times. In the absence of adequate rainfall, maintain soil moisture to a depth of 4" by daily watering.
2. During the second week, maintain adequate moisture in the upper 4" of soil necessary for the promotion of deep root growth.
3. Do not mow until the sod is firmly rooted and securely in place. No more than 40% of the grass blade shall be removed by the initial and subsequent mowings.

4. Maintenance shall continue for at least 30 days or until final acceptance.

3.04 INSPECTION AND ACCEPTANCE

A. Inspection And Acceptance

1. When landscape work is completed, Engineer will, upon request, make an inspection to determine acceptability.
2. Landscape work may be inspected for acceptance in parts agreeable to Engineer, provided work offered for inspection is complete.
3. When inspected landscape work does not comply with requirements, replace rejected work and schedule a reinspection by Engineer. Remove rejected plants and materials promptly from project site.
4. Warranty period will begin on date when work is accepted.
5. A warranty inspection will be made 365 days after final acceptance. Plant replacements will be made as soon as the next planting season allows.

END OF SECTION

SECTION 02901

SITE STABILIZATION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This section covers the furnishing of all labor, equipment and materials necessary for the establishment of vegetation of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses and legumes.

PART 2: PRODUCTS

2.01 MATERIALS

A. Fertilizer:

1. The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the North Carolina Board of Agriculture.
2. Fertilizer shall be 10-10-10 grade. Upon written approval of the Engineer a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.
3. During handling and storing, the fertilizer shall be cared for in such a manner that it will be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

B. Lime:

1. The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.
2. During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking.
Any hardened or caked lime shall be pulverized to its original conditions before being used.
3. Lime shall be agriculture grade ground dolomitic limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

C. Seed:

1. The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture. Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Engineer before being sown, and no seed will be accepted with a date of test more than 9 months prior to the date of sowing. Such testing however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Engineer, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.
 2. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents or other causes.
 3. Seed shall be entirely free from bulblets or seed of Johnson Grass, Nutgrass, Sandbar, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.
- D. Mulch: Straw Mulch shall be threshed straw of oats, rye or wheat free from matured seed of obnoxious weeds or other species which would grow and be detrimental to the specified grass.
- E. Tackifier: Emulsified asphalt or organic tackifier such as Reclamare R2400 shall be sprayed uniformly on mulch as it is ejected from blower or immediately thereafter. Tackifier shall be applied evenly over area creating uniform appearance. Rates of application will vary with conditions. Asphalt shall not be used in freezing weather.

PART 3: EXECUTION

3.01 PREPARATION

- A. Protection of Existing Trees and Vegetation:
1. Protect existing trees and other vegetation indicated to remain in place against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide wood or metal stakes set on 8 to 10 foot centers and connected at a 4'-0" height by 2" minimum brightly colored flagging tape to protect trees and vegetation to remain. Set perimeter of

protection at the drip line of trees to remain unless approved otherwise by the Engineer.

2. Provide protection for roots over 1-1/2" diameter cut during construction operations. Cleanly cut off end of damaged root and coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out and cover with earth as soon as possible.
3. The Contractor shall not remove or damage trees and shrubs which are outside the Clearing Limits established by the Owner or those within the Clearing Limits designated to remain.
4. Repair trees scheduled to remain and damaged by construction operations in a manner acceptable to the Engineer. Repair damaged trees promptly to prevent progressive deterioration caused by damage.
5. Replace trees scheduled to remain and damaged beyond repair by construction operations, as determined by the Engineer with trees of similar size and species. Repair and replacement of trees scheduled to remain and damaged by construction operations or lack of adequate protection during construction operations shall be at the Contractor's expense.

B. Grading:

1. Rough grading shall be done as soon as all excavation required in the area has been backfilled. The necessary earthwork shall be accomplished to bring the existing ground to the desired finish elevations as shown on the Contract Drawings or otherwise directed.
2. Fine grading shall consist of shaping the final contours for drainage and removing all large rock, clumps of earth, roots and waste construction material. It shall also include thorough loosening of the soil to a depth of 6" by plowing, discing, harrowing or other approved methods until the area is acceptable as suitable for subsequent landscaping operations. The work of establishing vegetation shall be performed on a section by section basis immediately upon completion of earthwork or pipeline installation.
3. Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Engineer may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Engineer.

C. Seedbed Preparation:

1. The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the

Engineer to provide for more effective seeding and for ease of subsequent mowing operations.

2. The soil shall then be scarified or otherwise loosened to a depth of not less than 6" except as otherwise provided below or otherwise directed by the Engineer. Clods shall be broken and the top 2" to 3" of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Engineer.
3. On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so permitted by the Engineer.
4. On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Engineer, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.
5. On cut slopes that are either 2:1 or steeper, the Engineer may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in condition acceptable to the Engineer, additional seedbed preparation may be reduced or eliminated.
6. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Engineer determines that it is in an otherwise unfavorable working condition.

3.02 APPLICATION

- A. Seed shall be applied by means of a hydro-seeder or other approved methods. The rates of application of seed, fertilizer and limestone shall be as stated in Table I.
- B. Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Engineer before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.
- C. Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Engineer determines that weather and soil conditions are unfavorable for such operations.
- D. Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at the specified rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed. Seed shall be distributed uniformly over the seedbed at the

- required rate of application, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Engineer. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.
- E. When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.
 - F. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Engineer.
 - G. Immediately after seed has been properly covered the seedbed shall be compacted in the manner and degree approved by the Engineer.
 - H. When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

Such modifications may include but not be limited to the following:

- 1. The incorporation of limestone into the seedbed may be omitted on (a) cut slopes steeper than 2:1; (b) on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or (c) on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.
 - 2. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.
 - 3. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.
- I. Mulching:
- 1. All seeded areas shall be mulched unless otherwise indicated in the special provisions or directed by the Engineer.
 - 2. It shall be spread uniformly at a rate of two tons per acre in a continuous blanket over the areas specified.
 - 3. Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3" in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil. Mulch shall be applied within 24 hours after the completion of seeding unless otherwise permitted by the Engineer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operation.

4. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.
5. Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Engineer. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch application.
6. The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

3.03 MAINTENANCE

- A. The Contractor shall keep all seeded areas in good condition, reseeding if and when necessary, until an acceptable stand of grass is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract.
- B. Grassed areas will be accepted when a 95% cover by permanent grasses is obtained and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.
- C. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Engineer. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Engineer at no cost to the Owner.
- D. Application Rates:

1. Lime and Fertilizer:

In the absence of a soil test, the following rates of application of limestone and fertilizer shall be:

- a. 4,000 pounds limestone per acre.
- b. 1000 pounds 10-10-10 (N-P205-K20) fertilizer per acre and the remaining quantity applied when vegetation is three inches in height or 45 days after seeding, whichever comes first.

2. Mulch:

Mulch shall be applied at the following rates per acre:

- a. 3,000-4,000 pounds straw mulch, or

- b. 1,500-2,000 pounds wood cellulose fiber.
- c. 35-40 cubic yards of shredded or hammermilled hardwood bark.
- d. 1,200-1,400 pounds of fiberglass roving.

3. Seed:

The kinds of seed and the rates of application shall be as contained in this table. All rates are in pounds per acre. See Notes 4 and 5.

- a. Fall and Winter (Normally August 1 to June 1): 80 pounds of Ky-31 tall fescue and 15 pounds of rye grain.
- b. Summer (Normally May 1 to September 1): 100 pounds of Ky-31 tall fescue.

E. Notes:

- 1. Use only native grass mixes in riparian buffers.
- 2. Do not use fertilizer in riparian buffers.
- 3. Use only biodegradable erosion control matting such as coconut coir.
- 4. On cut and fill slopes having 2:1 or steeper slopes, add 40 pounds of sericea lespedeza per acre to the planned seeding (hulled in spring and summer unhulled in fall and winter) plus 15 pounds of sudangrass in summer seeding or 25 pounds of rye cereal per acre in fall and winter seeding, if seeded September to February.
- 5. These seeding rates are prescribed for all sites with less than 50% ground cover and for sites with more than 50% ground cover where complete seeding is necessary to establish effective erosion control vegetative cover. On sites having 50% to 80% ground cover where complete seeding is not necessary to establish vegetative cover, reduce the seeding rate at least one-half the normal rate.

END OF SECTION

SECTION 02905 RESTORATION OF SURFACES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This section covers the furnishing of all labor, equipment and materials necessary for the proper restoration of existing surfaces disturbed or damaged as a result of construction operations which are not specifically scheduled or specified for topsoil and seeding, paving, landscaping or other surfacing.
- B. In general, the types of replacement included in this section are seeding along pipelines, concrete sidewalks, driveways, roadways, ditches, lawns and landscaped areas, curb and gutter.
- C. Any damage to existing structures shall be repaired using materials and workmanship equal to those of original construction.

PART 2: PRODUCTS – NOT APPLICABLE

PART 3: EXECUTION

3.01 RESTORATION OF SURFACES

A. Seeding Along Pipelines:

- 1. All ground surfaces along pipelines, which are not classified as lawns, landscaped areas, or pavement areas, but would be classified as open fields, shall be raked smooth and seeded in accordance with the section entitled Seeding, Fertilizing and Mulching. Large rocks, clumps of earth and excessive spoil material shall be removed from the area prior to seeding.
- 2. Shoulders of all roads shall be restored as specific for lawns and landscaped areas.
- 3. Wooded areas, not classified as lawns shall be restored to as near their original condition as possible.

B. Concrete Sidewalks:

- 1. Concrete walks removed in connection with, or damaged as a result of, construction operations under the Contract shall be replaced with new construction. Such walks shall be constructed of Class B concrete on a thoroughly compacted subgrade, shall have a vertical thickness, unless otherwise noted, of not less than 4" or the thickness of the replaced walk where greater than 4".
- 2. Walks shall be float finished, edged with an edging tool, and grooved at intermediate intervals not in excess of the width of the walk, uniform throughout the length of the walk in any one direction.

C. Driveways:

1. Unless otherwise noted, unpaved driveways shall be surfaced with not less than 4" of CABC, topped with 4" of stone, gravel, or other materials equal to that found in the original driveway. Driveways shall be left in a condition better than their original condition.
2. Concrete drives shall be replaced with Class B concrete and shall have equal thickness and reinforcing steel to that of the original drive. Prior to placing the concrete a 6" aggregate base course shall be placed in the drive area.
3. Unless otherwise noted, bituminous or Asphaltic concrete drives shall be restored to original base and asphalt thicknesses or a minimum of 6" aggregate base course and a 2" surface course, whichever is greater. Base material shall be compacted in 3-inch lifts and type 1-2 asphalt compacted in 2-inch lifts to match existing pavement section. All work shall be in accordance with the section entitled Bituminous Pavement Repairs.

D. Roadway Replacement:

1. Bituminous or Asphaltic pavements shall include all areas paved with blacktop; built-up pavements or oil and stone, tar and stone and similar pavements constructed with a bituminous or asphalt and stone materials.
2. Immediately upon completion of installation of underground piping and structures, the trench shall be backfilled and the roadway shall be repaired. Provide materials as specified in the Contract Drawings if, in the opinion of the Engineer, the area adjacent to the excavation has not been damaged to the extent that the base course need to be replaced, restoration may consist of a surface course of sufficient thickness to meet the existing pavement.
3. Portland cement concrete roadways shall be replaced with Class B Concrete and shall have equal thickness and reinforcing steel as the original roadway. An aggregate of 6" shall be placed prior to the placing of concrete.
4. Differential settlement of restored pavements shall be corrected immediately.
5. The Contractor shall repair and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications.
6. All existing manhole and valve covers shall be raised as required by the Contractor prior to paving. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

E. Ditches: Ditches shall be regraded to the original grade and line. The surface of all ditches shall be returned to the same condition as found before commencing work.

F. Lawns and Landscaped Areas:

1. Lawns and landscaped areas shall be regraded and replaced as follows:
 - a. Grading shall be to the grade existing before construction of the work under this Contract.

- b. Lawn replacement shall be in accordance with the section entitled Landscaping. Topsoiled areas shall be replaced with topsoil of equal quality and quantity.
- 2. Landscaped areas shall be replaced with shrubs, hedges, ornamental trees, flowers, or other items to original condition.
- G. Curb and Gutter: Curb and gutter removed with, or damaged as a result of construction operations, injured or disturbed by the Contractor, his agents, or employees, shall be replaced with new construction to a condition similar and equal to that existing before damage was incurred. Class B Concrete shall be used in curb and gutter replacement.
- H. Damage to Structures: Any damage to existing structures shall be repaired of materials and workmanship equal to those of original construction. Extensively damaged structures, where the structural stability has been affected or which cannot be repaired in a suitable fashion shall be replaced entirely. Replacement shall not commence until approval of the plan of replacement has been given by the Engineer. Replacement costs shall be responsibility of the Contractor.

END OF SECTION

SECTION 02921

TOP SOIL

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The work of this section consists of furnishing and placing topsoil for turf areas to be seeded, fertilized, and mulched. No topsoil shall be furnished, nor will be paid for, under this section until all job-stockpiles have been exhausted.

1.02 SUBMITTALS

A. Soil Analysis Certificates

Submit six (6) copies of soil analysis certificates covering grain size and additive recommendations from the State University Agricultural Extension Service or other certified testing laboratory.

1.03 DELIVERY

- A. Product Handling: Do not deliver topsoil in frozen or muddy condition

PART 2: PRODUCTS

2.01 MATERIALS

- A. Topsoil: Natural, friable, loamy soil, typical of local topsoil which produces heavy vegetative growth; free from subsoil, weeds, sods, stiff clay, stones larger than 1-inch, toxic substances, litter, or other foreign material harmful to plant growth; having a pH between 6.0 and 7.0.

Grading Analysis	
Sieve	Minimum Percent Passing
2 in.	100
No. 4	90
No. 10	80

Topsoil shall contain sand, silt, and clay as required by AASHTO M146.

	Minimum Percent	Maximum Percent
Sand	20	75
Silt	10	60
Clay	5	30

PART 3: EXECUTION

3.01 PREPARATION

- A. Job Conditions: Do not perform tilling operations when ground is frozen or excessively wet.

3.02 INSTALLATION

A. General

1. Use equipment and methods to prevent damage to existing structures, utilities, lawns and plantings.
2. Prior to placing topsoil, shape the subgrade to graded lines, and cross sections to provide for 2 inches of compacted topsoil. Clear the subgrade of materials larger than 2 inches. Excavate to depth of 12 inches all areas that have become saturated with oil, gasoline, or bituminous products; backfill with approved material.
3. After alignment of subgrade, loosen and till to a depth of 6 inches by disking, harrowing, rototilling, or other approved methods.
4. After approval, place and spread topsoil to secure required depth after compaction; rake and remove materials larger than 2 inches: Compact with approved roller equipment. Finish smoothing even, and true to lines and grades indicated.

END OF SECTION

SECTION 02931

SEEDING, FERTILIZING AND MULCHING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This section covers the furnishing of all labor, equipment and materials necessary for the landscaping of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses or legumes.

PART 2: PRODUCTS

2.01 MATERIALS

A. Fertilizer:

1. The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the North Carolina Board of Agriculture.
2. Fertilizer shall be 10-10-10 grade. Upon written approval of the Engineer a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.
3. During handling and storing, the fertilizer shall be cared for in such a manner that it will be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

B. Lime:

1. The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.
2. During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original condition before being used.
3. Lime shall be agriculture grade ground dolomitic limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

C. Seed:

1. The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture.

2. Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Engineer before being sown, and no seed will be accepted with a date of test more than nine (.9) months prior to the date of sowing. Such testing, however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Engineer, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.
 3. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents, or other causes.
 4. Seed shall be entirely free from bulblets or seed of Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.
- D. Mulch: Straw mulch shall be threshed straw of oats, rye or wheat free from matured seed of obnoxious weeds or other species which would grow and be detrimental to the specified grass.
- E. Tackifier: Emulsified asphalt or organic tackifier such as Reclamare R2400 shall be sprayed uniformly on mulch as it is ejected from blower or immediately thereafter. Tackifier shall be applied evenly over area creating uniform appearance. Rates of application will vary with conditions. Asphalt shall not be used in freezing weather.

PART 3: EXECUTION

3.01 PREPARATION

- A. Protection of Existing Trees and Vegetation:
1. Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 2. Provide protection for roots over 1-1/2" diameter cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover

exposed roots with wet burlap to prevent roots from drying out and cover with earth as soon as possible.

3. The Contractor shall not remove or damage trees and shrubs which are outside the Clearing Limits established by the Owner or those within the Clearing Limits designated to remain.
4. Repair trees scheduled to remain and damaged by construction operations in a manner acceptable to the Engineer. Repair damaged trees promptly to prevent progressive deterioration caused by damage.
5. Replace trees scheduled to remain and damaged beyond repair by construction operations, as determined by the Engineer with trees of similar size and species. Repair and replacement of trees scheduled to remain and damaged by construction operations or lack of adequate protection during construction operations shall be at the Contractor's expense.

B. Grading:

1. Rough grading shall be done as soon as all excavation required in the area has been backfilled. The necessary earthwork shall be accomplished to bring the existing ground to the desired finish elevations as shown on the Contract Drawings or otherwise directed.
2. Fine grading shall consist of shaping the final contours for drainage and removing all large rock, clumps of earth, roots and waste construction materials. It shall also include thorough loosening of the soil to a depth of 6" by plowing, discing, harrowing or other approved methods until the area is acceptable as suitable for subsequent landscaping operations. The work of landscaping shall be performed on a section-by-section basis immediately upon completion of earthwork.
3. Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Engineer may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Engineer.

C. Seedbed Preparation:

1. The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside of the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities, which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the Engineer to provide for more effective seeding and for ease of subsequent mowing operations.
2. The soil shall then be scarified or otherwise loosened to a depth of not less than 6" except as otherwise provided below or otherwise directed by the Engineer. Clods shall be broken and the top 2" to 3" of soil shall be worked

into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Engineer.

3. On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so, permitted by the Engineer.
 4. On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Engineer, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.
 5. On cut slopes that are either 2:1 or steeper, the Engineer may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in a condition acceptable to the Engineer, additional seedbed preparation may be reduced or eliminated.
 6. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Engineer determines that it is in an otherwise unfavorable working condition.
- D. Application Rates: Seed shall be applied by means of a hydro-seeder or other approved methods. The rates of application of seed, fertilizer and limestone shall be as stated below.
1. Lime and Fertilizer: In the absence of a soil test, the following rates of application of limestone and fertilizer shall be:
 - a. 4,000 pounds limestone per acre
 - b. 1000 pounds 10-10-10 (N-P205-K20) fertilizer per acre and the remaining quantity applied when vegetation is three inches in height or 45 days after seeding, whichever comes first.
 2. Mulch: Mulch shall be applied at the following rates per acre:
 - a. 3,000-4,000 pounds straw mulch, or
 - b. 1,500-2,000 pounds wood cellulose fiber.
 - c. 35-40 cubic yards of shredded or hammermilled hardwood bark
 - d. 1,200-1,400 pounds of fiberglass roving
 3. Seed: The kinds of seed and the rates of application shall be as contained in this table. All rates are in pounds per acre. See Notes 1 and 2.
 - a. Fall and Winter (Normally August 1 to June 1): 80 pounds of Ky-31 tall fescue and 15 pounds of rye grain
 - b. Summer (Normally May 1 to September 1): 100 pounds of Ky-31 tall fescue
 4. NOTE:

- a. On cut and fill slopes having 2:1 or steeper slopes, add 40 pounds of sericea lespedeza per acre to the planned seeding (hulled in spring and summer unhulled in fall and winter) plus 15 pounds of sudangrass in summer seeding or 25 pounds of rye cereal per acre in fall and winter seeding, if seeded September to February.
- b. These seeding rates are prescribed for all sites with less than 50% ground cover and for sites with more than 50% ground cover where complete seeding is necessary to establish effective erosion control vegetative cover. On sites having 50% to 80% ground cover where complete seeding is not necessary to establish vegetative cover, reduce the seeding rate at least one-half the normal rate.

E. Application:

1. Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Engineer before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.
2. Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Engineer determines that weather and soil conditions are unfavorable for such operations.
3. Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at the specific rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed.
4. Seed shall be distributed uniformly over the seedbed at the required rate of application, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Engineer. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.
5. When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill or drilled lightly following the initial drilling operation.
6. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Engineer.
7. Immediately after seed has been properly covered the seedbed shall be compacted in the manner and degree approved by the Engineer.

8. When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.
9. Such modifications may include but not be limited to the following:
 - a. The incorporation of limestone into the seedbed may be omitted on
 - i. cut slopes steeper than 2:1.
 - ii. on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or
 - iii. on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.
 - b. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.
 - c. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

F. Mulching:

1. All seeded areas shall be mulched unless otherwise indicated in the special provisions or directed by the Engineer.
2. It shall be spread uniformly at a rate of two tons per acre in a continuous blanket over the areas specified.
3. Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3" in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil.
4. Mulch shall be applied within 24 hours after the completion of the seeding unless otherwise permitted by the Engineer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations.
5. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.
6. Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Engineer. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch operation.

7. The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

G. Maintenance:

1. The Contractor shall keep all seeded areas in good condition, reseeding and mowing if and when necessary, as directed by the Engineer, until a good lawn is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract.
2. Grassed areas will be accepted when a 95% cover by permanent grasses is obtained, and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.
3. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Engineer. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Engineer at no cost to the Owner.

END OF SECTION

SECTION 03100 CONCRETE FORMWORK

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Extent of formwork is indicated by the concrete structures shown on the drawings. Work shall include (except as specified elsewhere in the Contract Documents) providing formwork and shoring for all cast-in-place concrete; and installation into the formwork, items furnished by others, such as anchors, plates, inserts, frames, nosings, and any other items embedded in concrete.

1.02 STANDARDS

- A. References: Some products and execution are specified in this section by reference to published specifications or standards of the following with respective abbreviations used:
 - 1. American Concrete Institute ACI
 - 2. The American Society for Testing and Materials ASTM
 - 3. U. S. Products Standards PS
- B. Standard Specifications and Codes: The following Publications of the American Concrete Institute form a part of this Specification:
 - 1. ACI 347-78 "Recommended Practice for Concrete Formwork".
 - 2. ACI 301-72 "Specifications for Structural Concrete".

PART 2: PRODUCTS

2.01 MATERIALS

- A. Materials used for formwork shall be selected by the Contractor, subject to approval by the Engineer. All materials shall be high quality and standard for the industry.

PART 3: EXECUTION

3.01 FORMWORK DESIGN

- A. The Contractor shall be responsible for the design of all concrete formwork. Formwork shall be designed in accordance with ACI 347 unless noted. Design, erect, support, brace and maintain formwork so that it will safely support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, and height of concrete drop, vibrator frequency, ambient temperature, foundation pressure,

stresses, lateral stability, and other factors pertinent to safety of structure during construction. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide back-up material at joints as required to prevent leakage and fins.

- C. Formwork for foundation systems may be omitted when workmanship and soil conditions permit accurate excavation and the omission is approved by the Engineer. Provide temporary openings in wall forms, column forms, and other locations necessary to permit inspection and cleanout.
- D. Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be a commercially manufactured type. Nonfabricated wire shall be used. Form ties shall be constructed so that the end fasteners can be removed without causing appreciable spalling at the faces of the concrete. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than two diameters or twice the minimum dimensions of the tie from the formed faces of concrete to be permanently exposed to view except that in no case shall this distance be less than 3/4". When the formed face of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces.
- E. At construction joints, contact surface of the form for sheeting for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by more than one foot. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint and to maintain a true surface. Wood forms for wall openings shall be constructed to facilitate loosening, if necessary, to counteract swelling of the forms. Wedges used for final adjustment of the forms prior to concrete placement shall be fastened in position after the final check. Formwork shall be so anchored to shores or other supporting surfaces or members that upward or lateral movement of any parts of the formwork system during concrete placement will be prevented. Runways for moving equipment or pump lines shall be provided with struts or legs and shall be supported directly on the formwork or structural member without resting on the reinforcing steel. When mudsills are to be placed for supporting concrete forms, a reasonably level and sufficiently compacted surface will be required. Shores shall be plumb within acceptable tolerances.

3.02 TOLERANCES

- A. Unless otherwise specified by the Engineer, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits listed in Table 4.3.1 of ACI 301-72.

- B. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project, sufficient control points and bench marks to be used for reference purposes to check tolerances.

3.03 PREPARATION OF FORM SURFACES AND FORM COATINGS

- A. All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar or grout from previous concreting and of all other foreign materials before concrete is placed in the forms. Coat form contact surfaces with form-coating compound before reinforcement is placed. Provide form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion or impede the wetting of surfaces to be cured with water or curing compounds. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.04 REMOVAL OF FORMS

- A. Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations provided surfaces, are cured and protected from cold weather as specified in other sections of this specification.

Forms and shoring in the formwork used to support the weight of concrete in beams, slabs and other structural members, shall remain in place until the concrete has reached the minimum strength specified of 75% of the specified 28-day design strength. Strength of concrete must be verified by concrete test cylinders molded and cured in the field under the same conditions that the concrete represented by these cylinders are cured and/or maturity meters connected to thermo-couples embedded in the concrete. It shall be the responsibility of the concrete technician, employed by the Owner, to inform the General Contractor when the strength of concrete cured in the field has attained the minimum specified strength required for removal of the forms.

Bottom forms of slabs shall not be removed in less time than is indicated below unless otherwise approved by the Engineer.

Above 60° F	50° F	40° to 50° F
8 days	10 days	18 days

When temperature is below 40° F., the shores shall remain in place for an additional time equal to the lower temperature.

- B. When shores and other vertical supports are so arranged that the non-load carrying form-facing material may be removed without loosening or disturbing the shores and supports, the facing material may be removed at an earlier age as specified or permitted. Wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.

When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.

3.05 RESHORING

- A. When reshoring is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is under way, no live load shall be permitted on the new construction.

In no case during reshoring shall concrete in beam, slabs, column or any other structural member be subjected to combined dead and construction loads in excess of the loads permitted by the Engineer for the developed concrete strength at the time of reshoring. Reshores shall be placed as soon as practicable after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.

3.06 RECORDS

- A. The Contractor shall maintain an accurate log showing the following information:
1. Date of pour
 2. Area poured
 3. Average ambient temperature during curing period
 4. Date forms scheduled for removal
 5. Date form removal completed
 6. Method of reshoring (number of floor, etc.)
 7. Test cylinder serial numbers
 8. Strength of test cylinders at 7 and 28 days.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1: GENERAL

1.01 DESCRIPTION OF WORK

- A. This section includes cast-in-place concrete as shown on Drawings, and as specified herein. In general, this work includes providing cast-in-place concrete consisting of Portland Cement, fine and coarse aggregate, selected admixtures, mixing, transporting, placing, finishing, and curing as herein specified. This section further includes related items of quality control, testing, and evaluation of concrete strength.

1.02 REFERENCES

- A. Some products and execution are specified in this section by reference to published specifications or standards of the following with respect abbreviations used.
1. American Concrete Institute ACI
 2. The American Society for Testing and Materials ASTM
- B. Standard References: The current edition of the following standard references shall apply to the work of this Section as indicated. Suffixes indicating issue date are omitted from reference numerals elsewhere in the text. Concrete work shall comply with the following standards and codes except as indicated otherwise on the Drawings or herein.
1. ACI 301 "Specifications for Structural Concrete"
 2. ACI 304 "Recommended Practice for Measuring, Mixing Transporting, and Placing Concrete"
 3. ACI 305 "Recommended Practice for Hot Weather Concreting"
 4. ACI 306 "Recommended Practice for Cold Weather Concreting"
 5. ACI 308 "Recommended Practice for Curing Concrete"
 6. ACI 309 "Recommended Practice for Consolidation of Concrete"
 7. ACI 311 "Recommended Practice for Concrete Inspection"
 8. ACI 214 "Recommended Practice for Evaluation of Compressive Test Results of Field Concrete"
 9. ACI 211.1 "Recommended Practice for Selecting Proportions 70 for Normal Weight Concrete"
 10. ACI 211.2 "Recommended Practice for Selecting Proportions for Structural light-weight Concrete"
 11. ACI 212 "Guide for Use of Admixtures in Concrete"

12.ACI 214 "Recommended Practice for Evaluation of Compression Test Results of Field Concrete"

1.03 QUALITY ASSURANCE

- A. If the average strength of the laboratory control cylinders shows the concrete to be below the specified design strength, the aggregate proportions and water content may be changed by the Engineer, who, in addition to such changes, may require core tests. Tests confirming concrete strengths on hardened concrete which was poured without testing shall be paid for by the Contractor.
- B. Prepare design mixes for each class of concrete used in accordance with ACI 311.1. The Contractor shall pay for all design mix costs. Submit written reports to the Engineer for each proposed mix for each class of concrete prior to start of work. Do not begin concrete production until mixes have been reviewed by the Engineer.
- C. Strength data for establishing standard deviation and required overstrength factor will be considered suitable if the concrete production facility has certified records consisting of at least 30 consecutive tests in one group or the statistical average for two groups totaling 30 or more tests representing similar materials and project conditions. Records of these tests shall be submitted with the proposed design mix.
- D. If standard deviation exceeds 800 psi or if no suitable records are available, selected proportions to produce an average strength of at least 1200 psi greater than the required compressive strength of concrete. If standard deviations are less than 600 psi, the minimum overstrength factor required in the design mix shall be in accordance with ACI 318, Section 4.3.1.
- E. Design mixes shall be proportioned using the maximum specified slump and temperature. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by the Engineer before using in the work. Admixtures shall be used in strict accordance with the manufacturer's written instructions. Design mix shall be proportioned using the proposed admixtures at optimum recommended dosages. The manufacturer of the mixture shall prepare and submit test data used to determine the optimum dosage.

1.04 SUBMITTALS

- A. The Contractor shall submit four copies of the proposed design mix for each class of concrete specified herein in accordance with the requirements herein. Design mixes shall be submitted two weeks prior to placement of concrete. The cost of the design mix shall be paid for by the contractor. Submit records of all concrete pours showing exact location of pour, date of pour, quantity of pour, and class of concrete poured to the Engineer each month. Temperature at time of pour should also be recorded. Submit to the Engineer chemical and physical analysis of all cement and fly ash delivered to the batch plant seven (7) days prior to use of the cement or fly ash.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Portland Cement shall be fresh stock of an approved standard brand meeting the requirements of ASTM C-150, of Type II. Only one brand of cement shall be used except when otherwise approved by the Engineer, and the Contractor shall inform the Engineer of the brand name of the cement proposed for use. The Contractor shall submit a copy of mill test reports on all cement delivered to the job 7 days prior to use of the cement. Cube strength from mill tests shall have a tolerance of ± 600 psi. The fineness of cement used shall not have more than 10% retained on a #325 mesh screen when tested in accordance with ASTM C-430.
- B. Fly Ash shall have a high fineness and low carbon content and shall exceed the requirements of ASTM C-618. Specifications for Fly Ash and Raw or Calcined Natural for use in Portland Cement Concretes for Class 7, except that the loss of ignition shall be less than 3%, and all fly ash shall be a classified processed material. Fly ash shall be obtained from one source for the concrete delivered to the project. Complete chemical and physical analysis of each carload of fly ash shall be submitted to the Engineer ten (10) days prior to use of each carload delivered. Concrete mixes proportioned with fly ash shall contain not less than 10% nor more than 20% by weight of cement of fly ash.
- C. Concrete Aggregate for stone concrete shall consist of clean crushed stone or gravel having hard, strong, uncoated particles free from injurious amounts of soft, thin, elongated or laminated pieces, alkali, organic or other deleterious matter. Maximum aggregate size shall be 3/4" of slabs, columns, etc. The maximum permissible percentage of elongated particles shall not exceed 5% by weight. Elongated particles are those defined as having a length equal to or greater than 5 times the width. Samples of coarse aggregate shall be submitted to the testing laboratory for testing and approval prior to use. The fineness modulus of the coarse aggregate shall not vary for more than $\pm 0.3\%$.
- D. Fine Aggregate shall consist of sand, stone screening, or other inert materials with similar characteristics having clean, strong, durable, uncoated grains and free from lumps, soft or flaky particles, clay, shale, alkali, organic matter or other deleterious substances. Fine aggregate shall be submitted for testing and approval to the testing laboratory. The laboratory shall verify that fine aggregate conforms to ASTM standards by making standard colorimetric, sediment, and comparative tensile tests, and by sieve analysis. The fineness modulus of the sand shall not vary by more than $\pm 0.2\%$. Color shall be standard as determined from colorimetric tests.
- E. Concrete Admixtures, when required or permitted shall conform to the appropriate specification listed. Do not use admixtures which have not been incorporated and tested in the accepted mixes unless otherwise authorized in writing by the Engineer. Air-entraining admixtures shall exceed the requirements of ASTM C-260, "Specifications for Air- Entraining Admixtures for Concrete". Water reducing admixtures shall be hydroxylated polymer type exceeding the requirements of ASTM C-494, Type A.
- F. Premolded Expansion Joint Fillers shall conform to ASTM D1751.

- G. Liquid curing material for concrete shall exceed the requirements of ASTM C-309, Type I. Products acceptable shall provide water retention not exceeding a loss of 0.020 grams per sq. cm. when tested at a coverage of 200 sq. ft. per gallon and tested in accordance with ASTM C-156. Submit test data verifying these requirements for approval.
- H. Burlap shall be free of sizing or any substance that is injurious to cement or can cause discoloration. Burlap shall be rinsed in water prior to use. Burlap shall be sufficient thickness to retain water without requiring wetting.
- I. Steel for Embedded Angles and Plate Cast in Concrete shall conform to ASTM A-36. Plates and angles shall receive a commercial sand blast and be painted with an inorganic zinc base paint equal to Carbomastic #11, or an approved equal.
- J. Crushed Stone Fill, 6" in depth, shall be placed under all concrete floors in contact with the ground. Stone shall be uniform 1" stone, no fines, compacted as thoroughly as possible by tamping and rolling. Stone fill shall conform to ASTM C-33.
- K. Vapor Barrier shall be Moistop as manufactured by the St. Regis Co., or an approved equal.
- L. Waterstops shall be Sealtight PVC waterstrips as manufactured by the W.R. Meadows Co., or an approved equal. All waterstops shall be Type 6316. Water bars shall be located in all expansive joints in the concrete and in all construction joints in concrete walls.
- M. Joint Sealing Compound shall be a two-part mineral filled epoxy polyurethane, and shall be used for all exposed joints in exterior paving slabs, sidewalks, where concrete slabs abut concrete walls, and in exposed joints in slabs on grade.
- N. Surface Coating for all exposed concrete except where otherwise shown shall be "Thoroseal" as manufactured by the Standard Dry Wall Co., or an approved equal.

2.02 AIR ENTRAINMENT

- A. Air-entraining admixtures shall be used for all concrete exposed to freezing and thawing or subjected to hydraulic pressure. Entrained air shall conform to the air control limits of Table 3.4.1 of ACI 301. The water-cement ratio for all air-entrained concrete exposed to freezing and thawing shall not exceed 0.53.

2.03 SLUMPS

- A. All concrete shall be proportioned and produced to have a maximum slump of 4" and a minimum slump of 2". A tolerance of up to but not exceeding 1" above the indicated maximum shall be allowed for individual batches in any one day's pour provided the average of the most recent ten batches within the same pour does not exceed the maximum limits. No tolerance will be permitted for individual batches when less than ten (10) batches are delivered for one day's pour.

2.04 CONCRETE MIXING

- A. Concrete shall be mixed at batch plants, or it may be transit mixed as specified herein. Concrete batch plants must comply with the requirements of ASTM C-94

and ACI-304 with sufficient capacity of producing concrete of the quantity and quality as specified herein. All plant facilities are subject to inspection by the Engineer. Ready-mix concrete shall comply with requirements of ASTM C-94, and as specified herein, unless otherwise noted. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C-94 will be required as follows:

1. When air temperatures are between 80° F and 90° F, reduce the mixing and delivery time from 1-1/2 hours to 1 hour
 2. When outside air temperatures are above 90° F, reduce the mixing and delivery time from 1-1/2 hours to 45 minutes.
- B. Addition of water at the site for concrete mix with insufficient slumps, slumps less than the maximum specified herein, will not be permitted. Concrete delivered to the project with slump less than the minimum or greater than the maximum specified shall be rejected and discarded off site.
- C. Batch tickets for each load of concrete shall be submitted to the Engineer. The following information shall be provided on each batch ticket:
1. Design mix designation
 2. Exact time cement, 'water and aggregate were discharged into the mix
 3. Compressive strength of mix
 4. Amount of water added to the mix
- D. Maintain equipment in proper operating condition, with drums cleaned before charging of each batch. Schedule delivery of trucks in order to prevent delay of placing after mixing.
- E. *Concrete Type and Strengths

Location	Maximum Size Aggregate	28 Day Compressive Strength
Slabs on Grade	3/4"	4,000 psi
Walls	3/4"	4,000 psi
Columns	3/4"	See Notes on Plans
Beams, Supported Slabs & Joists	3/4"	4,000 psi

* Note: Twenty-eight day strength shall be as determined from concrete sampled in accordance with ASTM C-172 and standard 6" x 12" molded cylinders tested in accordance with ASTM C-31 and C-39.

PART 3: EXECUTION

3.01 PREPARATION

- A. Before placing concrete, all equipment for mixing and transporting and placing concrete shall be cleaned, all debris and ice removed from spaces to be occupied by the concrete, forms thoroughly cleaned of soil, ice, or other coatings which will

prevent proper bond, reinforcement shall be securely tied in place and expansion joint material, anchors, and other embedded items shall be securely positioned. Hardened concrete and foreign materials shall be removed from the conveying equipment.

3.02 CONCRETE PLACEMENT

- A. Place concrete in compliance with the practices and recommendations of ACI 304 or as herein specified. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practical by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality concrete is obtained. Conveying equipment shall be of size and design to insure a continuous flow of concrete at the delivery end.
- B. Concrete shall be deposited continuous, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located at points as provided for in the drawings or as approved. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as possible to its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure which will cause segregation.
- C. Concrete shall not be allowed to "freefall" a distance greater than 3'-0". All concrete placed in columns and walls shall be placed through a tremie with the bottom or outlet of the tremie being held at maximum of 3'-0" above the surface where concrete is being placed.
- D. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
- E. Do not use concrete which has become non-plastic and unworkable or does not meet the required quality control limits, or which has become contaminated by foreign material. Remove rejected concrete from the project site and dispose of in an acceptable location. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding, and tamping. Vibration of forms and reinforcing steel will not be permitted.
- F. Do not use vibrators to transport concrete inside forms. Insert and withdraw vertically at uniformly spaced locations not further than the visible effectiveness of the vibrator. Do not insert vibrators into lower levels of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcing and other embedded items without causing segregation of the mix.
- G. Deposit and consolidate concrete in slabs in a continuous operation, within the limits of construction joints until the placing of the entire section is complete.
- H. Bring surface of slabs to the correct elevations with a straight edge and strike off. Use bull floats or darbies to smooth the surface, leaving it free of lumps and

hollows. Do not sprinkle water on the plastic surface. Do not disturb the surface prior to beginning the finish operation.

- I. Concrete placed by pumping shall conform to the recommendations of ACI Publication, "Placing Concrete by Pumping Methods."

3.03 CONSTRUCTION JOINTS

- A. Joints not shown on the drawings shall be made at locations that will least impair the strength of the structure and shall be approved by the Engineer. In general, they shall be located near the middle of the span of members. Joints in walls and columns shall be located at the underside of floors or slabs, and the tops of foundation walls. Roughen surfaces of hardened concrete at all vertical construction joints. Clean surface of laitance, coatings, loose particles, and foreign matter to expose aggregate. Prepare for bonding of fresh concrete to new concrete that has hardened; at joints between foundation systems and walls dampen, but do not saturate, the roughened and cleaned surface of set concrete immediately before placing fresh concrete. In lieu of neat cement grout, bonding grout may be a commercial bonding agent. Apply to cleaned concrete surfaces in accordance with the printed instruction of this bonding material manufacturer. Provide keyways at least 1-1/2" deep in all construction joints in walls, slabs, and between walls, and foundation systems. Provide PVC Waterstops in all construction joints in concrete walls and in concrete beams and slabs. PVC waterstops shall also be provided between concrete beams and slabs at all expansion joints.

3.04 COLD WEATHER PLACING AND CURING REQUIREMENTS

- A. All concrete placed in temperatures 40° F or below or exposed to temperatures 40° F or below within five (5) days after the concrete is placed, shall conform to the requirements of ACI 306, "Recommended Practice for Winter Concreting", unless otherwise specifically specified herein.
- B. The following protection requirements for concrete placed, protected, and cured in temperature 40° F or less shall be considered the minimum acceptable standards.
 1. Slabs and Beams: Enclose the entire perimeter of the floor below with a continuous sheet of reinforced polyethylene or canvas. The enclosure shall be securely fastened to the top of the outside edge of the forms of the area being protected and to the slab or floor level immediately below the concrete being protected. The top of the concrete surface shall be covered with either insulating blankets designed specifically for this use, or sheets of polystyrene covered with polyethylene. Sufficient heaters shall be placed in the enclosure below the slabs to maintain the air temperature within all sections of the enclosure between 60° F and 70° F for a minimum period of five (5) days. Salamanders will not be permitted.
 2. Columns and Walls: Forms shall remain in place for a minimum of five days. When the outside temperature falls below 32° F, an insulating blanket shall be dropped over and around the perimeter of the column or wall. These blankets shall remain in place for a minimum period of five days.

3. Slabs on Grade: Cover top with insulating blankets. Blankets shall remain in place for a minimum period of five days.
4. Temperature of concrete at placement shall not be less than 55° F.
5. In addition to laboratory-cured test specimens, additional concrete test specimens shall be cured under the same field conditions that the concrete in the field represented by these cylinders is cured and high thermometers shall be placed on the surface of slab to record daily temperatures during curing period.

3.05 HOT WEATHER PLACING

- A. An approved admixture designed to retard the rate of set shall be used for all concrete placed when temperatures exceed 75° F. Set retarding admixtures shall conform to ASTM C-494, Type D, water reducing and retarding. Wet forms thoroughly before placing. Cool reinforcing by wetting sufficiently so that steel temperatures will be nearly equal to the ambient air temperature. Provide wind breaks around the perimeter of the area where concrete is being placed. Fresh concrete with temperatures 90° F or above shall be discarded off site. The amount of cement used in the job is computed for the temperature indicated on the approved design mix. For higher concrete mix temperature, the weight of the cement shall be increased at the rate of 12 lbs. per cubic yard for each 10° F above the concrete mix temperature.

3.06 CURING AND PROTECTION

- A. Protect freshly placed concrete from premature drying and excessive cold or, hot temperatures, and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.
- B. Curing for all horizontal slab surfaces, except those to receive a bonded finish material, during periods when the outside air temperature does not exceed 60° F shall be provided by applying a membrane-forming curing compound to concrete surfaces as soon as the final troweling or floating operation has been completed. Apply uniformly with a roller brush at a rate not to exceed 200 sq. ft. per gallon. Maintain the continuity of the coating and repair damage to the coat during the entire curing period. Curing for surfaces to receive a bonded finish material shall be as noted below. Curing for all horizontal surfaces during period when the outside air temperature will exceed 60° F shall be provided by covering the entire surface with burlap. The burlap shall be lapped 1/2 width in order to provide a double thickness of burlap. Immediately following the placement of the burlap, the entire surface shall be maintained continuously wet for a period of 7 days. Do not permit surfaces to dry at any period during the required curing period.
- C. Cure formed surfaces by moist curing with the forms in place for the full curing period, or until forms are removed. If forms are removed before the curing period is complete, apply a membrane-forming curing compound to damp surfaces as soon as the water film has disappeared. Apply uniformly in continuous operation by roller brushes in accordance with the manufacturer's directions.

- D. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to the concrete or with any other cover or finish material which shall be bonded to the concrete. These surfaces must be watercured with a full coverage of burlap kept continuously moist for a period of 7 days.
- E. During the curing period, protect concrete from damaging mechanical disturbances, including load stresses, shocks, excessive vibration and from change caused by subsequent construction operations.

3.07 SURFACE REPAIRS

- A. Repair and patch defective areas immediately after removal of forms as directed by the Engineer. Cut out honeycombs, rock pockets, voids over 1/2" in diameter and holes left by tie rods and bolts down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surfaces. Exposed reinforcing steel with at least 3/4" clearance all around. Dampen all concrete surfaces in contact with patching concrete, and brush with a neat cement grout coating or concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same materials to provide concrete of the same type or class as the original adjacent concrete. Place, compact, and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
- B. Fill holes extending through concrete by means of a plunger type gun or other suitable device from the least exposed face to insure complete filling. Remove stains and other discolorations that cannot be removed by cleaning for all exposed surfaces. Repair isolated random cracks and single holes not over 1" in diameter by the dry-pack method. Groove the top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen all cleaned concrete surfaces and brush with a neat cement grout coating. Place dry-pack, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a #16 mesh sieve using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match the existing surface.
- C. Fill in holes and openings left in concrete structures for the passage of work by other trades, unless otherwise shown or directed, after the work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide all other miscellaneous concrete filling shown or required to complete work.
- D. Correct high areas in unformed surfaces by grinding, after the concrete has cured at least 14 days. Correct low areas in unformed surfaces during, or immediately after, completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.

3.08 SLABS ON GRADE:

- A. Preparation of Subgrade: The subgrade shall be well drained and of adequate and uniform load-bearing nature. The in-place density of the subgrade soils shall

be at least the minimum required in the specifications. The bottom of an undrained granular base course shall not be lower than the adjacent finished grade. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing, it shall be raised and maintained above 50° F long enough to remove all frost from the subgrade. The subgrade shall be moist at the time of concreting. If necessary; it shall be dampened with water in advance of concreting, but there shall be no free water standing on the subgrade nor any muddy or soft spots when the concrete is placed.

- B. Joints: Joints in slabs on grade shall be located as to divide the slab in areas not in excess of 800 sq. ft. The maximum distance between joints in slabs on grade at all points of contact between slabs on grade and vertical surfaces such as foundation walls and elsewhere as indicated. At exposed joints, recess the premolded fill on a minimum of 1/2", and fill the remaining section with a joint seal and as specified herein. All exposed construction joints in the slabs on grade shall have the edges tooled and the crack and groove formed by the edging tool filled with a polyurethane joint sealant. No cold-key or metal form joints will be permitted.

3.09 FINISHES

- A. Standard Rough Form Finish: Provide a standard rough form finish to all concrete formed surfaces that are to be concealed in the finish work or other construction. (NOTE: Interior faces of walls of water retaining structures are not considered to be concealed.) Standard rough form finish shall consist of all defective areas repaired as specified and all holes or voids larger than 3/8" filled with cement grout.
- B. Standard Finish for Exposed Surfaces: Provide an applied surface finish of "Thoroseal" or an approved equal to all exposed interior and exterior concrete finishes unless otherwise noted. Interior faces of walls of water retaining structures, including areas which are normally submerged, are considered to be exposed surfaces and shall receive the specified standard finish for exposed surfaces. The surface finish shall consist of chopping and/or grinding down all high spots removing grinding of all burrs and/or other projections, filling all voids 3/8" and larger, and cutting out all unsound concrete and patching as specified herein. Before applying the finish, wet and clean the surface of all grease, oils, efflorescence, and other foreign material. Dampen surface immediately ahead of application. Apply the finish coat with a tampico fiber brush by laying the finish coat on the wall in a thick coat of a minimum of 2 lbs. per sq. yard, and brush to a uniform level surface. Do not apply in temperatures 40° F or below, or when temperatures are likely to fall below 40° F within 24 hours after application. The finish coat shall be mixed in strict accordance with the manufacturer's written instructions. After the finish coat has cured, apply a finish coat of "Quick Seal" at a minimum of 12 lb. per sq. yd. The Thoroseal shall be applied by trained technicians.
- C. Smooth Form Finish: Provide a smooth form finish for all exposed interior concrete walls inside buildings, in pipe gallery areas, or as noted on the Drawings.

Standard form finish shall produce a smooth, hard, uniform texture on the concrete. The arrangement of the forms and the number of seams and joints shall be kept to a minimum. Immediately after forms are removed, cut out all unsound concrete and patch as specified herein, and fill all pinholes and other voids larger than 1/4" with a cement grout. Compress mortar into voids with a firm rubber trowel or float. After mortar dries, wipe off surface with burlap.

D. Slab Finishes:

1. Scratched Finish: After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, the surface shall be roughened with stiff brushes or rakes before a final set. A scratched finish shall be applied to all surfaces which are to receive a bonded surface finish.
2. Floated Finish: After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, planeness of surface shall be checked with a 10'-0" straight edge 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 a surface with Class B tolerance throughout. This slab shall then be floated immediately to a uniform sandy texture. A float finish shall be applied to all slab surfaces which are to receive a waterproofing membrane.
3. Troweled Finish: The surface shall first be float-finished as specified. It shall next be power troweled, and finally hand troweled. The first troweling after power floating shall produce a smooth surface which may still show some trowel marks. Additional 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 essentially free of trowel marks, uniform in texture, and appearance, and shall be planed to a Class tolerance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding. A trowel finish shall be applied to all surfaces which are exposed to view or are to receive a floor covering of carpet, vinyl, asbestos, tiles, etc.
4. Broom Finish: Immediately after the concrete has received a float finish as specified in Section B, it shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface. A broom finish shall be applied to all parking surfaces, exterior concrete walks, and concrete paving slabs.

3.10 FINISHING TOLERANCES

- A. Finishes with a Class C tolerance shall be true planes within 1/4" in 2'-0" as determined by a 2'-0" straight edge placed elsewhere on the slab in any direction. Variation from level for Class A tolerance shall not exceed 1/4" in 10'-0" or 1/2" maximum in any one bay between columns. Variation from level for a Class B and

Class C finish shall not exceed 1/4" in 10'-0" or 3/4" in any one bay between columns.

3.11 RELATED UNFORMED SURFACES

- A. As tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching the adjacent formed surfaces. Continue the final surface treatment of formed surfaces uniformly across the adjacent unformed surface unless otherwise shown.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- B. Provide machine and equipment bases and foundations, as shown on the drawings. Set anchor bolts for machines and equipment to template at correct elevations prior to placement of the concrete, complying with certified diagrams or templates of the manufacturer finishing machines and equipment.

3.13 INSPECTION

- A. Before placing concrete, the formwork installation, reinforcing steel, and items to be embedded or cast-in must be complete. Notify other crafts involved in ample time to permit the installation of 'their work; co-operate with other trades in setting such work, as required. Notify Engineer upon completion of installation of all reinforcing and other items in ample time to permit inspection of the work. Soil bottoms at foundation systems are subject to testing laboratory as directed by the Engineer. Place concrete immediately after approval of foundation excavations.

3.14 TESTING AND QUALITY CONTROL

- A. The Owner shall employ a concrete testing laboratory to provide all laboratory testing services on the project and a concrete technician to perform all quality control tests on concrete and materials used to batch concrete. The testing agency employed shall meet the requirement of "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction", (ASTM E-329).
- B. Such tests will be provided and paid for by the Owner, except that tests which reveal non-conformance with the Specifications and all succeeding tests for the same area, until conformance with the Specifications is established, shall be at the expense of the Contractor. The Owner will be responsible for paying for only the successful tests.
- C. The Contractor shall provide and maintain adequate facilities on the project for the testing laboratory to locate the required testing equipment and for safe storage area for test cylinders. The general contractor shall provide at his own expense all casual labor needed to assist the concrete technician in obtaining

samples of concrete and concrete materials and moving and transporting cylinders and materials which are being tested.

- D. The following services shall be performed by the designated testing agency:
1. Review and/or check-test the Contractor's proposed materials for compliance with the specifications.
 2. Review and/or check-test the Contractor's proposed mix design as required by the Engineer.
 3. Secure production samples of materials at plants or stock-piles during the course of the work and test for compliance with the specifications.
 4. Conduct strength tests of the concrete during construction in accordance with the following procedures:
 - a. Secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C-172). Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.
 - b. Mold and cure three specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexural Specimens in the Field" (ASTM C-31). Any deviations from the requirements of this Standard shall be recorded in the test report.
 - c. Test specimens in accordance with "Method of Test for Compression Strength of Molded Concrete Cylinders" (ASTM C-39). Two specimens shall be tested at 28 days for acceptance and one shall be the average of the strengths of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in the test show any of the above defects, the entire test shall be discarded. When high early strength concrete is used, the specimens shall be tested at the ages indicated in the Contract Documents.
 - d. Make at least one strength test for each 50 cu. yd., or fraction thereof, of each mix design of concrete placed in any 1 day. When the total quantity of concrete with a given mix design is less than 50 cu. yd., the strength test may be waived by the Engineer if, in his judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects.
 5. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using "Method of Test for Slump of Portland Cement Concrete" (ASTM C-143).
 6. Determine air content of normal weight concrete sample for each strength test in accordance with either "Method of Test for Air Content of Freshly Mixed

Concrete by the Pressure Method" (ASTM C-231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C-173), or "Method of Test for Weight per Cubic Foot, Yield and Air Content (Gravimetric) of Concrete", (ASTM C-138).

7. Determine unit weight of concrete sample for each strength test.
8. Determine temperature of concrete sample for each strength test.
9. Determine in-place strength of concrete by curing cylinders under the same field conditions that the concrete representing these field cylinders is cured and additionally by determining the degree/hours of curing required for the concrete to develop the required strength for form removal.
10. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the Engineer.
11. Review the manufacturer's report for each shipment of cement.

3.15 EVALUATION AND ACCEPTANCE OF CONCRETE STRUCTURES

- A. The concrete quality control testing as specified will be evaluated by the following criteria:
 1. Compressive strength tests for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of three consecutive compressive strength test results equal or exceed the 28-day design compressive strength of the type of class of concrete; and, no individual strength test falls below the required compressive strength by more than 500 psi. If compressive strength tests fail to meet these requirements, the concrete represented by these tests will be considered deficient and subject to additional testing and/or removal.
 2. Concrete work which does not conform to the specified requirements, including strength, tolerance and finishes, shall be corrected as directed at the Contractors expense, without extension of time therefore. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from correction to the concrete work. Core tests, if required, shall be required, shall be evaluated in accordance with the requirements of ACI 318-77.
 3. The testing agency shall further provide quality control inspection and testing of materials used in concrete. The following inspection and tests shall be on all equipment and materials on a random basis:
 - a. Fineness modulus and gradation of sand
 - b. Fineness modulus and gradation of coarse aggregate.
 - c. Colorimetric of sand.
 - d. Weight per cu. ft. and percent of voids on a dry rodded basis of the coarse aggregate.
 - e. Check of aggregate stock piles for contamination or intermingling of aggregates.

- f. Check of mixing equipment and trucks for compliance with ASTM C-94.
- g. Absorption of stone and sand.

3.16 LEAK TESTING OF WATER RETAINING STRUCTURES

- A. All concrete structures which will retain water or wastewater under normal operating conditions shall be filled with water prior to backfilling and final exterior painting and tested for leaks. Unless otherwise specified by the Engineer, the tank shall remain filled with water for a period of seven (7) days. Any leaks, damp spots, or other defects found shall be repaired and made watertight to the satisfaction of the Engineer. The first 48 hours of the test are utilized to allow the concrete to absorb water. After the first 48 hours of the test, the water level shall be noted and monitored for the remaining five (5) days. A reduction in water greater than 0.1% per 24 hours shall be considered excessive and shall constitute failure of the leak test. (NOTE: Rainfall and evaporation must be considered during calculation of water loss. Rainfall shall be added to and evaporation shall be deducted from the measured loss to determine net liquid loss.)

END OF SECTION

SECTION 03310 PRECAST CONCRETE PRODUCTS

PART 1: GENERAL

1.01 DESCRIPTION OF WORK

- A. This specification covers the materials for and manufacture of precast reinforced concrete units produced in accordance with the plans and these specifications.

1.02 REFERENCES - Where applicable, the latest editions of the following standards shall be considered a part of these specifications. In case of conflict, these specifications shall take precedence over the listed standard.

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. "Standard Specification for Highway Bridges"
 - 2. "Guide Specifications for Structural Design of Sound Barriers"
- B. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete
- C. ACI 318 - Building Code Requirements for Reinforced Concrete
- D. ASTM C478 - Specification for Precast Reinforced Concrete Manholes Sections
- E. ASTM C825 - Standard Specification for Precast Concrete Barriers
- F. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
- G. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures"
- H. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
- I. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures
- J. ASTM C915 - Standard Specification for Precast Reinforced Concrete Crib Wall Members
- K. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
- L. ASTM C936 - Standard Specification for Solid Concrete Interlocking Paving Units
- M. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
- N. ASTM C1227 - Standard Specification for Precast Concrete Septic Tanks
- O. ASTM 1433 - Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
- P. ASTM C1478 - Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals

- Q. AWS D1.1 - Structural Welding Code - Structural Steel
- R. AWS D1.4 - Structural Welding Code - Reinforcing Steel
- S. CRSI Manual of Standard Practice

1.03 FRANCHISE PRODUCTS

Products manufactured under franchise arrangements shall conform to all the requirements specified by the franchiser. Items not included in the franchise specification but included in this specification shall conform to the requirements in this specification.

1.04 SUBMITTALS

A. Product Data

1. For standard precast concrete units, the precast concrete producer will supply cut sheets showing conformance to project drawings and requirements and to applicable ASTM specifications listed in this specification. The Precast concrete producer shall certify that such products will meet the ASTM specifications.
2. For proprietary precast concrete units, the precast concrete producer may supply standard plans or informative literature. Supporting calculations and design details shall be available upon request. The Precast concrete producer shall warrant that such products will perform the intended task.

B. Shop Drawings

1. The plans for custom-made precast concrete units shall be shop drawings furnished by the precast concrete producer for approval by the Owner or his agent (specifier). These drawings shall show complete design, installation, and construction information in such detail as to enable the Owner to determine the adequacy of the proposed units for the intended purpose. Details of steel reinforcement size and placement as well as supporting design calculations, if appropriate, shall be included. The drawings shall include a schedule, which will list the size and type of precast concrete units at each location where they are to be used. The precast concrete units shall be produced in accordance with the approved drawings.

1.05 QUALITY ASSURANCE

- A. Precast concrete producer shall demonstrate adherence to the standards set forth in the National Precast Concrete Association Quality Control Manual. Precast concrete producer shall meet requirements written in subparagraph 1 or 2.
 1. NPCA Certification - The precast concrete producer shall be certified by the National Precast Concrete Association's Plant Certification Program prior to and during production of the products for this project.
 2. Qualifications, Testing and Inspection
 1. The Precast concrete producer shall have been in the business of producing precast concrete products similar to those specified for a minimum of 5 years. The precast concrete producer shall maintain a

permanent quality control department or retain an independent testing agency on a continuing basis. The agency shall issue a report, certified by a licensed engineer, detailing the ability of the precast concrete producer to produce quality products consistent with industry standards.

2. The Precast concrete producer shall show that the following tests are performed in accordance with the ASTM standards indicated. Tests shall be performed for each 150 cu. yd. of concrete placed, but not less frequently than once per week.
 - a. Slump: C143
 - b. Compressive Strength: C31, C192, C39
 - c. Air Content (when air-entrained concrete is being used): C231 or C173
 - d. Unit Weight: C138
3. The Precast concrete producer shall provide documentation demonstrating compliance with this subparagraph.
4. The Owner may place an inspector in the plant when the products covered by this specification are being manufactured.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Handling – Products shall be stored, handled shipped and unloaded in a manner to minimize damage. Lifting holes or inserts shall be consistent with industry standards. Lifting shall be accomplished with methods or devices intended for this purpose.
- B. Acceptance at Site – The Owner's representative shall make final inspection and acceptance of the precast concrete products upon arrival at the jobsite.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. The precast concrete manufacturer must meet the guidelines written in article 1.5 paragraph A.

2.02 MANUFACTURED PRECAST UNITS

- A. Precast Concrete: Provide all units shown in Contract Documents and as needed for a complete and proper installation
- B. Design Criteria - Design units in accordance with:
 1. ACI 304 and 318.
 2. CRSI Manual of Standard Practice.
 3. Applicable ASTM Standard(s).
- C. Finishes
 1. Formed non-architectural surfaces: Surfaces cast against approved forms using industry practice in cleaning forms, designing concrete mixes, placing and curing concrete. Normal color variations, form joint marks, small surface

holes caused by air bubbles, and minor chips and spalls will be tolerated but no major imperfections, honeycombs or other defects will be permitted.

2. Unformed surfaces: Surfaces finished with a vibrating screed, or by hand with a float. Normal color variations, minor indentations, minor chips and spalls will be tolerated but no major imperfections, honeycombs, or other defects shall be permitted.
3. Special finishes:
 - a. Troweled, broom or other finishes shall be according to the requirements of project documents and performed per industry standards or supplier specifications.
 - b. Precast concrete producers shall submit finishes for approval when required by the project documents. The sample finishes shall be approved prior to the start of production.

D. Patching and Repairs

1. No repair is required to formed surfaces that are relatively free of air voids and honeycombed areas, unless the surfaces are required by the design to be finished.
2. Repairing Minor Defects - Defects that will not impair the functional use or expected life of a manufactured precast concrete product may be repaired by any method that does not impair the product.
3. Repairing Honeycombed Areas - When honeycombed areas are to be repaired, all loose material shall be removed and the areas cut back into essentially horizontal or vertical planes to a depth at which coarse aggregate particles break under chipping rather than being dislodged. Proprietary repair materials shall be used in accordance with the manufacturer's instructions. If a proprietary repair material is not used, the area shall be saturated with water and, immediately prior to repair, the area should be damp, but free of excess water. A cement-sand grout or an approved bonding agent shall be applied to the chipped surfaces, followed immediately by consolidating an appropriate repair material into the cavity.
4. Repairing Major Defects - Defects in precast concrete products which impair the functional use or the expected life of products shall be evaluated by qualified personnel to determine if repairs are feasible and, if so, to establish the repair procedure.

2.03 MATERIALS

- A. Concrete - Concrete shall be a uniform mix of quality materials listed below. Mix proportions shall be determined by following the standards in ACI 318 Chapter 5. Recommendations for selecting proportions for concrete are given in detail in Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete (ACI 211.1). Recommendations for lightweight concrete are given in Standard Practice for Selecting proportions for Structural Lightweight Concrete (ACI 211.2).

1. Water-Cement Ratio

- a. Concrete that will be exposed to freezing and thawing shall contain entrained air and shall have water-cement ratios of 0.45 or less. Concrete which will not be exposed to freezing, but which is required to be watertight, shall have a water-cement ratio of 0.48 or less if the concrete is exposed to fresh water, or 0.45 or less if exposed to brackish water or sea water. For corrosion protection, reinforced concrete exposed to deicer salts, brackish water or seawater shall have a water-cement ratio of 0.40 or less.

b. Air Content

1. The air content of concrete that will be exposed to freezing conditions shall be within the limits given in Table 1.

Table 1 Total Air Content for Frost-Resistant Concrete Nominal Maximum

Nominal Max. Aggregate Size (inches)	Air Content, %	
	Severe Exposure	Moderate Exposure
3/8	6.0 to 9.0	4.5 to 7.5
1/2	5.5 to 8.5	4.0 to 7.0
3/4	4.5 to 7.5	3.5 to 6.5
1	4.5 to 7.5	3.0 to 6.0
1-1/2	4.5 to 7.0	3.0 to 6.0

*For specified compressive strengths greater than 5000 psi, air content may be reduced 1%.

c. Compressive Strength

1. All concrete shall develop a minimum compressive strength of 4,000 psi in 28 days unless other strengths are designated on the drawings.

B. Portland Cement: ASTM C150, Type I, II, III or V.

C. Aggregates: ASTM C33 or C330.

D. Water: Potable or free of deleterious substances in amounts harmful to concrete or embedded metals.

E. Admixtures:

1. Air-entraining: ASTM C260
2. Water reducing, retarding, accelerating, high range water reducing: ASTM C494
3. Pozzolans, fly ash and other mineral admixtures: ASTM C618
4. Ground granulated blast furnace slag: ASTM C989
5. Pigments: Non-fading and lime-resistant

2.04 REINFORCEMENT AND CONNECTION MATERIALS

- A. Provide all reinforcement, accessory and connection materials required. Concrete reinforcement shall be steel bars or welded wire fabric, or a combination thereof.
- B. Reinforcing Bars:
 - 1. Deformed Billet-steel: ASTM A615
 - 2. Deformed Rail-steel: ASTM A616
 - 3. Deformed Axle-steel: ASTM A617
 - 4. Deformed Low-alloy steel: ASTM A706
- C. Reinforcing Wire:
 - 1. Plain Wire: ASTM A82
 - 2. Deformed Wire: ASTM A496
- D. Welded Wire Fabric:
 - 1. Plain Wire: ASTM A185
 - 2. Deformed Wire: ASTM A497
- E. Epoxy Coated Reinforcement:
 - 1. Reinforcing Bars: ASTM A775
 - 2. Wires and Fabric: ASTM A884
- F. Galvanized Reinforcement:
 - 1. Reinforcing Bars: ASTM A767
- G. Inserts and Embedded Metal - All items embedded in concrete shall be of the type required for the intended task, and meet the following standards:
 - 1. Structural steel plates, angles, etc: ASTM A36
 - 2. Proprietary items: In accordance with manufacturers published literature
 - 3. Welded studs: AWS D1.1
 - 4. Finishes (as required):
 - a. Shop primer: Manufacturers' standards
 - b. Hot-dipped galvanized: ASTM A152
 - c. Zinc-rich coating: MIL-P-2135 self-curing, one component, sacrificial
 - d. Cadmium coating: Manufacturers' recommendations
- H. Joint Sealant and Joint Gaskets:
 - 1. Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets: ASTM C443.
 - 2. External Sealing Bands for Noncircular Sewer, Storm Drain, and Culvert Pipe: ASTM C877.

3. Joints for Concrete Pipe, Manholes, and Manufactured Box Sections Using Preformed Flexible Joint Sealants: ASTM C990
4. Specification for Elastomeric Joint Sealants: ASTM C920
- I. Pipe Entry Connectors:
 1. Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals: ASTM C923.
- J. Grout:
 1. Cement grout: Portland cement with enough water for the required strength and sand for proper consistency. May contain mineral or chemical admixtures, if approved by Owner's representative.
 2. Non-shrink grout: Premixed, packaged expansive and non-expansive shrink-resistant grout.

2.05 FABRICATION

- A. Forms for manufacturing precast concrete products shall be of the type and design consistent with industry standards. They should be capable of consistently providing uniform products and dimensions. Forms shall be constructed so that the forces and vibrations to which the forms will be subjected can cause no product damage.
 1. Forms shall be cleaned of concrete build-up after each use.
 2. Form release agents shall not be allowed to build up on the form casting surfaces.
- B. Reinforcement
 1. Cages of reinforcement shall be fabricated either by tying the bars, wires or welded wire fabric into rigid assemblies or by welding where permissible in accordance with AWS D1.4. Reinforcing shall be positioned as specified by the design and so that the concrete cover conforms to requirements. The tolerance on concrete cover shall be one-third of that specified but not more than 1/2 in. Concrete cover shall not be less than 1/2 in. Positive means shall be taken to assure that the reinforcement does not move significantly during the casting operations.
- C. Embedded Items
 1. Embedded items shall be positioned at locations specified in the design documents. Inserts, plates, weldments, lifting devices and other items to be imbedded in precast concrete products shall be held rigidly in place so that they do not move significantly during casting operations.
- D. Placing Concrete
 1. Concrete shall be deposited into forms as near to its final location as practical. The free fall of the concrete shall be kept to a minimum. Concrete shall be consolidated in such a manner that segregation of the concrete is minimized and honeycombed areas are kept to a minimum. Vibrators used to

consolidate concrete shall have frequencies and amplitudes sufficient to produce well consolidated concrete.

2. Cold Weather Requirements - Recommendations for cold weather concreting are given in detail in Cold Weather Concreting reported by ACI Committee 306.
 - a. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather.
 - b. All concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come in contact shall be free from frost.
 - c. Frozen materials or materials containing ice shall not be used.
 - d. In cold weather the temperature of concrete at the time of placing shall not be below 45 F Concrete that freezes before its compressive strength reaches 500 psi shall be discarded.
3. Hot Weather Requirements - Recommendations for hot weather concreting are given in detail in Hot Weather Concreting reported by ACI Committee 305.
 - a. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The temperature of concrete at the time of placing shall not exceed 90 F.

E. Curing

1. Curing by Moisture Retention - Moisture shall be prevented from evaporating from exposed surfaces until adequate strength for stripping (Article 2.6, paragraph F) is reached by one of the following methods:
 - a. Cover with polyethylene sheets a minimum of 6 mils thick.
 - b. Cover with burlap or other absorptive material and keep continually moist.
 - c. Use of a membrane-curing compound applied at a rate not to exceed 200 sq. ft. per gallon, or per manufacturers' recommendations.
2. Surfaces that will be exposed to weather during service shall be cured as above a minimum of 3 days. Forms shall be considered effective in preventing evaporation from the contact surfaces. If air temperature is below 50° F the curing period shall be extended.
3. Curing with Heat and Moisture
 - a. Concrete shall not be subjected to steam or hot air until after the concrete has attained its initial set. Steam, if used, shall be applied within a suitable enclosure, which permits free circulation of the steam. If hot air is used for curing, precautions shall be taken to prevent moisture loss from the concrete. The temperature of the concrete shall not be permitted to exceed 160 F. These requirements do not apply to products cured with steam under pressure in an autoclave.

- F. Stripping Products from Forms – Products shall not be removed from the forms until the concrete reaches the compressive strength for stripping required by the design. If no such requirement exists, products may be removed from the forms after the final set of concrete provided that stripping damage is minimal.
- G. Shipping Products – Products shall not be shipped until they are at least 5 days old, unless it can be shown that the concrete strength has reached at least 75% of the specified 28-day strength, or that damage will not be caused which will impair the performance of the product.

2.06 SOURCE QUALITY CONTROL

- A. Fabricate units in accordance with ACI 318 and the National Precast Concrete Association's Quality Control Manual for Precast Plants.

PART 3: EXECUTION

3.01 INSTALLATION

A. Site Access

- 1. General contractor shall be responsible for providing adequate access to the site to facilitate hauling, storage and proper handling of the precast concrete products.

B. Installation

- 1. Precast concrete products shall be installed to the lines and grades shown in the contract documents or otherwise specified.
- 2. Products shall be lifted by suitable lifting devices at points provided by the precast concrete producer.
- 3. Products shall be installed per the precast concrete producer's recommendation.

C. Water tightness

- 1. Where water tightness is a necessary performance characteristic of the precast concrete product's end use, watertight joints, connectors and inserts should be used to ensure the integrity of the entire system.

3.02 FIELD QUALITY CONTROL

- A. Site tests - when testing is required for an underground product, one of the following methods need to be followed:
 - 1. Vacuum testing prior to backfill according to ASTM C1244.
 - 2. Water testing according to contract documents and precast concrete producer's recommendations.

END OF SECTION

APPENDIX A - PERMIT DOCUMENTS

PUBLIC WATER SUPPLY AUTHORIZATION TO CONSTRUCT

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
S. DANIEL SMITH
Director



December 17, 2021

Town of Rosman
Attention: Brian Shelton, Mayor
6 Main Street
Rosman, North Carolina 28772

Re: Engineering Plans and Specifications Approval
Distribution Extension
Sewer Line Extension, Water Line Extension and
Sewer Pump Station
Town of Rosman
Water System No.: NC0188115, Transylvania County
Serial No.: 21-00895

Dear Applicant:

Enclosed please find one copy of the referenced engineering plans and specifications bearing the Division of Water Resources stamp of approval for the referenced project. These engineering plans and specifications are approved under Division of Water Resources Serial Number 21-00895, dated December 17, 2021.

Engineering plans and specifications prepared by James N. Johnston, P.E., call for the installation of approximately 16,220 feet of 12-inch water main, fire hydrants, valves and associated appurtenances along Highway 64 from Clement Road southward to connection at Camp Kahdalea Road near Rosman to help promote economic and residential growth in the southern part of Transylvania County. The extension is not anticipated to immediately create much increase in customers or demand. The proposed 12-inch water main will connect to an existing 8-inch water main along Morgan Mill Road (SR 1331) at two locations just northwest of the intersection with Rosman Hwy (US-64).

Please note that in accordance with 15A NCAC 18C .0309(a), no construction, alteration, or expansion of a water system shall be placed into service or made available for human consumption until the Public Water Supply Section has issued Final Approval. Final Approval will be issued and mailed to the applicant upon receipt of both an Engineer's Certification and an Applicant's Certification submitted in accordance with 15A NCAC 18C .0303 (a) and (c).

These plans and specifications in the foregoing application are approved insofar as the protection of public health is concerned as provided in the rules, standards and criteria adopted under the authority of Chapter 130A-317 of the General Statutes. This approval does not constitute a warranty of the design, construction or future operation of the water system.



North Carolina Department of Environmental Quality | Division of Water Resources
512 North Salisbury Street | 1634 Mail Service Center | Raleigh, North Carolina 27699-1634
919.707.9100

Town of Rosman
Attention: Brian Shelton, Mayor
Page 2 of 2
December 17, 2021

One copy of the plans and specifications with a seal of approval from the department are enclosed. One copy of the documents in digital format (CD) is being forwarded to our Asheville Regional Office. The second copy of the CD is being retained in our office.

If the Public Water Supply Section can be of further service, please call (919) 707-9100.

Sincerely,

 /for

Robert W. Midgette, P.E.
Chief, Public Water Supply Section

RWM/SB

Enclosures: Approval Documents

cc: Kimberly Barnett, P.E., Asheville Regional Office
Transylvania County Health Department
High Country Engineering

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
S. DANIEL SMITH
Director



January 03, 2022

Town of Rosman
ATTN: Brian Shelton, Mayor
6 Main Street
Rosman, NC 28772

Re: **Authorization to Construct (This is not a Final Approval)**
Issue Date: January 03, 2022
Sewer Ln Ext, Water Ln Ext & Sewer Pump Sta
Serial No.: 21-00895 Water System No.: NC0188115
Transylvania County

Dear Applicant:

This letter is to confirm that a complete Engineer's Report and a Water System Management Plan have been received, and that engineering plans and specifications have been approved by the Department for **Sewer Ln Ext, Water Ln Ext & Sewer Pump Sta, Serial No.: 21-00895**.

The "Authorization to Construct" is valid for 36 months from the issue date. Authorization to construct may be extended if the Rules Governing Public Water Supplies and site conditions have not changed (see Rule .0305). The "Authorization to Construct" and the engineering plans and specifications approval letter shall be posted at the primary entrance of the job site before and during construction.

Upon completion of the construction or modification, **and prior to placing the new construction or modification into service**, the applicant must submit an Engineer's Certification and Applicant's Certification to the Public Water Supply Section.

- **Engineer's Certification:** in accordance with Rule .0303 (a), the applicant shall submit a certification statement signed and sealed by a registered professional engineer stating that construction was completed in accordance with approved engineering plans and specifications, including any provisions stipulated in the Department's engineering plan and specification approval letter.
- **Applicant's Certification:** in accordance with Rule .0303 (c), the applicant shall submit a signed certification statement indicating that the requirements for an Operation and Maintenance Plan and Emergency Management Plan have been satisfied in accordance with Rule .0307 (d) and (e) and that the system has a certified operator in accordance with Rule .1300. The "Applicant's Certification" form is available at <http://www.ncwater.org/> (click on Public Water Supply Section, Plan Review, Plan Review Forms).

Certifications can be sent by mail, fax (919-715-4374), or attachment to an e-mail message to **PWSSection.PlanReview@ncdenr.gov**.

If this "Authorization to Construct" is for a new public water system, the owner must submit a completed **application for an Operating Permit** and the appropriate fee. For a copy of the application for an Operating Permit please call (919) 707-9085.

Once the certifications and permit application and fee (if applicable) are received and determined adequate, the Department will issue a Final Approval letter to the applicant. In accordance with Rule .0309 (a), **no portion of this project shall be placed into service until the Department has issued Final Approval**.

Please contact us at (919) 707-9100 if you have any questions or need additional information.

Sincerely,

A handwritten signature in black ink, reading "RW Midgette".

Robert W. Midgette, P.E.
Chief, Public Water Supply Section

cc: KIMBERLY BARNETT, P.E., Regional Engineer
High Country Engineering, PC



North Carolina Department of Environmental Quality | Division of Water Resources
512 North Salisbury Street | 1634 Mail Service Center | Raleigh, North Carolina 27699-1634
919.707.9100

North Carolina Department of Environmental Quality
Division of Water Resources

Authorization to Construct

Project Applicant:	Town of Rosman
Public Water System Name and Water System No.:	ROSMAN, TOWN OF NC0188115
Project Name:	Sewer Ln Ext, Water Ln Ext & Sewer Pump Sta
Serial No.:	21-00895
Issue Date:	January 03, 2022
Expiration Date:	36 Months after Issue Date

In accordance with NCAC 18C .0305, this Authorization to Construct must be posted
at the primary entrance to the job site during construction.

James N. Johnston, PE
High Country Engineering, PC
111 E. Chestnut Street
Asheville, NC 28801

DWR - WASTEWATER COLLECTION SYSTEM EXPANSION PERMIT

ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

S. DANIEL SMITH
Director



SENT VIA ELECTRONIC MAIL ONLY: NO HARD COPY WILL BE MAILED.

November 1, 2021

Brian Shelton, Mayor
Town of Rosman
E-mail: rosmantown@comporium.net

Subject: Permit No. WQ0042924
Town of Rosman
Water and Sewer Main Extension and Sewer Pump Station
Wastewater Collection System Extension Permit
Transylvania County

Dear Mayor Shelton:

In accordance with your complete application received October 21, 2021, and additional information received October 29, 2021, we are forwarding herewith Permit No. WQ0042924 dated November 1, 2021, to the Town of Rosman (Permittee) for the construction and operation upon certification of the subject wastewater collection system extension. This permit shall be effective from the date of issuance until rescinded, and shall be subject to the conditions and limitations as specified therein. This cover letter shall be considered a part of this permit and is therefore incorporated therein by reference.

Please pay particular attention to the following conditions contained within this permit:

- Condition II.1: This permit shall not be automatically transferable; a request must be made and approved.
- Condition II.4: Requires that the wastewater collection facilities be properly operated and maintained in accordance with 15A NCAC 02T .0403 or any individual system-wide collection system permit issued to the Permittee.
- Condition II.7: Upon completion of construction and prior to operation of these permitted facilities, the completed Engineering Certification form with checklist attached to this permit shall be submitted with the required supporting documents to the address provided on the form. **Permit modifications are required for any changes resulting in non-compliance with this permit, regulations, or the Minimum Design Criteria.** [15A NCAC 02T.0116]

It shall be responsibility of the Permittee to ensure that the as-constructed project meets the appropriate design criteria and rules. Failure to comply may result in penalties in accordance with North Carolina



North Carolina Department of Environmental Quality | Division of Water Resources
Asheville Regional Office | 2090 U.S. Highway 70 | Swannanoa, North Carolina 28778
828.296.4500


Permit No. WQ0042924

General Statute §143-215.6A through §143-215.6C, construction of additional or replacement wastewater collection facilities, and/or referral of the North Carolina-licensed Professional Engineer to the licensing board.

If any parts, requirements, or limitations contained in this permit are unacceptable, you have the right to request an adjudicatory hearing upon written request within 30 days following receipt of this permit. This request must be in the form of a written petition, conforming to Chapter 150B of North Carolina General Statutes, and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714. Unless such demands are made, this permit shall be final and binding.

If you need additional information concerning this matter, please contact Tim Heim at (828) 296-4500 or via e-mail at tim.heim@ncdenr.gov.

Sincerely,

DocuSigned by:

E397192DABFB4FF...

for S. Daniel Smith
Director, Division of Water Resources

by Daniel Boss, Asst. Regional Supervisor
Water Quality Regional Operations Section
Asheville Regional Office
Division of Water Resources, NCDEQ

Ec: Jay Johnston, P.E. – High Country Engineering, PC
LF



WASTEWATER COLLECTION SYSTEM EXTENSION PERMIT

In accordance with the provisions of Article 21 of Chapter 143, General Statutes of North Carolina as amended, and other applicable Laws, Rules, and Regulations, permission is hereby granted to the

Town of Rosman
Transylvania County

for the construction and operation of a 30-gallon per minute pump station with duplex pumps, on-site audible and visual high water alarms, telemetry, and a permanent generator with automatic transfer switch; as well as approximately 13,500 linear feet of 6-inch force main, and approximately 2,600 linear feet of 3-inch force main to serve an herbal supplements manufacturing facility as part of the Water and Sewer Main Extension and Sewer Pump Station project, and the discharge of 10,000 gallons per day of collected domestic and industrial wastewater into the Town of Rosman's existing sewerage system, pursuant to the application received October 21, 2021, and additional information received October 29, 2021, and in conformity with 15A NCAC 02T; the Division's Gravity Sewer Minimum Design Criteria adopted February 12, 1996 as applicable; the Division's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains adopted June 1, 2000 as applicable; and other supporting data subsequently filed and approved by the Department of Environmental Quality and considered a part of this permit.

This permit shall be effective from the date of issuance until rescinded and shall be subject to the specified conditions and limitations contained therein.

DocuSigned by:
Daniel Boss
E397192DABFB4FF...

for S. Daniel Smith
Director, Division of Water Resources
By Authority of The Environmental Management Commission

Permit Number: WQ0042924
Permit Issued: November 1, 2021

SUPPLEMENT TO PERMIT COVER SHEET

Town of Rosman is hereby authorized to:

Construct, and then operate upon certification the aforementioned wastewater collection extension. The sewage and wastewater collected by this system shall be treated in the Town of Rosman Wastewater Treatment Facility in accordance with Permit Number NC0021946.

Permitting of this project does not constitute an acceptance of any part of the project that does not meet 15A NCAC 02T; the Division's Gravity Sewer Minimum Design Criteria adopted February 12, 1996 as applicable; and the Division's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains adopted June 1, 2000 as applicable, unless specifically mentioned herein. Division approval is based on acceptance of the certification provided by a North Carolina-licensed Professional Engineer in the application. It shall be the Permittee's responsibility to ensure that the as-constructed project meets the appropriate design criteria and rules.

Construction and operation is contingent upon compliance with the Standard Conditions identified below.

I. STANDARD CONDITIONS

1. This permit shall not be transferable. In the event there is a desire for the wastewater collection facilities to change ownership, or there is a name change of the Permittee, a formal permit request shall be submitted to the Division accompanied by documentation from the parties involved, and other supporting materials as may be appropriate. The approval of this request shall be considered on its merits and may or may not be approved. [15A NCAC 02T.0116; G.S 143-215.1(d3)]
2. This permit shall become voidable unless the wastewater collection facilities are constructed in accordance with the conditions of this permit; 15A NCAC 02T; the Division's Gravity Sewer Minimum Design Criteria adopted February 12, 1996 as applicable; the Division's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains adopted June 1, 2000 as applicable; and other supporting materials unless specifically mentioned herein. [15A NCAC 02T.0110]
3. This permit shall be effective only with respect to the nature and volume of wastes described in the application and other supporting data. [15A NCAC 02T .0110]
4. The wastewater collection facilities shall be properly maintained and operated at all times. The Permittee shall maintain compliance with an individual system-wide collection system permit for the operation and maintenance of these facilities as required by 15A NCAC 02T .0403. If an individual permit is not required, the following performance criteria shall be met:
 - a. The sewer system shall be effectively maintained and operated at all times to prevent discharge to land or surface waters, and to prevent any contravention of groundwater standards or surface water standards.
 - b. A map of the sewer system shall be developed and shall be actively maintained.
 - c. An operation and maintenance plan including pump station inspection frequency, preventative maintenance schedule, spare parts inventory and overflow response has been developed and implemented.

- d. Pump stations that are not connected to a telemetry system shall be inspected every day (i.e. 365 days per year). Pump stations that are connected to a telemetry system shall be inspected at least once per week.
 - e. High-priority sewer lines shall be inspected at least once per every six-months and inspections are documented.
 - f. A general observation of the entire sewer system shall be conducted at least once per year.
 - g. Overflows and bypasses shall be reported to the appropriate Division regional office in accordance with 15A NCAC 2B .0506(a), and public notice shall be provided as required by North Carolina General Statute §143-215.1C.
 - h. A Grease Control Program is in place as follows:
 - 1. For public owned collection systems, the Grease Control Program shall include at least biannual distribution of educational materials for both commercial and residential users and the legal means to require grease interceptors at existing establishments. The plan shall also include legal means for inspections of the grease interceptors, enforcement for violators and the legal means to control grease entering the system from other public and private satellite sewer systems.
 - 2. For privately owned collection systems, the Grease Control Program shall include at least bi-annual distribution of grease education materials to users of the collection system by the permittee or its representative.
 - 3. Grease education materials shall be distributed more often than required in Parts (1) and (2) of this Subparagraph if necessary to prevent grease-related sanitary sewer overflows.
 - i. Right-of-ways and easements shall be maintained in the full easement width for personnel and equipment accessibility.
 - j. Documentation shall be kept for Subparagraphs (a) through (i) of this Rule for a minimum of three years with exception of the map, which shall be maintained for the life of the system.
5. The Permittee shall report by telephone to a water resources staff member at the Asheville Regional Office, telephone number (828) 296-4500, as soon as possible, but in no case more than 24 hours, following the occurrence or first knowledge of the occurrence of either of the following:
- a. Any process unit failure, due to known or unknown reasons, that renders the facility incapable of adequate wastewater transport, such as mechanical or electrical failures of pumps, line blockage or breakage, etc.; or
 - b. Any SSO and/or spill over 1,000 gallons; or
 - c. Any SSO and/or spill, regardless of volume, that reaches surface water

Voice mail messages or faxed information is permissible, but this shall not be considered as the initial verbal report. Overflows and spills occurring outside normal business hours may also be reported to the Division of Emergency Management at telephone number (800) 858-0368 or (919) 733-3300. Persons reporting any of the above occurrences shall file a spill report by completing and submitting Part I of Form CS-SSO (or the most current Division approved form) within five days following first knowledge of the occurrence. This report must outline the actions taken or proposed to be taken to ensure that the problem does not recur. Part II of Form CS-SSO (or the most current Division approved form) can also be completed to show that the SSO was beyond control. [G.S. 143-215.1C(a1)]

6. Construction of the gravity sewers, pump stations, and force mains shall be scheduled so as not to interrupt service by the existing utilities nor result in an overflow or bypass discharge of wastewater to the surface waters of the State. [15A NCAC 02T.0108(b)]
7. Upon completion of construction and prior to operation of these permitted facilities, the completed Engineering Certification form with checklist attached to this permit shall be submitted with the required supporting documents to the address provided on the form. A complete certification is one where the form is fully executed and the supporting documents are provided as applicable. Any wastewater flow made tributary to the wastewater collection system extension prior to completion of this Engineer's Certification shall be considered a violation of the permit and shall subject the Permittee to appropriate enforcement actions.

If the permit is issued to a private entity with an Operational Agreement, then a copy of the Articles of Incorporation, Declarations/Covenants/Restrictions, and Bylaws that have been appropriately filed with the applicable County's Register of Deeds office shall be submitted with the certification.

A complete certification is one where the form is fully executed and the supporting documents are provided as applicable. Supporting documentation shall include the following:

- a. One copy of the project construction record drawings (plan & profile views of sewer lines & force mains) of the wastewater collection system extension. Final record drawings should be clear on the plans or on digital media (CD or DVD disk) and are defined as the design drawings that are marked up or annotated with after construction information and show required buffers, separation distances, material changes, etc.
- b. One copy of the supporting applicable design calculations including pipe and pump sizing, velocity, pump cycle times, and level control settings, pump station buoyancy, wet well storage, surge protection, detention time in the wet well, and force main, ability to flush low points in force mains with a pump cycle, and downstream sewer capacity analysis. If a portable power source or pump is dedicated to multiple stations, an evaluation of all the pump stations' storage capacities and the rotation schedule of the portable power source or pump, include travel timeframes, shall be provided.
- c. Changes to the project that do not result in non-compliance with this permit, regulations, or the Minimum Design Criteria should be clearly identified on the record drawings, on the certification in the space provided, or in written summary form.

Prior to Certification (Final or Partial): Permit modifications are required for any changes resulting in non-compliance with this permit (including but not limited to pipe length changes of 10% or greater, increased flow, pump station design capacity design increases of 5% or greater, and increases in the number/type of connections), regulations, or the Minimum Design Criteria. Requested modifications or variances to the Minimum Design Criteria will be reviewed on a case-by-case basis and each on its own merit. Please note that variances to the Minimum Design Criteria should be requested and approved during the permitting process prior to construction. After-construction requests are discouraged by the Division and may not be approved, thus requiring replacement or repair prior to certification & activation. [15A NCAC 02T .0116]

8. Gravity sewers installed greater than ten percent below the minimum required slope per the Division's Gravity Sewer Minimum Design Criteria shall not be acceptable and shall not be certified until

corrected. If there is an unforeseen obstacle in the field where all viable solutions have been examined, a slope variance can be requested from the Division with firm supporting documentation. This shall be done through a permit modification with fee. Such variance requests will be evaluated on a case-by-case basis. Resolution of such request shall be evident prior to completing and submitting the construction certification. [15A NCAC 02T.0105(n)]

9. A copy of the individual permit and construction record drawings shall be maintained on file by the Permittee for the life of the wastewater collection facilities. [15A NCAC 02T .0116]
10. Failure to abide by the conditions and limitations contained in this permit; 15A NCAC 02T; the Division's Gravity Sewer Design Criteria adopted February 12, 1996 as applicable; the Division's Minimum Design Criteria for the Fast-Track Permitting of Pump Station and Force Mains adopted June 1, 2000 as applicable; and other supporting materials may subject the Permittee to an enforcement action by the Division, in accordance with North Carolina General Statutes §143-215.6A through §143-215.6C, construction of additional or replacement wastewater collection facilities, and/or referral of the North Carolina-licensed Professional Engineer to the licensing board. [15A NCAC 02T .0108(b-c)]
11. In the event that the wastewater collection facilities fail to perform satisfactorily, including the creation of nuisance conditions, the Permittee shall take immediate corrective action, including those as may be required by this Division, such as the construction of additional or replacement facilities. [15A NCAC 02T .0110; 15A NCAC 02T .0108(b)]
12. The issuance of this permit shall not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by the Division any other Federal, State, or Local government agencies which have jurisdiction or obtaining other permits which maybe required by the Division or any other Federal, State, of Local government agencies. [G.S. 143-215.1(b)]

CERTIFICATION CHECKLIST

To be completed by the certifying engineer prior to operation of the permitted sewers, per 15A NCAC 02T.0116.

Certifying Engineer: _____

Certification Review Date: _____

Water and Sewer Main Extension and Sewer Pump Station :

WQ00 _____ Project County: _____

- 1) Has permittee information changed since the permit was issued (or last modified): change of mailing address, change of ownership, transfer from developer to HOA/POA, etc. ☐ Yes ☐ No
 - If yes, please provide either a change of ownership form or new contact information. Note that transfer of permits from the developer to the HOA/POA must occur with the first certification.
- 2) Have the as-built drawings have been signed, sealed, and dated by an N.C. PE? ☐ Yes ☐ No
- 3) Final Engineering certification? ☐ Yes ☐ No
 - **If Partial Engineering certification, provide detailed narrative including what is being certified in the current phase, what was previously certified (if applicable), and what is left to be certified.**
- 4) Adequate information related to sewer lines: ☐ Yes ☐ No ☐ N/A
 - Three feet minimum cover has been provided for all sewers unless ferrous pipe was installed.
 - Minimum diameters for gravity sewers are 8-inches for public lines and 6-inches for private lines.
 - Manholes have been installed: At the end of each line, at all changes in grade, size, or alignment, at all intersections, and at distances not greater than 425 feet; minimum diameter shall be 4 feet (48-inches).
- 5) Adequate information related to pump stations: ☐ Yes ☐ No ☐ N/A
 - Ensure power reliability option was selected per 15A NCAC 02T.0305(h).
- 6) Was project construction completed in accordance with all of the following: ☐ Yes ☐ No ☐ N/A
 - 15A NCAC 02T, Minimum Design Criteria (MDC) for the permitting of Gravity Sewers (latest version), and MDC for the Permitting of Pump Stations and Force Mains (latest version)?

If not, a variance approval is required in accordance with 15A NCAC 02T.0105(b), **prior to certification and operation.**

 - Contact the Central Office to discuss the variance to determine a course of action.
 - Applicant must submit two copies of the variance request form, plans, specifications, calculations, and any other pertinent information to the Central Office (one hard copy, one digital copy).
 - The central office will review the variance request, and if approvable, specific language regarding the variance will be incorporated into the permit, either via a special condition or a supplementary letter. A copy of the reissued permit with variance language or the variance letter must be maintained with the original documents.
- 7) Does the project contains high priority lines (15A NCAC 02T .0402(2))? ☐ Yes ☐ No
 - If yes, ensure that the permit already contains the necessary condition related to high priority lines 15A NCAC 02T.0403 (a)(5). If the permit does not include this language, the Fast Track reviewer will reissue the permit with the appropriate language.
- 8) Are Permit modifications are required for any changes resulting in non-compliance with this permit (including but not limited to pipe length changes of 10% or greater, change in flow, pump station design capacity design change of 5% or greater, and/or change in the number/type of connections)? ☐ Yes ☐ No
 - If yes, a permit modification request must be submitted to the appropriate Regional Office, and **a modified permit with revised certification must be issued prior to certification and operation.**

FAST TRACK SEWER ENGINEERING CERTIFICATION

PERMITTEE: TOWN OF ROSMAN
PERMIT #: WQ0042924
PROJECT: WATER AND SEWER MAIN EXTENSION AND SEWER PUMP STATION
ISSUE DATE: November 1, 2021

This project shall not be considered complete nor allowed to operate in accordance with Condition 7 of this permit until the Division has received this Certification and all required supporting documentation. It should be submitted in a manner that documents the Division's receipt. Send the required documentation the Regional Supervisor, Water Quality Regional Operations Section at the address at the bottom.

Any wastewater flow made tributary to the wastewater collection system extension prior to completion of this Certification shall be considered a violation of the permit and shall subject the Permittee to appropriate enforcement actions. The Permittee is responsible for tracking all partial certifications up until a final certification is received. A Final Certification shall be a complete set of record drawings and design calculations regardless of whether partials have been submitted.

PERMITTEE'S CERTIFICATION

I, the undersigned agent for the Permittee, hereby state that this project has been constructed pursuant to the applicable standards & requirements, the Professional Engineer below has provided applicable design/construction information to the Permittee, and the Permittee is prepared to operate & maintain the wastewater collection system permitted herein or portions thereof.

 Printed Name, Title

 Signature

 Date

ENGINEER'S CERTIFICATION

I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (☐ periodically, ☐ weekly, ☐ full time) the construction of the Water and Sewer Main Extension and Sewer Pump Station and location as referenced above for the above Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the following construction:

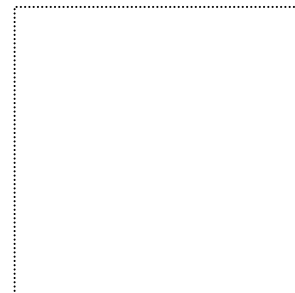
A 30-gallon per minute pump station with duplex pumps, on-site audible and visual high water alarms, telemetry, and a permanent generator with automatic transfer switch; as well as approximately 13,500 linear feet of 6-inch force main, and approximately 2,600 linear feet of 3-inch force main to serve an herbal supplements manufacturing facility as part of the Water and Sewer Main Extension and Sewer Pump Station project.

; such that the construction was observed to be built within substantial compliance of this permit; 15A NCAC 02T; the Division of Water Resources' (Division) Gravity Sewer Minimum Design Criteria adopted February 12, 1996 as applicable; the Division's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains adopted June 1, 2000 as applicable; and other supporting materials.

North Carolina Professional Engineer's Seal w/signature & date:

☐ **Final** ☐ **Partial (include description)**

Certification Comments/Qualifiers (attach if necessary):



NCDOT - DRIVEWAY, SECONDARY ROAD, AND CONTROLLED ACCESS PERMITTING AND ENCROACHMENTS



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

March 11, 2022

Mr. Brian Shelton
Town of Rosman
6 Main St.
Rosman, NC 28772

RE: Driveway Permit -- #8822002
Sewer pump station -- SR 1159
Transylvania County

D141-088-21-00039

Dear Mr. Shelton:

The driveway permit has been approved and construction may begin immediately. Construction shall be according to the attached **Standard Special Provisions for Driveways** and shall include **Project Special Provisions** as noted. The driveway access points shall be constructed per attached "Figure 6" for the vertical profile.

NOTE: The apron of the driveway must be paved.

Please refer any questions you might have concerning this driveway permit to Carl Ownbey, Engineering Technician III at 828-891-7911.

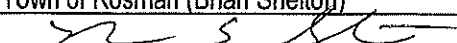
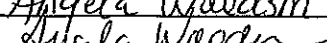
Sincerely,

Lonnie R. Watkins
District Engineer

LRW/co
Cc: Jay Johnston, PE

APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION	
Driveway Permit No.	Date of Application	STREET AND DRIVEWAY ACCESS PERMIT APPLICATION	
County: Transylvania			
Development Name: Sewer Pump Station Site			
LOCATION OF PROPERTY:			
Route/Road: SR 1159 (Old County Home Road)			
Exact Distance 120 feet	<input type="checkbox"/> Miles <input checked="" type="checkbox"/> Feet	N <input type="checkbox"/> S <input type="checkbox"/> E <input checked="" type="checkbox"/> W <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	
From the Intersection of Route No. SR 1198 and Route No. SR 1159 Toward NE			
Property Will Be Used For: <input type="checkbox"/> Residential /Subdivision <input type="checkbox"/> Commercial <input type="checkbox"/> Educational Facilities <input type="checkbox"/> TND <input type="checkbox"/> Emergency Services <input checked="" type="checkbox"/> Other			
Property: Sewer Pump Station Site <input type="checkbox"/> is <input checked="" type="checkbox"/> is not within Rosman/Transylvania City Zoning Area.			
AGREEMENT			
<ul style="list-style-type: none"> I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location. I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access to North Carolina Highways" as adopted by the North Carolina Department of Transportation. I agree that no signs or objects will be placed on or over the public right-of-way other than those approved by NCDOT. I agree that the driveway(s) or street(s) will be constructed as shown on the attached plans. I agree that that driveway(s) or street(s) as used in this agreement include any approach tapers, storage lanes or speed change lanes as deemed necessary. I agree that if any future improvements to the roadway become necessary, the portion of driveway(s) or street(s) located on public right-of-way will be considered the property of the North Carolina Department of Transportation, and I will not be entitled to reimbursement or have any claim for present expenditures for driveway or street construction. I agree that this permit becomes void if construction of driveway(s) or street(s) is not completed within the time specified by the "Policy on Street and Driveway Access to North Carolina Highways". I agree to pay a \$50 construction inspection fee. Make checks payable to NCDOT. This fee will be reimbursed if application is denied. I agree to construct and maintain the driveway(s) or street(s) in a safe manner so as not to interfere with or endanger the public travel. I agree to provide during and following construction proper signs, signal lights, flaggers and other warning devices for the protection of traffic in conformance with the current "Manual on Uniform Traffic Control Devices for Streets and Highways" and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the District Engineer. I agree to indemnify and save harmless the North Carolina Department of Transportation from all damages and claims for damage that may arise by reason of this construction. I agree that the North Carolina Department of Transportation will assume no responsibility for any damages that may be caused to such facilities, within the highway right-of-way limits, in carrying out its construction. I agree to provide a Performance and Indemnity Bond in the amount specified by the Division of Highways for any construction proposed on the State Highway system. The granting of this permit is subject to the regulatory powers of the NC Department of Transportation as provided by law and as set forth in the N.C. Policy on Driveways and shall not be construed as a contract access point. I agree that the entire cost of constructing and maintaining an approved private street or driveway access connection and conditions of this permit will be borne by the property owner, the applicant, and their grantees, successors, and assignees. I AGREE TO NOTIFY THE DISTRICT ENGINEER WHEN THE PROPOSED WORK BEGINS AND WHEN IT IS COMPLETED. 			
<div style="display: flex; justify-content: space-between; font-size: small;"> 2004-07 NOTE: Submit Four Copies of Application to Local District Engineer, N.C. Department of Transportation TEB 65-04rev. 61-03419 </div>			

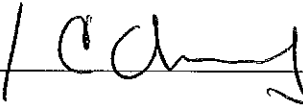
SIGNATURES OF APPLICANT

PROPERTY OWNER (APPLICANT)		WITNESS	
COMPANY	Town of Rosman (Brian Shelton)	NAME	Angela Woodsm
SIGNATURE		SIGNATURE	
ADDRESS	6 Main Street	ADDRESS	6 Main Street
	Rosman, NC 28772 Phone No. (828) 884-6859		Rosman, NC 28772

AUTHORIZED AGENT		WITNESS	
COMPANY		NAME	
SIGNATURE		SIGNATURE	
ADDRESS		ADDRESS	
	Phone No.		

APPROVALS

APPLICATION RECEIVED BY DISTRICT ENGINEER

Lonnie Watkins, PE / 

SIGNATURE

10/14/21

DATE


APPLICATION APPROVED BY LOCAL GOVERNMENTAL AUTHORITY (when required)

SIGNATURE

TITLE

DATE

APPLICATION APPROVED BY NCDOT

Lonnie Watkins, PE / 

SIGNATURE

TITLE

3/11/22

DATE

INSPECTION BY NCDOT

SIGNATURE

TITLE

DATE

COMMENTS:



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

March 11, 2022

Encroachment No.: E141-088-21-00240
Location: US 64, SR 1159, SR 1110, SR 1389, SR 1209
County: Transylvania
District Engineer: Lonnie Watkins, PE

Mr. Brian Shelton	Ms. Jamie Laughter
Town of Rosman	Transylvania County
6 Main St.	101 S. Broad St.
Rosman, NC 28772	Brevard, NC 28712

Dear Mr. Shelton and Ms. Laughter:

Attached for your files is a copy of a contract which has been properly executed for the encroachment on NCDOT right-of-way designated as US 64, SR 1159, SR 1110, SR 1389, SR 1209 to install over 16,200 feet of sewer with manholes and water including fire hydrants and valves along the roadways, as shown on the attached drawings.

NOTE: All state roads that are open cut must be repaired and patched back in accordance with standard drawing #654.01 (attached). All fire hydrants and valves must be installed behind the ditch line where appropriate.

If you have any questions please contact Carl Ownbey, Engineering Technician III, whom you can reach at the District Engineer's office at (828) 891-7911.

Sincerely,

Lonnie Watkins
Lonnie Watkins, PE

District Engineer

For Wanda Austin, PE
Division Engineer

WALW/co

DEPARTMENT OF TRANSPORTATION

THREE PARTY RIGHT OF WAY
ENCROACHMENT AGREEMENT ON
PRIMARY AND SECONDARY SYSTEM

-AND-

Transylvania County

101 S. Broad Street, Brevard, North Carolina 28712

-AND-

Town of Rosman

Post Office Box 636, Rosman, North Carolina 28772

THIS AGREEMENT, made and entered into this the 11th day of March, 20 22, by and between the Department of Transportation, party of the first part; and Transylvania County party of the second part; and Town of Rosman party of the third part,

WITNESSETH

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) Old County Home Road (SR 1159), Island Ford Road (SR 1110), Cassell Road (SR 1209), located in Transylvania County north of Rosman

with the construction and/or erection of: Approx. 2,600LF of 3" DIP/PVC/HDPE sewer force main (SR 1159 and 1110) and approx. 1,360LF of 8" DIP water main (SR 1209)

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part in the exercise of authority conferred upon it by statute, is willing to permit the encroachment within the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on attached plan sheet(s), specifications and special provisions which are made a part hereof upon the following conditions, to wit:

That the installation, operation, and maintenance of the above described facility will be accomplished in accordance with the party of the first part's latest UTILITIES ACCOMMODATIONS MANUAL, and such revisions and amendments thereto as may be in effect at the date of this agreement. Information as to these policies and procedures may be obtained from the Division Engineer or State Utilities Manager of the party of the first part.

That the said party of the second part binds and obligates himself to install and maintain the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said highway, nor obstruct nor interfere with the proper maintenance thereof, to reimburse the party of the first part for the cost incurred for any repairs or maintenance to its roadways and structures necessary due to installation and existence of the facilities of the party of the second part, and if at any time the party of the first part shall require the removal of or changes in the location of the said facilities, that the said party of the second part binds himself, his successors and assigns, to promptly remove or alter the said facilities, in order to conform to the said requirement, without any cost to the party of the first part.

That the party of the second part agrees to provide during construction and any subsequent maintenance proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first.

That the party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the installation and maintenance of this encroachment.

That the party of the second part agrees to restore all areas disturbed during installation and maintenance to the satisfaction of the Division Engineer of the party of the first part. The party of the second part agrees to exercise every reasonable precaution during construction and maintenance to prevent eroding of soil; silting or pollution of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces or other property; or pollution of the air. There shall be compliance with applicable rules and regulations of the North Carolina Division of Environmental Management, North Carolina Sedimentation Control Commission, and with ordinances and regulations of various counties, municipalities and other official agencies relating to pollution prevention and control. When any installation or maintenance operation disturbs the ground surface and existing ground cover, the party of the second part agrees to remove and replace the sod or otherwise reestablish the grass cover to meet the satisfaction of the Division Engineer of the party of the first part.

That the party of the second part agrees to assume the actual cost of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part agrees to have available at the construction site, at all times during construction, a copy of this agreement showing evidence of approval by the party of the first part. The party of the first part reserves the right to stop all work unless evidence of approval can be shown.

Provided the work contained in this agreement is being performed on a completed highway open to traffic; the party of the second part agrees to give written notice to the Division Engineer of the party of the first part when all work contained herein has been completed. Unless specifically requested by the party of the first part, written notice of completion of work on highway projects under construction will not be required.

That in the case of noncompliance with the terms of this agreement by the party of the second part, the party of the first part reserves the right to stop all work until the facility has been brought into compliance or removed from the right of way at no cost to the party of the first part.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within one (1) year from the date of authorization by the party of the first part unless written waiver is secured by the party of the second part from the party of the first part.

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

- a. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the U. S. Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
- b. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.
- c. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.
- d. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.
- e. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to,
 - (1) withholding of payments to the contractor under the contract until the contractor complies, and/or
 - (2) cancellation, termination or suspension of the contract, in whole or in part.
- f. Incorporation of Provisions: The contractor shall include the provisions of paragraphs "a" through "f" in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Department of Transportation to enter into such litigation to protect the interests of the State, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

That when title to the subject that constitutes the aforesaid encroachment passes from the party of the second part and vests in the party of the third part, the party of the third part agrees to assume all responsibilities and rights and to perform all obligations as agreed to herein by the party of the second part.

R/W (166) : Party of the Second Part certifies that this agreement is true and accurate copy of the form
R/W (166) incorporating all revisions to date.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

WITNESS:

Jennifer L. Gallowsay
Jennifer L. Gallowsay
Purchasing Coordinator

WITNESS

Jennifer L. Gallowsay
Jennifer L. Gallowsay
Purchasing Coordinator

DEPARTMENT OF TRANSPORTATION

BY:

Samuel W. Calkins
DIVISION ENGINEER
DISTRICT

Jaime Laughter
Jaime Laughter

County Manager

Second Party

Brian Shelton
Brian Shelton

Mayor

Third Party

DEPARTMENT OF TRANSPORTATION

THREE PARTY RIGHT OF WAY

-AND-

ENCROACHMENT AGREEMENT ON INTERSTATE
AND OTHER CONTROL ACCESS HIGHWAYSTransylvania County101 S. Broad Street, Brevard, North Carolina 28712

-AND-

Town of RosmanPost Office Box 636 Rosman, North Carolina 28772

THIS AGREEMENT, made and entered into this the 11th day of March, 2022, by and between the Department of Transportation, party of the first part; and Transylvania County party of the second part; and Town of Rosman party of the third part,

WITNESSETH

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) Hwy 64, located in Transylvania County north of Rosman with the construction and/or erection of: Approx. 16,200LF 6" DIP sewer force main and 12"78" DIP water main, 300LF 8" DIP gravity sewer and associated steel encasement pipes,

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part in the exercise of authority conferred upon it by statute, is willing to permit the encroachment with in the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on attached plan sheet(s), specifications and special provisions which are made a part hereof upon the following conditions, to wit:

That the installation, operation, and maintenance of the above described facility will be accomplished in accordance with the party of the first part's latest UTILITIES ACCOMMODATIONS MANUAL, and such revisions and amendments thereto as may be in effect at the date of this agreement. Information as to these policies and procedures may be obtained from the Division Engineer or State Utilities Manager of the party of the first part.

That the said party of the second part hereby agrees that access for servicing its facilities will be limited to access via (a) frontage roads where provided, (b) nearby or adjacent public roads and street, or (c) trails along or near the highway right of way lines, connecting only to an intersecting road; from any one or all of which entry may be made to the outer portion of the highway right of way. The party of the second part's rights of access to the through-traffic roadways and ramps shall be subject to the same rules and regulations as apply to the general public, except if an emergency situation occurs, and the usual means of access for service operation as herein provided will not permit the immediate action required by the party of the second part in making emergency repairs as required for the safety and welfare of the public, the party of the second part shall have a temporary right of access to and from the through-traffic roadways and ramps as necessary to accomplish the required emergency repairs, provided that the party of the second part complies with the regulations established by the party of the first part for policing and control to protect the highway users.

That the said party of the second part binds and obligates himself to install and maintain the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said highway, nor obstruct nor interfere with the proper maintenance thereof, to reimburse the party of the first part for the cost incurred for any repairs or maintenance to its roadways and structures necessary due to the installation and existence of the facilities of the party of the second part, and if at any time the party of the first part shall require the removal of or changes in the location of the said facilities, that the said party of the second part binds himself, his successors and assigns, to promptly remove or alter the said facilities, in order to conform to the said requirement, without any cost to the party of the first part.

That the party of the second part agrees to provide during construction and any subsequent maintenance proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first part.

That the party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the installation and maintenance of this encroachment.

That the party of the second part agrees to restore all areas disturbed during installation and maintenance to the satisfaction of the Division Engineer of the party of the first part. The party of the second part agrees to exercise every reasonable precaution during construction and maintenance to prevent eroding of soil; silting or pollution of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces or other property; or pollution of the air. There shall be compliance with applicable rules and regulations of the North Carolina Division of Environmental Management, North Carolina Sedimentation Control Commission, and with ordinances and

regulations of various counties, municipalities and other official agencies relating to pollution prevention and control. When any installation or maintenance operation disturbs the round surface and existing ground cover, the party of the second part agrees to remove and replace the sod or otherwise reestablish the grass cover to meet the satisfaction of the Division Engineer of the party of the first part.

That the party of the second part agrees to assume the actual cost of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part agrees to have available at the construction site, at all times during construction, a copy of this agreement showing evidence of approval by the party of the first part. The party of the first part reserves the right to stop all work unless evidence of approval can be shown.

Provided the work contained in this agreement is being performed on a completed highway open to traffic; the party of the second part agrees to give written notice to the Division Engineer of the party of the first part when all work contained herein has been completed. Unless specifically requested by the party of the first part, written notice of completion of work on highway projects under construction will not be required.

That in the case of noncompliance with the terms of this agreement by the party of the second part, the party of the first part reserves the right to stop all work until the facility has been brought into compliance or removed from the right of way at no cost to the party of the first part.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within one (1) year from the date of authorization by the party of the first part unless written waiver is secured by the party of the second part from the party of the first part.

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

- a. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the U. S. Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
- b. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.
- c. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.
- d. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.
- e. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to,
 - (1) withholding of payments to the contractor under the contract until the contractor complies, and/or
 - (2) cancellation, termination or suspension of the contract, in whole or in part.
- f. Incorporation of Provisions: The contractor shall include the provisions of paragraphs "a" through "f" in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Department of Transportation to enter into such litigation to protect the interests of the State, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

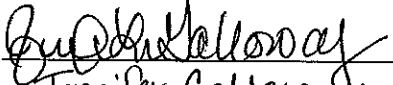
That when title to the subject that constitutes the aforesaid encroachment passes from the party of the second part and vests in the party of the third part, the party of the third part agrees to assume all responsibilities and rights and to perform all obligations as agreed to herein by the party of the second part.

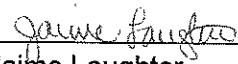
IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

DEPARTMENT OF TRANSPORTATION

BY: 
DIVISION ENGINEER
~~DISTRICT~~

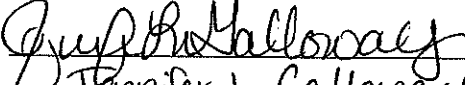
WITNESS:

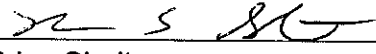

Jennifer Galloway
Purchasing Coordinator


Jaime Laughter
County Manager

Second Party

WITNESS:


Jennifer L. Galloway
Purchasing Coordinator


Brian Shelton
Mayor

Third Party

R/W (166A): Party of the Second Part certifies that this agreement is true and accurate copy of the form R/W (166A) incorporating all revisions to date.

INSTRUCTIONS

When the applicant is a corporation or a municipality, this agreement must have the corporate seal and be attested by the corporation secretary or by the empowered city official, unless a waiver of corporate seal and attestation by the secretary or by the empowered City official is on file in the Raleigh office of the State Utilities Manager. In the space provided in this agreement for execution, the name of the corporation or municipality shall be typed above the name, and title of all persons signing the agreement should be typed directly below their signature.

When the applicant is not a corporation, then his signature must be witnessed by one person. The address should be included in this agreement and the names of all persons signing the agreement should be typed directly below their signature.

GENERAL REQUIREMENTS

1. Wherever possible, freeway crossing should be parallel to and within the prevailing right of way of intersecting roads.
2. Crossings should be as near as possible normal to the center line of the freeway.
3. Parallel encroachments will not be permitted except outside of control of access lines.
4. The Department's Division Engineer should be given notice by the applicant prior to actual starting of installations included in this agreement.

For Overhead Wire Lines

1. Minimum vertical clearances of overhead wires above all roadways must conform to clearances set out in the National Electric Safety Code.
2. Supporting poles or structures must be clear of control of access lines, and be at least 30 feet clear of the edge of shoulders of through lanes and 20 feet clear of the shoulders of interchange ramps.

For Underground Utilities

1. Open-cut installation for crossings will be permitted only when a highway project is in rough grading stage prior to paving. Generally, on rough grading projects, open-cut will not be permitted in fills of over 10 feet in depth and back filled material must be compacted to maximum density meeting Department requirements.
2. Encasements under an existing freeway must be installed by means of tunneling, jacking, or boring and any voids outside the encasement must be filled with lean concrete grout and the ends of encasements be satisfactorily closed.
3. In cut section, encasement must extend continuously from ditch line to ditch line and in fill section, encasement must extend continuously five feet beyond toe to slopes.
4. Vents for encasement should be extended to the right of way line or as otherwise required by the Department.
5. All pipe encasements as to material and strength shall meet the standards and specifications of the Department.
6. When trenching is carried down cut slopes, excavation must be backfilled to maximum density and the disturbed portion of the slope be stabilized and sodded to the satisfaction of the Department's Engineer.

Plans

This Encroachment agreement must be accompanied, in the form of an attachment, by a plan showing the following:

1. All roadways and ramps
2. Right of way and control of access lines
3. Drainage structures or bridges if affected by encroachment
4. Location of the proposed encroachment
5. Length, size and type of encroachment
6. Dimensions, showing the distance from the encroachment to roadways, shoulders, structures, etc.
7. Location by highway survey station number. If station number cannot be obtained, location should be shown by distance from some identifiable point, such as a bridge, road intersection, etc. (To assist in preparation of the encroachment plan, Department roadway plans may be seen at the various Highway Division Offices or at the Raleigh Office.)

All encroachment agreements involving the crossing of the right of way, roadways and/or ramps of a freeway, must be accompanied, in the form of an attachment, by a profile showing the following information:

1. The profile should extend from right of way line to right of way line and show all slopes (cut or fill), ditches, shoulders, pavements, medians, etc.
2. A vertical dimension from bottom of road ditches and from surface of pavement to encroaching structures.
3. Length, size, and type of encasement where required.
4. Notation of portion to be installed by open-cut.
5. For underground encroachments involving encasements that must be vented, the location of vents must be shown.
6. Method of installation must be shown in detail on either the plan or profile.
7. Any attachment to a bridge or other drainage structure must be approved by the Department's State Utilities Manager.
8. Where profile is required, it should be on same sheet with the plan.

SPECIAL PROVISIONS OR SPECIFICATIONS

Any special provisions or specifications as to the performance of the work or the method of construction that may be required by the Department must be shown on a separate sheet attached to encroachment, provided that such information cannot be shown on the plan and profile sheet.

STANDARD SPECIAL PROVISIONS FOR ENCROACHMENTS
REVISED - FEBRUARY 2011

1. Notify the District Engineer's office at least 3 day's prior to commencing work and again upon completion of work. (828- 891-7911)
2. Traffic control devices and procedures shall be installed to ensure public safety and shall comply with the latest edition of the Manual on Uniform Traffic control Devices and the N.C. Department of Transportation's Standards and Specifications for Roads and Structures.
3. Contact the appropriate Utility Company(ies) involved and make satisfactory arrangements to adjust any utilities in conflict with the proposed work prior to construction.
4. Any drainage structure disturbed or damaged shall be restored to its original condition as directed by the District Engineer. Drainage structures shall not be blocked with excavation, construction or other materials. In addition, any drainage pattern that is altered must be repaired / modified. This work must meet NCDOT standards, and result in proper and adequate drainage of disturbed area. This includes but is not limited to culverts, ditches, shoulders, or drainage structures. The District Office is to be notified of any changes made.
5. Trenching, bore pits and/or other excavations shall not be left open or unsafe to pedestrian or vehicular traffic overnight or during holidays and weekends and shall comply with all O.S.H.A regulations and requirements.
6. All fill areas/backfill shall be compacted to 95% density in accordance with AASHTO T99 as Modified by NCDOT. All material to a depth of 8.0" below the finished surface of the sub-grade shall be compacted to a density equal to at least 100.0% density in accordance with AASHTO T99 as modified by NCDOT. The sub-grade shall be compacted at a moisture content which is approximately the required to produce the maximum density indicated by the above test method. The contractor shall dry or add moisture to the sub-grade when required to provide a uniformly compacted and acceptable sub-grade.
7. Proper temporary and permanent measures shall be installed and maintained for the duration of the encroachment to control erosion sedimentation in accordance with local, State and Federal regulations.
8. Materials and workmanship shall conform to the N.C. Department of Transportation's Standards and Specifications for Road and Structures and Roadway Standard Drawings.
9. Strict compliance with The Policies and Procedures for Accommodating Utilities on Highway Rights of Way shall be required.
10. Silt basins shall be removed as soon as possible and shall not infringe on the roadway or components of the roadway including required clear recovery areas or any other areas traversable by vehicles.
11. It is the encroaching party's responsibility to determine if any permits are required by other local, state and federal governments to perform the work described in the encroachment and to secure such permits before any construction begins.
12. Any work requiring equipment or personnel within 5.0' of the edge of the travel lane shall require a lane closure in accordance with NCDOT Standards and Specifications for Roads and Structures and Roadway Standard Drawings manuals and the latest edition of the MUTCD or supplements thereof.
13. No material or equipment storage will be allowed within 30.0' of the edge of the travel lane without the permission of the Engineer. Absolutely no material or equipment storage will be allowed within 15.0' of the edge of the travel lane.
14. NCDOT does not guarantee the right of way on these roads, nor will it be responsible for any claim for damages brought by any property owner by reason of this installation.
15. If any blasting is required, the maximum peak particle velocity shall be limited to 4.0 in./sec. As measured at the closest structure extremity.

16. Any changes to the encroachment must be submitted in writing to the Engineer for review and comment. Failure to request changes may result in cancellation of the encroachment agreement.
17. All disturbed right of way monuments shall be reset by a NC licensed Surveyor in accordance with NCDOT Standards and Specifications for Roads and Structures and Roadway Standard Drawings manuals.
18. No lane closures will be allowed prior to 8:30 AM or after 4:30 PM (time changes can be approved on a case by case basis). No lane closures will be allowed on Sundays or on State observed holidays (without prior approval).
19. All manhole lids, water valves/meters and applicable concrete encasements shall be set flush with the natural ground elevation and should be located so as to minimize interference with highway drainage. All fire hydrants must be located a minimum 5.0' behind the ditch line.
20. All longitudinal installations of proposed encroachments shall be located as close to the outside edge of the Right of Way and as far away from the outside edge of the nearest travel lane as possible to the satisfaction of the District Engineer.
21. All manholes and vaults shall be of a design approved by the State Design Services Engineer. A list of previously "Approved Manholes and Vaults" may be obtained from the State Design Services Engineer.
22. All driveways altered during construction shall be at a minimum returned to a state comparable with the condition of the driveways prior to construction.
23. An Executed copy of this Encroachment agreement will be present at the construction site at all times during construction. If safety or traffic conditions warrant such an action, NCDOT reserves the right to further limit, restrict or suspend operations within the right of way.
24. All roadway signs which are removed due to construction shall be reinstalled as soon as possible.
25. Ingress and egress shall be maintained to all business and dwellings affected by the project. Special attention shall be paid to police and fire stations, fire hydrants and hospitals.
26. Vegetative cover shall be established on all disturbed and damaged areas to the satisfaction of the District Engineer in accordance with the attached Seeding and Mulching guidelines. The N.C. Department of Transportation reserves the right to modify the guidelines for unique situations or as recommended by the Area Roadside Environmental Engineer.

SEEDING AND MULCHING GUIDELINES

MATERIAL	May 1 – Aug. 31	Sept. 1 – April 30
Kentucky 31 Fescue	100 Lb./Ac.	100 Lb./Ac
OR		
Hard Fescue	15 Lb./Ac.	15 Lb./Ac.
Fertilizer	500 Lb./Ac.	500 Lb./Ac.
Limestone	4000 Lb./Ac.	4000 Lb./Ac.
Rye grain	-----	25 Lb./Ac.
German Millet	25 Lb./Ac.	-----
Mulch with grain straw	40 bales/Ac.	40 bales/Ac.

NOTES

- A. Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application is adjusted to provide the same amount of nutrients as the 10-20-20 analysis.
- B. Hard Fescue may be substituted for Kentucky 31 Fescue and Vice Versa however see the above table as the rate of application for the two materials is different.
- C. Seeding and mulching operations shall be adapted to various weather or soil conditions as necessary for the successful establishment and growth of the grasses and legumes as directed by the Engineer.

27. The encroaching party shall comply with all applicable federal, state, and local environmental regulations, and shall obtain all necessary federal, state, and local environmental permits, including but not limited to, those related to sediment control, storm water, wetland, streams, endangered species, and historical sites.
28. Excavation within 1000 feet of a signalized intersection will require notification by the party of the second part to the Division Traffic Engineer at telephone number 828-631-1185. All traffic signal or detection cables must be located prior to excavation.
29. With directional boring, under no condition shall jetting alone or wet boring with water of utility pipelines be allowed. Directional boring using jetting with a Bentonite (or equivalent material) slurry is approved at a minimum depth of ten (10) feet below the pavement surface (fifteen feet below the surface of controlled access roads) and five (5') below any ditch line. Any parallel installation utilizing the directional boring shall be made at a minimum depth of three (3') feet (cover) below the ground surface except where the parallel installation crosses a paved roadway. The tip of the drill string shall have a cutter head. Any changes shall be submitted to the District Engineer for approval prior to construction. An overbore shall not be more than two (2") inches greater than the diameter of the pipe or encasement will be considered. If the encroachment agreement includes a statement signed and sealed by a North Carolina Registered Professional Engineer, indicating that an over bore in excess of two (2") inches of the pipe or encasement will arch and no damage will be done to the pavement or subgrade.
30. Any open cut pavement must be repaired / replaced with an NCDOT approved Bituminous material within 48 hours. NCDOT will not be responsible for damages incurred to the traveling public where the pavement has been cut.
31. That the party of the second part agrees to provide traffic control devices, lane closures, road closures, positive protection and/or any other warning or positive protection devices necessary for the safety of motorists and workers during construction and any subsequent maintenance. This shall be performed in conformance with the latest NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures and Amendments or Supplements thereto. When there is no guidance provided in the Roadway Standard Drawings and Specifications, comply with the Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplement thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first part.
32. As part of any utility encroachment where structures will be installed above ground, the following conditions shall apply. "Any and all components of this utility encroachment that extend vertically beyond ground elevation must be provided with a 3 foot radius that is regularly maintained or kept clear of vegetation for the purpose of visibility. This includes poles, guy wires and anchors, pedestals, cabinets, etc. All utility owners are to place visible sleeves on all guy wires. Failure to comply with this condition will forfeit the utility owner's right to reimbursement for damages from NCDOT resulting from future mowing operations."
33. NCDOT WORK ZONE TRAFFIC CONTROL QUALIFICATIONS AND TRAINING PROGRAM:
 - a. Effective July 1, 2010, all flagging operations within NCDOT Right of Way requires qualified and trained Work Zone Flaggers.
 - b. Effective July 1, 2011, qualified and trained Work Zone Traffic Control Supervisors will be required on Significant Projects.
 - c. Training for this certification is provided by NCDOT approved training sources and by private entities that have been pre-approved to train themselves. If you have questions, contact our web site at <https://connect.ncdot.gov/projects/WZTC/Pages/Training.aspx> or NCDOT Work Zone Safety Program at 919-707-2660.

DEMLR EROSION CONTROL PLAN APPROVAL

ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

BRIAN WRENN
Director



NORTH CAROLINA
Environmental Quality

December 22, 2021

LETTER OF APPROVAL

Transylvania County
ATTN: Ms. Jaime Laughter
101 South Broad Street
Brevard, NC 28712

RE: Project Name: SEWER LINE EXTENSION, WATER LINE EXTENSION, SEWER PUMP STATION
Acres Approved: 9.1
Project ID: TRANS-2022-006
County: Transylvania
City: Rosman
Address: Hwy. 64
River Basin: French Broad
Stream Classification: Peter Weaver Creek – C, Trout
Submitted By: High Country Engineering, P.C. - James Johnston, P.E.
Date Received by LQS: December 21, 2021
Plan Type: Express – Utility

Dear Ms. Laughter,

This office has reviewed the subject erosion and sedimentation control plan and hereby issues this Letter of Approval. This plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, as is required by Title 15A NCAC 4B .0129. Should the plan not perform adequately, a revised plan will be required (G.S. 113A-54.1)(b).

As of April 1, 2019, all new construction activities are required to complete and submit an electronic Notice of Intent (eNOI) form requesting a Certificate of Coverage (COC) under the NCG010000 Construction General Permit. After the form is reviewed and found to be complete, you will receive a link with payment instructions for the \$100 annual permit fee. After the fee is received, you will receive the COC via email. You MUST obtain the COC prior to commencement of any land disturbing activity. The eNOI form may be accessed at



North Carolina Department of Environmental Quality | Division of Energy, Mineral and Land Resources
Asheville Regional Office | 2090 U.S. Highway 70 | Swannanoa, North Carolina 28778
828.296.4500

deq.nc.gov/NCG01. Please direct questions about the eNOI form to Paul Clark at Paul.clark@ncdenr.gov. If the owner/operator of this project changes in the future, the new responsible party is required to apply for his/her own COC.

Title 15A NCAC 4B .0118(a) and the NCG01 permit require that the following documentation be kept on file at the job site:

1. The approved E&SC plan as well as any approved deviation.
2. The NCG01 permit and the COC, once it is received.
3. Records of inspections made during the previous 12 months.

Also, this letter gives the notice required by G.S. 113A-61.1(a) of our right of periodic inspection to insure compliance with the approved plan.

North Carolina's Sedimentation Pollution Control Program is performance-oriented, requiring protection of existing natural resources and adjoining properties. If, following the commencement of this project, it is determined that the erosion and sedimentation control plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute 113A-51 through 66), this office may require revisions to the plan and implementation of the revisions to ensure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with Federal and State water quality laws, regulations, and rules. In addition, local city or county ordinances or rules may also apply to this land-disturbing activity. This approval does not supersede any other permit or approval.

Please note that this approval is based in part on the accuracy of the information provided in the Financial Responsibility Form, which you provided. This permit allows for a land-disturbance, as called for on the application plan, not to exceed the approved acres. Exceeding the acreage will be a violation of this permit and would require a revised plan and additional application fee. You are requested to file an amended form if there is any change in the information included on the form. In addition, it would be helpful if you notify this office of the proposed starting date for this project. Please notify us if you plan to have a preconstruction conference.

Your cooperation is appreciated.

Sincerely,



Fred Walker, P.E.
Express Engineer
Land Quality Section

Letter of Approval
ATTN: Ms. Jaime Laughter
December 22, 2021
Page **3** of **3**

Enclosures: Certificate of Coverage
NPDES NCG01 Fact Sheet

ec: Mr. James Johnston, P.E. (jjohnston@hcepc.net)
Mr. Bryan Shamblin – NCDEQ LQS (bryan.shamblin@ncdenr.gov)
Mr. Landon Davidson, P.G. – NCDEQ-DWR (landon.davidson@ncdenr.gov)
Ms. Amy Annino – NCDEQ-DWR (amy.annino@ncdenr.gov)
cc: Regional Office file

CERTIFICATE OF PLAN APPROVAL



The posting of this certificate certifies that an erosion and sedimentation control plan has been approved for this project by the North Carolina Department of Environmental Quality in accordance with North Carolina General Statute 113A – 57 (4) and 113A – 54 (d) (4) and North Carolina Administrative Code, Title 15A, Chapter 4B.0107 (c). This certificate must be posted at the primary entrance of the job site before construction begins and until establishment of permanent groundcover as required by North Carolina Administrative Code, Title 15A, Chapter 4B.0127 (b).

Sewer Line Extension, Water Line Extension **Transylvania**

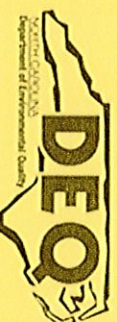
Project Name and Location

TRANS-2022-006

December 22, 2021

Date of Plan Approval


Regional Engineer



Certificate of Coverage Number

