



Contract Documents and Technical Specifications

Middle Oconee Pump Station & Gravity Sewer

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Prepared By:

CEC

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**SECTION 00 11 13
ADVERTISEMENT FOR BIDS**

The City of Jefferson, Georgia (Owner) is soliciting BIDS for the construction of the following project:

CITY OF JEFFERSON – MIDDLE OCONEE PUMP STATION & GRAVITY SEWER

The project shall include one 60-HP Triplex Pump Station and installation of approximately 3,300 linear feet of 24-inch C900 PVC DR 18 pipe and a 36-inch cased bore, connections to the existing gravity sewer, and furnishing of all materials, labor, equipment, and appurtenances necessary to complete the work.

SEALED BIDS will be accepted until **2:00 p.m.** local time on **Tuesday, April 21, 2026**, at **Jefferson City Hall, located at 147 Athens Street, Jefferson, Georgia 30549**, then publicly opened and read aloud.

Bids must be submitted in a sealed, non-transparent envelope and clearly marked on the outside with the words, "City of Jefferson – Middle Oconee Pump Station & Gravity Sewer", along with Bidder's name, address, phone number and contact person.

Bid Documents: All Bid Documents are available for download at <https://cecincga.com> under the 'Bid Information' tab. Upon payment of \$200.00 (non-refundable), the Contractor will be added to the Plan Holders list and eligible to submit a bid for the project. Make checks payable to Civil Engineering Consultants and mail to 4994 Lower Roswell Road, Suite 34, Marietta, GA 30068. Please include the project name, contact person, phone number, and email address. **Hard copies of the Contract Documents will not be available.**

Contractor Questions: All questions pertaining to the Project and Bid Documents must be submitted electronically. Questions must be submitted by **Tuesday, April 7, 2026**. All Contractor questions should be made in writing to Cheri Reynolds at cheri@cecincga.com.

A satisfactory Bid Bond (in the amount of 5% of the Bid), executed by the Bidder, and an acceptable surety company listed in the latest issue of U.S. Treasury Circular 570, will accompany each BID. In lieu of a Bid Bond, the City will accept a cashier's check, certified check, or cash deposit in an amount equal to at least 5% of the total contract amount. The Owner reserves the right to reject any or all Bids or to waive any informality in the bidding, to evaluate Bids, and to accept any Bid, which in his opinion, may be for his best interest.

The successful Bidder for this Contract will be required to furnish a satisfactory Performance Bond and a Labor and Material Payment Bond, with a corporate surety approved by the OWNER and listed in the latest issue of U.S. Treasury Circular 570, each in the amount of 100% of the Bid. An Irrevocable Letter of Credit from a local, Jackson County bank is acceptable in lieu of Performance Bond and Labor and Material Payment Bond.

Instructions to Bidders: For all further requirements regarding Bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

**SECTION 00 21 13
INSTRUCTIONS TO BIDDERS**

BIDS will be received by the City of Jefferson, herein called the "OWNER", until **2:00 p.m.** local time, on **Tuesday, April 21, 2026.**

Each BID must be submitted in a sealed envelope, addressed to The City of Jefferson located at Jefferson City Hall, 147 Athens Street, Jefferson, Georgia 30549. Each sealed envelope containing a BID must be plainly marked on the outside as BID for the **City of Jefferson – Middle Oconee Pump Station & Gravity Sewer** and the envelope should bear on the outside, the name of the BIDDER, his address, and his license number (if applicable). If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at Jefferson City Hall, located at 147 Athens Street, Jefferson, Georgia 30549.

All BIDS must be made on the required BID Form. All blank spaces for BID prices must be filled in, in ink or typewritten, and the BID Form must be fully completed and executed when submitted. Only one (1) copy of the BID Form is required.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. No BIDS will be received or accepted after the above specified date and time for the opening of BIDS, unless otherwise extended by an Addendum. BIDS submitted after the designated hour will be deemed invalid and returned unopened to the BIDDER. No BIDDER may withdraw a BID within 90 days after the actual date of the opening thereof. Should there be reasons why the Contract cannot be Awarded within the specified period, the time may be extended by mutual agreement between the OWNER and the BIDDER.

The BIDDER must meet the minimum project experience requirements stated in the Advertisement for Bids. Those requirements are as follows:

1. Minimum of three (3) projects in the last five (5) years involving similar work.
2. Proposed Project Superintendent shall have been directly involved in at least one of the above-mentioned projects.
3. To demonstrate current qualifications to perform the Work, each Bidder must submit the following with their Bid:
 - a. Section 00 41 13 – Bid Form
 - b. Section 00 43 13 – Bid Bond
 - c. Section 00 45 13 – Statement of Bidder's Qualifications
 - d. Section 00 45 47 – Security and Immigration Compliance Act Certification
 - e. Section 00 45 48 – Contractor Affidavit

BIDDERS must satisfy themselves of the amount of required work and materials by a review of the plans and specifications and including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done. Any request for interpretation of Contract Documents or ADDENDA shall be made, to the Engineer, in writing.

Each BID must be accompanied by a BID Bond payable to the OWNER for five percent (5%) of the total amount of the BID. As soon as the BID prices have been compared, the OWNER will return the Checks or BID Bonds of all except the three (3) lowest responsible BIDDERS. When the Agreement is executed, the Bonds of the two (2) remaining unsuccessful BIDDERS will be returned. If no Award has been made within 120 days after the opening of BIDS, the BIDDERS may request return of their Checks or BID Bonds, if they have not been notified of the acceptance of his/her or their BID. The BID Bond of the successful BIDDER will be retained until the Performance Bond has been executed and approved, after which, it will be returned. A certified check may be used in lieu of a BID Bond. The BID Bond shall be secured by a guaranty or a surety company, listed in the latest issue of U.S. Treasury Circular 570, licensed to do business in the State of Georgia.

The party to whom the Contract is Awarded will be required to execute the Agreement and obtain the Performance Bond and the Payment Bond within ten (10) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary Agreement and bond forms. In case of failure of the BIDDER to execute the Agreement, the OWNER may, at his option, consider the BIDDER in default, in which case the BID BOND accompanying the bid shall become the property of the OWNER.

The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the 10-day period, or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as he deems necessary to determine the ability 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 Agreement and to complete the WORK contemplated therein.

The OWNER reserves the right to add to and/or delete from the Contract after it has been Awarded. BIDS may be held by the OWNER for a period not to exceed ninety (90) days from the date of the opening of BIDS for the purpose of reviewing the BIDS, prior to Awarding the Contract.

A conditional or qualified BID will not be accepted.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to his BID.

The specifications contained herein are intended to provide performance and material requirements for the execution and completion of this Project.

The number and trade names given for any products are taken from various manufacturer catalogs as stated and shall be construed as being descriptive only of type, style, and quality of material required. Material of other reputable manufacturers of equal quality, type and style may be acceptable only if approved by the Engineer.

The CONTRACTOR, in signing his BID on the whole or any portion of the WORK, shall conform to the following requirements:

- (a) BIDS which are not signed by individuals making them shall have attached thereto a power of attorney evidencing authority to sign the BID in the name of the person for whom it is signed.
- (b) BIDS which are signed for a partnership shall be signed by all of the partners or by an attorney-in-fact. If a BID is signed by an attorney-in-fact, there should be attached to the BID a power of attorney executed by the partners evidencing authority to sign the BID.
- (c) BIDS which are signed for a corporation shall have the correct corporate name thereof and the signature of the President or other authorized officer of the corporation manually written below the corporate name following the wording "By _____". The Corporation seal shall also be affixed to the BID and the signature shall be attested by the Secretary.

The Award of the Contract will be made to the lowest responsive, responsible BIDDER, based on the BID Form with the lowest TOTAL BID PRICE. The BIDDER to whom the Award is made will be notified at the earliest possible date. The OWNER reserves the right to reject any and all BIDS and to waive any informality in BIDS whenever such rejection or waiver is in its interest.

BIDDER must agree to commence work on or before a date to be specified in a written "NOTICE TO PROCEED" of the OWNER. The Contract Time for Substantial Completion shall be 365 consecutive calendar days. BIDDER must also agree to pay as Liquidated Damages the sum of \$500.00 dollars per day for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

Any questions should be directed to Cheri Reynolds in writing to cheri@cecincga.com. The last day for submission of questions shall be **Tuesday, April 7, 2026**.

END OF SECTION

SECTION 00 41 13
BID FORM

Bid Submitted By: _____
(Typed or printed name of organization)

Bid Addressed To: **Jefferson City Hall**
147 Athens Street
Jefferson, GA 30549

1. The undersigned BIDDER proposes and agrees, if this BID is accepted, to enter into an agreement with the OWNER in the form included in the Contract Documents to perform and furnish all WORK as specified or indicated in the contract Documents for the TOTAL PRICE BID and within the BID times indicated in this BID and in accordance with the other terms and conditions of the Contract Documents.
2. BIDDER accepts all of the terms and conditions of the Advertisement for Bids and Information for Bidders, including without limitation those dealing with the disposition of the BID security. This BID will remain subject to acceptance for ninety (90) days after the day of BID opening, or for such longer period of time that BIDDER may agree to in writing upon request of the OWNER. BIDDER will sign and deliver the required number of counterparts of the Agreement with the Bonds, Certifications of Insurance, and other documents required by the Bidding Requirements within ten (10) days after the date of the OWNER's Notice of Award.
3. In submitting this BID, BIDDER represents, as more fully set forth in the Agreement, that:
 - (a) BIDDER has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda receipt of all which is hereby acknowledged (list Addenda by Addendum Number and Date):

<u>Addendum No.</u>	<u>Date Received</u>	<u>Addendum No.</u>	<u>Date Received</u>
_____	_____	_____	_____
_____	_____	_____	_____
 - (b) BIDDER has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance and furnishing of the WORK, and BIDDER has not relied upon any oral representations by employees or agents of OWNER or ENGINEER.
 - (c) BIDDER is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance and furnishing of the WORK.

- (d) BIDDER has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or continuous to the site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions. BIDDER acknowledges that such reports and drawings are not Contract Documents and may not be complete for BIDDER's purposes. BIDDER acknowledges that OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site.
- (e) BIDDER has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the WORK or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by BIDDER and safety precautions and programs incident thereto.
- (f) BIDDER does not consider that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this BID for performance and furnishing of the WORK in accordance with the times, price and other terms and conditions of the Contract Documents.
- (g) BIDDER is aware of the general nature of WORK to be performed by OWNER and OTHERS at the site that relates to WORK for which this BID is submitted as indicated in the Contract documents.
- (h) BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- (i) BIDDER has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that BIDDER has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the WORK for which this BID is submitted.

(j) This BID is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, associates, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other BIDDER to submit a false or sham BID; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other BIDDER or over OWNER.

4. UNIT PRICES have been computed in accordance with paragraph 11.03 of the General Conditions. All specific cash allowances are included in the price(s) and have been computed in accordance with paragraph 11.02 of the General Conditions.

BIDDER acknowledges that quantities are not guaranteed and are solely for the purpose of comparison of BIDS, and final payment for all Unit Price BID items will be based on actual quantities provided, determined as provided in the Contract Documents.

5. BIDDER declares that he understands that the quantities shown on the bid are subject to adjustment by either increase or decrease, and that should the quantities of any of the items or WORK be increased, the undersigned proposes to do the additional work at the Unit Prices stated herein; and should the quantities be decreased, BIDDER also understands that payment will be made on actual quantities at the Unit Price bid and will make no claim for anticipated profits for any decrease in the quantities and that actual quantities will be determined upon completion of WORK, at which time adjustment will be made to the Contract Amount by direct increase or decrease.
6. BIDDER will complete the WORK in accordance with the Contract Documents for the prices listed in the following Bid Schedule.

BID SCHEDULE

All BID Items shall include all costs for furnishing all labor, materials, equipment, supplies, allowances, and all other costs including permit fees, taxes, insurance, miscellaneous costs, overhead and profit incurred for the WORK, complete in place and ready for continuous service.

MIDDLE OCONEE PUMP STATION AND GRAVITY SEWER

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Approx. Qty.</u>	<u>Unit Price</u>	<u>Total Price</u>
1.	Middle Oconee Pump Station	LS	1	\$_____	\$_____
2.	24-Inch PVC DR 18 C900				
	a. 0' – 8' Deep	LF	173	\$_____	\$_____
	b. 8' – 10' Deep	LF	1,241	\$_____	\$_____
	c. 10' – 12' Deep	LF	1,326	\$_____	\$_____
	d. 12' – 14' Deep	LF	105	\$_____	\$_____
	e. 14' – 16' Deep	LF	8	\$_____	\$_____
	f. Greater than 16' Deep	LF	214	\$_____	\$_____
3.	12-Inch PVC DR 18 C900				
	a. 0' – 12' Deep	LF	88	\$_____	\$_____
	b. 12' – 14' Deep	LF	6	\$_____	\$_____
4.	36-Inch Steel Casing, Jack & Bore	LF	50	\$_____	\$_____
5.	5-Foot Diameter Manhole Base	EA	1	\$_____	\$_____
6.	5-Foot Diameter Manhole Riser	VLF	20	\$_____	\$_____
7.	4-Foot Diameter Manhole Base	EA	18	\$_____	\$_____
8.	4-Foot Diameter Manhole Riser	VLF	310	\$_____	\$_____
9.	Stone Stabilization	TN	400	\$_____	\$_____
10.	Silt Fence Type "NS"	LF	6,500	\$_____	\$_____
11.	Silt Fence Removal	LF	6,500	\$_____ 3.00	\$_____ 19,500.00
12.	Tree Save Fence	LF	6,300	\$_____	\$_____

13.	Tree Save Fence Removal	LF	6,300	\$ <u>3.00</u>	\$ <u>18,900.00</u>
14.	GAB Gravel Access Road Repair	SF	2,200	\$ _____	\$ _____
15.	Permanent Grassing	LF	4,000	\$ _____	\$ _____
16.	Construction Exit	EA	2	\$ _____	\$ _____
17.	Erosion Control Monitoring	LS	1	\$ _____	\$ _____
18.	McDonalds LS Decommissioning	LS	1	\$ _____	\$ _____
19.	Power Connection Allowance	LS	1	\$ <u>50,000.00</u>	\$ <u>50,000.00</u>
20.	SCADA Allowance	LS	1	\$ <u>50,000.00</u>	\$ <u>50,000.00</u>
21.	Owner Contingency Allowance	LS	1	\$ <u>100,000.00</u>	\$ <u>100,000.00</u>

Total Amount Bid (Items 1 Through 21, Inclusive) \$ _____

Total Price Bid (In Words): _____

The amount of Total Price Bid shall be shown in both figures and words. In case of a discrepancy, the amount shown in words shall govern. In the event of a discrepancy between the Unit Price bid and the extension, the Unit Price will be deemed intended by the Bidder and the extension adjusted. In the event of a discrepancy between the sum of the extended amounts and the Bid total, the sum of the extended amounts shall govern.

- BIDDER agrees that the WORK will be Substantially Completed within 365 consecutive calendar days, from the date when the Contract Time commences to run as provided in paragraph 4.01 of the General Conditions and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions.***

BIDDER accepts the provisions of the Agreement as to Liquidated Damages in the event of failure to complete the WORK within the time(s) specified in the Agreement.

- The following documents are attached and made a condition of this BID:
 - Required Bid Security in the form of Bid Bond, Certified Check, or Cashier's Check. *(Strikeout inapplicable terms.)*
 - BIDDERS who submit Bid Security in the form of a Certified Check or Cashier's Check are bound by the "Terms of Bid Bond" as if submitted on the attached "Bid Bond" form.

The address of BIDDER indicated below.

BIDDER'S NAME: _____

Primary Contact Person: _____

Secondary Contact Person: _____

Bidder's Street Address: _____

Bidder's Mailing Address (if different from above): _____

Bidder's Telephone Number: _____

Bidder's Fax Number: _____

3. Terms used in this BID which are defined in the General Conditions will have the meanings indicated in the General Conditions.

THIS BID SUBMITTED on _____, 2026.

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature)

Title: _____

Attest: _____ (CORPORATE SEAL)
(Signature)

Business Address: _____

Telephone Number: _____

Date of Qualification to do business is: _____

**SECTION 00 43 13
BID BOND**

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
as PRINCIPAL, and _____ as SURETY, are held and firmly bound
unto The City of Jefferson, hereinafter called the "Local Public Agency", in the penal sum of
_____ Dollars,
(\$_____) lawful money of the United States, for the payment of which sum well
and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and
assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that Whereas the Principal has submitted the
Accompanying Bid, dated _____, 2026 for the construction of

CITY OF JEFFERSON – MIDDLE OCONEE PUMP STATION AND GRAVITY SEWER

NOW, THEREFORE, if the Principal shall not withdraw said Bid within the period specified
therein after the opening of the same, or, if no period be specified, within thirty (30) days
after the said opening and shall within the period specified therefore, or if no period be
specified, within ten (10) days after the prescribed forms are presented to him for signature,
enter into a written Contract with the Local Public Agency in accordance with the Bid as
accepted, and give bond with good and sufficient surety or sureties, as may be required, for
the faithful performance and proper fulfillment of such Contract, or in the event of the
withdrawal of said Bid within the period specified, or the failure to enter into such Contract
and give such bond within the time specified, if the Principal shall pay the Local Public
Agency the difference between the amount specified in said Bid and the amount for which
the Local Public Agency may procure the required work or supplies or both, if the latter be in
excess of the former, than the above obligation shall be void and of no effect, otherwise to
remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their
several seals this _____ day of _____, 2026, the name and corporate seal of each
corporate party being hereto affixed, and these presents signed by its undersigned
representative, pursuant to authority of its governing body.

In presence of:

_____ (SEAL)
(Individual Principal)

(Address, Zip Code)

_____ (SEAL)
(Partnership)

(Address, Zip Code)

By: _____

(Corporate Principal)

(Address, Zip Code)

By: _____
(Affix Corporate Seal)

(Corporate Surety)

By: _____
(Affix Corporate Seal)

Countersigned by:

Attorney-in-Fact, State of

State of _____

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____, Secretary of the Corporation named as Principal in the within bond; that _____, who signed the said bond on behalf of the Principal was then _____ of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed, sealed, and attested to for and in behalf of said corporation by authority of this governing body.

(Corp.)

_____ (Seal)

Title _____

SECTION 00 45 13
STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information desired. Attach all additional sheets to this statement. (Sample "Project Information Form" contained at the end of this Section.)

1. Name of Bidder: _____
2. Permanent main office address and phone number: _____
3. When organized: _____
4. How many years have you been engaged in the contracting business under your present firm or trade name: _____
5. Contracts on hand (list major contracts, total number, and dollar value) _____

6. Have you ever failed to complete any work awarded to you? If so, where, and why? _____

7. Have you ever defaulted on a contract? If so, where, and why? _____

8. Attach a list of the most important projects recently completed by your company which are similar in scope to this Project. (Complete a "Project Information Form", attached, for each Project listed.) See the Advertisement for Bid and the Instructions to Bidders for required minimum project experience.
9. List your major equipment available for this Contract. _____

10. Background and experience of the Principal members of your organization, including officers. Attach resume(s)

11. Background and experience of the Project Manager who will be assigned to this Project. Attach resume
12. Background and experience of the Superintendent who will be assigned to this Project. Attach resume
13. Any history of litigation, arbitration, or other related mediation actions for the proposed Project Manager, Project Superintendent, or referenced Projects?

14. The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

I, _____, certify that I am _____ of the Bidder, and that the answers to the foregoing questions and statements contained therein are true and correct.

BIDDER: _____

By: _____
(name signed)

(name printed or typed)

Title: _____

Date: _____

Subscribed and sworn to me this ____ day of _____, 20 ____.

NOTARY PUBLIC: _____
(name signed)

(name printed or typed)

Commission Expires: _____
(Date)

(SEAL)

PROJECT INFORMATION FORM
(Attach Copies for Three (3) Projects)

Project Title: _____

Project Description: _____

Project Owner:

- 1. Owner Name: _____
- 2. Address: _____
- 3. Contact Person: _____
- 4. Phone Number: _____

Contractor Project Manager:

- 1. Company Name: _____
- 2. Contractor Project Manager: _____
- 3. Phone Number: _____

Contract Amount:

- 1. Initial: _____
- 2. Final: _____
- 3. Reason if Different: _____

Contract Time

- 1. Initial: _____
- 2. Final: _____
- 3. Completion Date: _____
- 4. Reason if Different: _____

**SECTION 00 45 47
SECURITY AND IMMIGRATION
COMPLIANCE ACT CERTIFICATION**

Pursuant to the Georgia Security and Immigration Compliance Act of 2006, Contractor understands and agrees that compliance with the requirements of OCGA 13-10-91 and Georgia Department of Labor Rule 300-10-1 et. seq. are conditions of Agreement. Contractor further agrees that such compliance shall be attested through execution of Contractor Affidavit and Agreement required by Georgia Department of Labor Rule 300-10-1-.07, or a substantially similar contractor affidavit. Contractor's fully executed affidavit is attached and is incorporated into this Agreement by reference herein.

By initialing in the appropriate line below, Contractor certifies that the following employee number category as identified in OCGA 13-10-91 is applicable to Contractor:

1. _____ 500 or more employees.
2. _____ 100 or more employees.
3. _____ Fewer than 100 employees.

Contractor understands and agrees that, in the event Contractor employs or contracts with Subcontractor in connection with this Agreement, Contractor shall:

1. Secure from each Subcontractor an indication of the employee-number category as identified in OCGA 13-10-91; and
2. Secure from each Subcontractor an attestation of Subcontractor's compliance with OCGA 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02 by causing each Subcontractor to execute the attached Subcontractor Affidavit required by Georgia Department of Labor Rule 300-10-1-.08, or a substantially similar subcontractor affidavit. Contractor further understands and agrees that Contractor shall require the executed Subcontractor Affidavit to become a part of the agreement between Contractor and each Subcontractor. Contractor agrees to maintain records of each Subcontractor attestation required hereunder for inspection by Owner.

BY: Authorized Officer or Agent

Date

Title of Authorized Officer or Agent if Contractor

Printed Name of Authorized Officer or Agent

Subscribed and Sworn Before Me on this
_____ day of _____, 20____

Notary Public
My Commission Expires: _____

SECTION 00 45 48
CONTRACTOR AFFIDAVIT

By executing this affidavit, the undersigned Contractor verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm, or corporation which is engaged in the physical performance of services on behalf of the _____ (Public Employer) has registered with, is authorized to use, and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned Contractor will continue to use the federal work authorization program throughout the contract period, and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with Subcontractors who present an affidavit to the Contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization Number
(EEV / E-Verify User Identification Number)

Date of Authorization

Name of Contractor

Name of Project

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.
Executed on _____, 20__ in _____ (City), _____ (State).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

Subscribed and sworn before me on this the __ day of _____, 20__.

Notary Public

My Commission Expires:

[NOTARY SEAL]

SECTION 00 45 49
SUBCONTRACTOR AFFIDAVIT

By executing this affidavit, the undersigned Contractor verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm, or corporation which is engaged in the physical performance of services on behalf of the _____ (Public Employer) has registered with, is authorized to use, and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned Contractor will continue to use the federal work authorization program throughout the contract period, and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with Subcontractors who present an affidavit to the Contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization Number
(EEV / E-Verify User Identification Number)

Date of Authorization

Name of Subcontractor:

Name of Contractor

Name of Project

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.
Executed on _____, 20__ in _____ (City), _____ (State).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

Subscribed and sworn before me on this the ____ day of _____, 20____.

Notary Public
My Commission Expires:

[NOTARY SEAL]

SECTION 00 51 00
NOTICE OF AWARD

DATE OF ISSUANCE:

OWNER:

CITY OF JEFFERSON

ENGINEER:

CIVIL ENGINEERING CONSULTANTS, INC.

PROJECT:

MIDDLE OCONEE PUMP STATION & GRAVITY SEWER

CONTRACTOR:

CONTRACTOR'S
ADDRESS:

DESCRIPTION OF WORK: The project shall include one 60-HP Triplex Pump Station and installation of approximately 3,300 linear feet of 24-inch C900 PVC DR 18 pipe and a 36-inch cased bore, connections to the existing gravity sewer, and furnishing of all materials, labor, equipment, and appurtenances necessary to complete the work.

The OWNER has considered the BID submitted by you for the above-described WORK. You are hereby notified that the Owner has accepted your BID for items in the amount of \$_____.

You are required, by the General Information for Contractor, to execute the Agreement and certificates of insurance within ten (10) days from the date of this Notice to you. If you fail to execute said Agreement within 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 as abandoned. 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.

OWNER:

CITY OF JEFFERSON

BY (signature):

NAME (printed):

PRISCILLA A. MURPHY

TITLE:

CITY MANAGER

ACCEPTANCE OF NOTICE:

The undersigned party hereby acknowledges the receipt of the above NOTICE OF AWARD.

CONTRACTOR:

BY (signature):

NAME (printed):

TITLE:

DATE:

**SECTION 00 52 13
STANDARD FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
ON THE BASIS OF STIPULATED PRICE**

This Agreement dated _____ is by and between **THE CITY OF JEFFERSON** hereinafter called (**OWNER**) and _____ hereinafter called (**CONTRACTOR**).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1—WORK

1.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **MIDDLE OCONEE PUMP STATION AND GRAVITY SEWER**

1.02 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

The project shall include one 60-HP Triplex Pump Station and installation of approximately 3,300 linear feet of 24-inch C900 PVC DR 18 pipe and a 36-inch cased bore, connections to the existing gravity sewer, and furnishing of all materials, labor, equipment, and appurtenances necessary to complete the work.

ARTICLE 2—ENGINEER

2.01 The Owner has retained **CIVIL ENGINEERING CONSULTANTS, INC.**, ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

2.02 The part of the Project that pertains to the Work has been designed by **CIVIL ENGINEERING CONSULTANTS, INC.**, and that same entity prepared the design.

ARTICLE 3—CONTRACT TIMES

3.01 *Time Is of The Essence*

A. Substantial Completion, and completion and readiness for final payment as stated below are of the essence of the Contract.

3.02 *Contract Times: Dates*

A. Notice to Proceed Date shall be _____

B. The Work will be substantially completed on or before _____

3.03 *Contract Times: Days*

A. The Work will be substantially completed within **365 consecutive calendar days** from the date when the Contract Time commences to run as provided in paragraph 4.01 of the General Conditions. Work will be finally completed within 30 consecutive calendar days after substantial completion.

3.04 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 3.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. *Substantial Completion:* Contractor shall pay Owner Five Hundred Dollars (\$500.00) for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$[number] for each day that expires after such time until the Work is completed and ready for final payment.
 3. Liquidated damages for failing to timely attain Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 4—CONTRACT PRICE

4.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

- A. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item).

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

- C. Total of Unit Price Work (subject to final Unit Price adjustment) is \$_____
- D. According to paragraph 13.02 of the General Conditions, all allowances are included in the abovementioned Lump Sum price.
1. Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances.

2. The Contractor shall cause work covered by these allowances to be performed for such amounts and by such persons as the Owner/Engineer may direct, but he will not be required to employ persons against whom he makes a reasonable objection. If the cost, when determined and approved by the Owner/Engineer, exceeds, or falls below the allowance, the Contract Sum shall be adjusted accordingly through a Change Order. The contractor is not entitled to overhead, profit, or mark-up on unutilized allowance funds. The amount of the Change Order shall reflect the difference between actual costs and the allowances.

BID SCHEDULE

All BID Items shall include all costs for furnishing all labor, materials, equipment, supplies, allowances, and all other costs including permit fees, taxes, insurance, miscellaneous costs, overhead and profit incurred for the WORK, complete in place and ready for continuous service.

MIDDLE OCONEE PUMP STATION AND GRAVITY SEWER

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Approx. Qty.</u>	<u>Unit Price</u>	<u>Total Price</u>
1.	Middle Oconee Pump Station	LS	1	\$_____	\$_____
2.	24-Inch PVC DR 18 C900				
	a. 0' – 8' Deep	LF	173	\$_____	\$_____
	b. 8' – 10' Deep	LF	1,241	\$_____	\$_____
	c. 10' – 12' Deep	LF	1,326	\$_____	\$_____
	d. 12' – 14' Deep	LF	105	\$_____	\$_____
	e. 14' – 16' Deep	LF	8	\$_____	\$_____
	f. Greater than 16' Deep	LF	214	\$_____	\$_____
3.	12-Inch PVC DR 18 C900				
	a. 0' – 12' Deep	LF	88	\$_____	\$_____
	b. 12' – 14' Deep	LF	6	\$_____	\$_____
4.	36-Inch Steel Casing, Jack & Bore	LF	50	\$_____	\$_____
5.	5-Foot Diameter Manhole Base	EA	1	\$_____	\$_____
6.	5-Foot Diameter Manhole Riser	VLF	20	\$_____	\$_____
7.	4-Foot Diameter Manhole Base	EA	18	\$_____	\$_____
8.	4-Foot Diameter Manhole Riser	VLF	310	\$_____	\$_____

9.	Stone Stabilization	TN	400	\$_____	\$_____
10.	Silt Fence Type "NS"	LF	6,500	\$_____	\$_____
11.	Silt Fence Removal	LF	6,500	\$_____ 3.00	\$ <u>19,500.00</u>
12.	Tree Save Fence	LF	6,300	\$_____	\$_____
13.	Tree Save Fence Removal	LF	6,300	\$_____ 3.00	\$ <u>18,900.00</u>
14.	GAB Gravel Access Road Repair	SF	2,200	\$_____	\$_____
15.	Permanent Grassing	LF	4,000	\$_____	\$_____
16.	Construction Exit	EA	2	\$_____	\$_____
17.	Erosion Control Monitoring	LS	1	\$_____	\$_____
18.	McDonalds LS Decommissioning	LS	1	\$_____	\$_____
19.	Power Connection Allowance	LS	1	\$ <u>50,000.00</u>	\$ <u>50,000.00</u>
20.	SCADA Allowance	LS	1	\$ <u>50,000.00</u>	\$ <u>50,000.00</u>
21.	Owner Contingency Allowance	LS	1	\$ <u>100,000.00</u>	\$ <u>100,000.00</u>

Total Amount Bid (Items 1 Through 21, Inclusive) \$_____

Total Price Bid (In Words): _____

ARTICLE 5—PAYMENT PROCEDURES

5.01 Submittal and Processing of Payments

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

5.02 Progress Payments; Retainage

- A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, on or about the last day of each month during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the schedule of values established in paragraph 2.07 of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Conditions.
- B. Prior to Substantial Completion, progress payments will be made in an amount equal

95% of the Work completed, but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02.B.5 of the General Conditions.

- C. Upon Substantial Completion, in an amount sufficient to increase total payments to CONTRACTOR to 95% of the Contract Price, less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02.B.5 of the General Conditions.

5.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

ARTICLE 6—CONTRACT DOCUMENTS

6.01 *Contents*

- A. The Contract Documents consist of all of the following:

1. This Agreement.
2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
3. General Conditions.
4. Supplementary Conditions.
5. Specifications (not attached but incorporated by reference) consisting of **XX** sections with each sheet bearing the following general title:
6. Drawings (not attached but incorporated by reference) consisting of **XX** sheets with each sheet bearing the following general title:
7. Addendum No. 1 dated XXXXX
8. Appendices to this Agreement (enumerated as follows):
 - a. City of Jefferson Standard Water and Sewer Specifications
9. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.

- B. The Contract Documents listed in Paragraph 6.01.A are attached to this Agreement (except as expressly noted otherwise above).

- C. There are no Contract Documents other than those listed above in this Article 6.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 7—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

7.01 CONTRACTOR'S REPRESENTATIONS

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
 - 1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 - 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - 4. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 - 5. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
 - 6. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
 - 7. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
 - 8. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

9. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

7.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 7.02:
 1. "Corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the Proposal process or in the Contract execution.
 2. "Fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the Proposal process or the execution of the Contract to the detriment of Owner, (b) to establish Proposal or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 3. "Collusive practice" means a scheme or arrangement between two or more Proposers, with or without the knowledge of Owner, a purpose of which is to establish Proposal prices at artificial, non-competitive levels.
 4. "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the Proposal process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____, (which is the Effective Date of the Contract).

Owner:

Contractor:

City of Jefferson

(typed or printed name of organization)

(typed or printed name of organization)

By: _____
(individual's signature)

By: _____
(individual's signature)

Date: _____
(date signed)

Date: _____
(date signed)

Name: Priscilla A. Murphy
(typed or printed)

Name: _____
(typed or printed)

Title: City Manager
(typed or printed)

Title: _____
(typed or printed)

(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach

Attest: _____
(individual's signature)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

Address for giving notices:

Jefferson City Hall
147 Athens Street
Jefferson, GA 30549

Designated Representative:

Designated Representative:

Name: _____
(typed or printed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Title: _____
(typed or printed)

Address:
Jefferson City Hall
147 Athens Street
Jefferson, GA 30549

Address:

Phone: 706-367-5121

Phone: _____

Email: pmurphy@cityofjeffersongga.com

Email: _____

License No.: _____
(where applicable)

State: _____

SECTION 00 55 00
NOTICE TO PROCEED

OWNER: CITY OF JEFFERSON
ENGINEER: CIVIL ENGINEERING CONSULTANTS, INC.
CONTRACTOR: _____
PROJECT: MIDDLE OCONEE PUMP STATION AND GRAVITY SEWER
EFFECTIVE DATE OF
CONTRACT: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on _____ pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The number of days to achieve Substantial Completion is 365 days from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of _____.

Owner: CITY OF JEFFERSON
By (signature): _____
Name (printed): PRISCILLA A. MURPHY
Title: CITY MANAGER
Date Issued: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by

Contractor: _____
By (signature): _____
Name (printed): _____
Title: _____
Date Issued: _____

SECTION 00 61 14
PERFORMANCE BOND

Contractor Name: Address:	Surety Name: Address:
Owner Name: City of Jefferson Mailing address: 147 Athens Street Jefferson, GA 30549	Contract Description: MIDDLE OCONEE PUMP STATION & GRAVITY SEWER Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: (Date of Bond cannot be earlier than Effective Date of Contract) Modifications to this Bond form: ☐ None ☐ See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
(Full formal name of Contractor)	(Full formal name of Surety) (corporate seal)
By: _____ (Signature)	By: _____ (Signature) (Attach Power of
Name: _____ (Printed or typed)	Name: _____ (Printed or typed)
Title: _____	Title: _____
Attest: _____ (Signature)	Attest: _____ (Signature)
Name: _____ (Printed or typed)	Name: _____ (Printed or typed)
Title: _____	Title: _____
Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default.
 - 3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract.
 - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors.
 - 5.3. Obtain proposals or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

- 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 - 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract.
 - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods

of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

16. Modifications to this Bond are as follows: _____

SECTION 00 61 15
PAYMENT BOND

Contractor Name: Address:	Surety Name: Address:
Owner Name: City of Jefferson Mailing address: 147 Athens Street Jefferson, GA 30549	Contract Description: MIDDLE OCONEE PUMP STATION & GRAVITY SEWER Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: ☐ None ☐ See Paragraph 18	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 5.1. Claimants who do not have a direct contract with the Contractor
 - 5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2. Pay or arrange for payment of any undisputed amounts.

- 7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1. *Claim*—A written statement by the Claimant including at a minimum:

16.1.1. The name of the Claimant;

16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

16.1.4. A brief description of the labor, materials, or equipment furnished;

16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

16.1.7. The total amount of previous payments received by the Claimant; and

16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

18. Modifications to this Bond are as follows:_____

SECTION 00 62 15
CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized and acting legal representative of the City of Jefferson, Georgia, (the "City") do hereby certify as follows:

I have examined the attached Contract Documents and the manner of execution thereof by the City, and I am of the opinion that each of the aforesaid agreements are adequate and have been duly executed by the proper parties on behalf of the City; that said representative(s) has full power and authority to execute said agreements on behalf of the City, and that the foregoing agreements constitute valid and legally binding obligations upon the City in accordance with terms, conditions, and provisions thereof.

By: _____

Date: _____

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.

SECTION 00 62 76
APPLICATION FOR PAYMENT

Prepared By



Endorsed By



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www.nspe.org

American Council of Engineering Companies
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www.acec.org

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www.asce.org

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GUIDELINES FOR THE INTENDED USE OF EJCDC C-620, APPLICATION FOR PAYMENT

1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

The Application for Payment is used to facilitate periodic progress payments to the Contractor for Work completed and for stored materials and equipment (referred to in this document as "Stored Materials").

For additional information regarding the Application for Payment, see EJCDC® C-700, Standard General Conditions of the Construction Contract (2018), Paragraph 15.01, and EJCDC® C-001, Commentary on the 2018 EJCDC Construction Documents (2018).

2.0 APPLICATION FOR PAYMENT OVERVIEW

This document was prepared in Microsoft Excel due to the number of calculations involved in the preparation of the Application for Payment. The application consists of a Summary worksheet, and 3 supporting worksheets: Lump Sum worksheet, Unit Price worksheet, and Stored Materials worksheet.

- 2.1 *Summary Worksheet* — calculates the amount to be paid to the Contractor at the end of each Application for Payment period. This calculation imports numbers from the supporting worksheets to determine the value of the Work completed and Stored Materials, calculate retainage, and deduct amounts previously paid to determine the amount the Contractor should be paid for the current application period. Application periods are typically one month; however these periods may be extended when Contractor's efforts do not result in the billable completion of Work or storage of materials and equipment during the payment period.
- 2.2 *Lump Sum Worksheet* — calculates the total value for completed Work for which compensation is paid on a Lump Sum basis. The schedule of values included in this worksheet reflects a breakdown of lump sum Work items to which Contractor and Engineer have agreed, pursuant to Article 2 of the General Conditions. Costs for Stored Materials associated with lump sum items are included on this worksheet to calculate the total value for completed lump sum Work and associated Stored Materials. This total is exported to the Summary worksheet. Separate totals for Work Completed and for materials currently stored are also exported to the Summary worksheet for use in calculating the amount of retainage to be held for each.
- 2.3 *Unit Price Worksheet* — calculates the total value for completed Work for which compensation is paid on a Unit Price basis. The schedule of values included in this spreadsheet is typically a tabulation of Unit Price items from the Agreement. Costs for Stored Materials associated with unit price items are included in this worksheet to calculate the total value for completed Unit Price Work and associated Stored Materials. This total is exported to the Summary worksheet. Separate totals for Work Completed and for Materials Currently Stored are also exported to the Summary worksheet for use in calculating the amount of retainage to be held for each.

- 2.4 *Stored Materials Worksheet* — calculates the total value for materials and equipment that have been purchased and are being stored until they are incorporated into the Work. This worksheet adds materials and equipment to the worksheet as they are brought to the site and stored; such Stored Materials are then deducted from the Stored Materials worksheet total as they are incorporated into the Work, providing a running net value for the materials and equipment remaining in storage. The values of Stored Materials must be manually added to the Lump Sum or Unit Price line items. These do not automatically update when changes are made. The amount of materials remaining in storage is eligible for payment but must be tracked separately from Work completed since different retainage rates may apply to Work completed and Stored Materials.

3.0 Instructions for filling out the Payment Application form

- 3.1 Project-specific information is to be entered in the top portion (header) of the Summary worksheet. This same information will automatically be copied to the other worksheets to complete the headers on all other worksheets.
- 3.2 Outside of the header, data can be entered in non-shaded cells when the sheet is protected. Cells shaded light blue contain equations that will automatically transfer data from other cells or make calculations to complete the worksheet. Altering any of these cells can result in errors in the Application for Payment. It is recommended that the worksheets be protected at all times unless alterations are deliberately being made to the Application for Payment form other than to enter data. See Paragraph 4.0 below for information on Protection of Worksheets.
- 3.3 Enter information regarding each item in the Lump Sum and/or Unit Price worksheets. For Lump Sum projects, each item should represent an item in the schedule of values prepared by the Contractor and approved by the Engineer/Owner, breaking down the Lump Sum amount into measurable components. For Unit Price contracts, use numbers from the Agreement as the schedule of values. Specific information on the data to be entered into each column may be seen by clicking on the header description for that column. Similar comments may be seen for cells in the "Totals" row that indicates how the number is calculated and where this number is exported to another part of the spreadsheet. See the Commentary for additional information.
- 3.4 The equations in the Summary worksheet use numbers imported from both the Lump Sum and Unit Price worksheets. Projects will typically either use the Lump Sum or the Unit Price worksheet, but some projects may use both. If one of the worksheets is not used, it should be hidden and not deleted. If it is deleted, Users will need to correct the equations in the Summary worksheet by unprotecting the worksheet and editing the equations. To hide a worksheet, right click on the worksheet tab at the bottom of the worksheet and select "Hide." To unhide a worksheet, right click on any worksheet tab and select "Unhide," and then select the worksheet to unhide and click "Okay." This same process may be used to hide these Guidelines for Use.

4.0 Protection of Worksheets

- 4.1 The cells in this Workbook that create the forms or contain equations have been coded to "lock" the cells that should not be altered. It is recommended that the Workbook be Protected (cells locked) at all times unless it is necessary to add or delete rows. Directions for adding and deleting rows are provided in the next section. Passwords can be used to lock the Protect / Unprotect settings on spreadsheets, however the worksheets in this workbook do not require a password.
- 4.2 To unprotect a worksheet, click on the "Review" menu tab at the top of Excel, then click "Unprotect Sheet." To protect a worksheet, click on the "Review" menu tab at the top of Excel, then click "Protect Sheet." This will open a dialog box in which the User is allowed to select protection options. It is recommended that only the top two checkboxes for "Select Locked Cells" and "Select Unlocked Cells" be checked. This will reset the protection for the Worksheet.

5.0 Adding and Deleting Rows

- 5.1 A limited number of blank rows are provided in the Lump Sum, Unit Price, and Stored Material worksheets. Additional rows may be added to these worksheets by the User. The first step in this process is to unprotect the worksheet as previously discussed. After the sheet is unprotected, move with caution to prevent inadvertently deleting any cells that contain equations. To insert a row, right click in the row heading at the left of the spreadsheet and select "Insert." A new row will be inserted at the location where the cursor was placed in the row heading. If more than one new row is desired, left click and drag the cursor to include the desired number of rows, right click in the selected row headings and then select "Insert." It is important that the line immediately above the "Totals" row not be included in the rows selected. Doing so will require that equations in the "Totals" row be adjusted. When rows are inserted, Excel automatically adjusts the equations to include the new rows, unless the row directly above the "Totals" row is also selected.
- 5.2 After new rows are inserted, it is important to copy a line from one of the original rows so correct formatting and equations are copied into each new row. To do this, select the row to be copied by clicking the cell in Column A and dragging the cursor to the last column in the table. Then select "Copy" from the menu or type CTRL+C to copy the cells. Excel will show that this row has been copied by showing a moving dashed line around the cells that are to be copied. Then select the new rows into which the information is to be copied as before and select Paste from the menu or type CTRL+V.
- 5.3 To delete an unused row, right click in the row heading on the left of the spreadsheet for the row to be deleted and select "Delete." The selected row will be deleted. If more than one row is to be deleted, left click and drag the cursor to the desired number of rows to be deleted and then right click to open the menu and select "Delete." Unlike the admonition on adding new rows, it is okay to delete the row just above the "Totals" row.
- 5.4 After rows have been added or deleted, it is important reset the worksheet protection.

6.0 Saving Files

This file is provided as a Microsoft® Excel Open XML workbook template (.xltx) to prevent this file from being inadvertently changed. When an application for payment is created for a specific project it should be saved as an Excel workbook (.xlsx) file. To do this, select Save As (F12), type in a new file name and select Excel Workbook (.xlsx) from the drop down Save As Type menu.

7.0 License Agreement

This document is subject to the terms and conditions of the License Agreement, 2018 EJCDC® Construction Series Documents. A copy of the License Agreement was furnished at the time of purchase of this document, and is available for review at www.ejcdc.org and the websites of EJCDC's sponsoring organizations.

Contractor's Application for Payment

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____	Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____																																				
Application No.: _____ Application Date: _____																																					
Application Period: From _____ to _____																																					
<table border="1" style="width: 100%; border-collapse: collapse;"><tr><td style="width: 70%;">1. Original Contract Price</td><td style="width: 10%; text-align: center;">\$</td><td style="width: 20%; text-align: center;">-</td></tr><tr><td>2. Net change by Change Orders</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>3. Current Contract Price (Line 1 + Line 2)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>5. Retainage</td><td></td><td></td></tr><tr><td> a. _____ X \$ - Work Completed</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td> b. _____ X \$ - Stored Materials</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td> c. Total Retainage (Line 5.a + Line 5.b)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>6. Amount eligible to date (Line 4 - Line 5.c)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>7. Less previous payments (Line 6 from prior application)</td><td></td><td></td></tr><tr><td>8. Amount due this application</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>9. Balance to finish, including retainage (Line 3 - Line 4)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr></table>		1. Original Contract Price	\$	-	2. Net change by Change Orders	\$	-	3. Current Contract Price (Line 1 + Line 2)	\$	-	4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-	5. Retainage			a. _____ X \$ - Work Completed	\$	-	b. _____ X \$ - Stored Materials	\$	-	c. Total Retainage (Line 5.a + Line 5.b)	\$	-	6. Amount eligible to date (Line 4 - Line 5.c)	\$	-	7. Less previous payments (Line 6 from prior application)			8. Amount due this application	\$	-	9. Balance to finish, including retainage (Line 3 - Line 4)	\$	-
1. Original Contract Price	\$	-																																			
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9. Balance to finish, including retainage (Line 3 - Line 4)	\$	-																																			
Contractor's Certification The undersigned Contractor certifies, to the best of its knowledge, the following: (1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment; (2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and (3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.																																					
Contractor: _____																																					
Signature: _____ Date: _____																																					
Recommended by Engineer By: _____ Title: _____ Date: _____	Approved by Owner By: _____ Title: _____ Date: _____																																				
Approved by Funding Agency By: _____ Title: _____ Date: _____	By: _____ Title: _____ Date: _____																																				

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____												Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____	
Application No.: _____		Application Period: From _____ to _____		Application Date: _____									
A	B	C	D	E	F	G	H	I	J	K	L		
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)		
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)						
Original Contract													
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Original Contract Totals					\$	-		\$	-	\$	-	\$	-

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner:		Owner's Project No.:	
Engineer:		Engineer's Project No.:	
Contractor:		Contractor's Project No.:	
Project:			
Contract:			

Application No.:		Application Period:	From		to		Application Date:	

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
Change Orders											
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Contractor's Application for Payment

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SECTION 00 63 63
CHANGE ORDER FORM

OWNER: CITY OF JEFFERSON

ENGINEER: CIVIL ENGINEERING CONSULTANTS, INC.

CONTRACTOR: _____

PROJECT: MIDDLE OCONEE PUMP STATION & GRAVITY SEWER

ORIGINAL AGREEMENT DATE: _____

ORIGINAL CONTRACT AMOUNT: _____

CHANGE ORDER DATE: _____

_____ is hereby directed to comply with the following additions and deductions to the above referenced Contract Plans and Specifications.

1.	<u>Additions / Deductions:</u>	Brief Description	
	Itemized Detail		\$ _____
	Itemized Detail		\$ _____
	Itemized Detail		\$ _____
	Subtotal Additions / Deductions:		\$ _____
2.	<u>Additions / Deductions:</u>	Brief Description	
	Itemized Detail		\$ _____
	Itemized Detail		\$ _____
	Itemized Detail		\$ _____
	Subtotal Additions / Deductions:		\$ _____
TOTAL CHANGE ORDER NO. ____			\$ _____

The **Contract Amount** shall be **increased / decreased** by \$_____, from \$_____ to \$_____. The **completion date** is **changed / unchanged**.

This Document will become a supplement to the Contract Documents and all provisions will apply hereto.

Requested By: OWNER
CITY OF JEFFERSON

Priscilla A. Murphy
City Manager

Date: _____

Recommended By: ENGINEER
CIVIL ENGINEERING CONSULTANTS, INC.

Andrew E. Lovejoy, P.E.
President

Date: _____

Accepted By: CONTRACTOR
Contractor Name Here

Contractor Contact Name
Title

Date: _____

SECTION 00 65 16
CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: City of Jefferson
Engineer: Civil Engineering Consultants, Inc.
Contractor:
Project: Middle Oconee Pump Station & Gravity Sewer
Engineer's Project No.: 24047

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

Date of Substantial Completion: _____, **as determined by Engineer**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

The following documents are attached to and made a part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer: Civil Engineering Consultants, Inc.

By
(signature):

Name
(printed): Andrew E. Lovejoy, P.E.

SECTION 00 65 20
FINAL LIEN WAIVER

TO: CITY OF JEFFERSON, GEORGIA

FROM: _____
(Contractor)

Re: Agreement between the City of Jefferson, Georgia and _____
(Contractor) dated _____, _____ for construction of the Middle Oconee Pump Station & Gravity Sewer project.

I hereby certify that all suppliers of materials, equipment and services, subcontractors, mechanics and laborers employed by _____ (contractor) or any of its subcontractors in Jackson County, Georgia have been paid and satisfied in full as of _____, and that there are no outstanding obligations or claims of any kind for the payment of which the City of Jefferson, Georgia on the above-named project might be liable, or subject to, in any lawful proceeding at law or in equity.

The undersigned is authorized by contractor to execute this document on contractor's behalf and has personal knowledge of the facts herein stated.

By: Authorized Officer or Agent

Date

Title of Authorized Officer or Agent

Printed Name of Authorized Officer or Agent

Subscribed and sworn before me on this

_____ day of _____, _____

Notary Public

My Commission Expires: _____

SECTION 00 72 00
GENERAL CONDITIONS

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ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

- A. Wherever used in the Bid 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 Bid 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 document prepared by Contractor, in a form acceptable to Engineer, to request 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. Bid Documents—The Bid Requirements, the proposed Contract Documents, and all Addenda.
 7. Bid 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; 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; 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.
 - 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.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. 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), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations 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 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. Electronic Document—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. Electronic Means—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.
22. Engineer—The individual or entity named as such in the Agreement.
23. 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.
24. 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.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. Laws and Regulations; Laws or Regulations—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. Liens—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. 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.
28. Notice of Award—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. 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.

30. 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.
31. Progress Schedule—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. 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.
33. Resident Project Representative—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. 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.
35. Schedule of Submittals—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.
36. 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.
37. 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.
38. 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 or areas furnished by Owner which are designated for the use of Contractor.
39. 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.
40. 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.
41. Submittal—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control

testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. 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 of such Work.
43. Successful Bidder—The Bidder to which the Owner makes an award of contract.
44. Supplementary Conditions—The part of the Contract that amends or supplements these General Conditions.
45. Supplier—A manufacturer, fabricator, supplier, distributor, 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.
46. Technical Data
 - a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. Underground Facilities—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. Unit Price Work—Work to be paid for on the basis of unit prices.
49. 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.
50. 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 Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bid Requirements or Contract Documents, have the indicated meaning.
- B. Intent of Certain Terms or Adjectives: 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: The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. Defective: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
1. does not conform to the Contract Documents.
 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. 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 Paragraph 15.04).
- E. Furnish, Install, Perform, Provide
1. The word "furnish," when used in connection with services, materials, or equipment, means 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, means 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, means 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. Contract Price or Contract Times: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.
- G. 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 Performance and Payment Bonds; Evidence of Insurance

- A. Performance and Payment Bonds: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. Evidence of Contractor's Insurance: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. Evidence of Owner's Insurance: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), 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 signed 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 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 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 the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will 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.
4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 Electronic Transmittals

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents 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 Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

- A. The Contract Documents are complementary; what is required by one Contract Document 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 versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will 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.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part

thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
2. 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.

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, means 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, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer 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 or Engineer 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 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 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 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 in writing 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.
- 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 notify Owner and Contractor in writing 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 versions, 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 precludes 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 30th 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 60th day after the day of Bid opening or the 30th 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 may 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 must 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 will 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 Contract Price or 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. Such an adjustment will 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 third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.
- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
 - 1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 - 2. Contractor shall not be entitled to an adjustment in Contract Price 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. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 - 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment.
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work.
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work.
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

- F. 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, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses 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.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing 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, or to improvements, structures, utilities, or similar facilities located at such adjacent lands 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 7.13, 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 in a court of competent jurisdiction; 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 will 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 of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 - 3. Technical Data contained in such reports and drawings.
- B. Underground Facilities: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. Reliance by Contractor on Technical Data: 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 Paragraph 1.01.A.46.b.
- D. Limitations of Other Data and Documents: 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.
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings.
 - 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 - 4. 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:
 - 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.

2. is of such a nature as to require a change in the Drawings or Specifications.
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 whether it is necessary for Owner to obtain 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; 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. Early Resumption of Work: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. Possible Price and Times Adjustments
 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, 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 subject to the provisions of Paragraphs 4.05.D and 4.05.E.
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.
 - 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 Bid 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 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, then any such adjustment will 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, 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.
- F. Underground Facilities; Hazardous Environmental Conditions: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 Underground Facilities

- A. Contractor's Responsibilities: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following is included in the Contract Price, and Contractor shall have full responsibility for:
 1. reviewing and checking all information and data regarding existing Underground Facilities at the Site.
 2. complying with applicable state and local utility damage prevention Laws and Regulations.
 3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction.
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. 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 on the Drawings, or was not shown or indicated on the Drawings 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), notify Owner and Engineer in writing regarding such Underground Facility.
- C. Engineer's Review: Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings or was not shown or indicated with reasonable accuracy.
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary, issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question.
 3. obtain any pertinent cost or schedule information from Contractor; 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
 4. 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. Early Resumption of Work: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. Possible Price and Times Adjustments
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, 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. 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.

- b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. 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, then any such adjustment will 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, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 - 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 Hazardous Environmental Conditions at Site

- A. Reports and Drawings: The Supplementary Conditions identify:
 - 1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - 2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; 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 on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. 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.
 - 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, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, 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. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- 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, 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 obligates 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 obligates 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 Contractor's obligations under the Contract. These bonds must 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 terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bid Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws

or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, 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 must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. 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.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

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. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages 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, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages 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, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. 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, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. 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.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain 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.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including

but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) 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 will be adjusted accordingly.
- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, 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 and Engineer.

6.03 Contractor's Insurance

- A. Required Insurance: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. General Provisions: The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required.
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater.
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, 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.
 - 4. apply with respect to the performance of the Work, whether such performance is 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; and
 - 5. include all necessary endorsements to support the stated requirements.

- C. Additional Insureds: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions.
 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds.
 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);
 4. not seek contribution from insurance maintained by the additional insured; and
 5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 Builder's Risk and Other 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 Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. Property Insurance for Facilities of Owner Where Work Will Occur: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. Property Insurance for Substantially Complete Facilities: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- 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 advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

- E. Insurance of Other Property; Additional Insurance: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. 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 6.04, it may do so at Contractor's expense.

6.05 Property Losses; Subrogation

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer 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.
 - 1. 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, risks, 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 individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater 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.
 - 2. None of the above waivers extends 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. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, 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, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
 - 1. 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 all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

- C. The waivers in this Paragraph 6.05 include the waiver of rights 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 insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract 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 fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 Receipt and Application of Property Insurance Proceeds

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 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 6.04 shall maintain such proceeds in a segregated account and 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, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 Contractor's Means and Methods of Construction

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 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 maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. 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 will 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.

7.04 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 must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will 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 must 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.

7.05 "Or Equals"

- A. Contractor's Request; Governing Criteria: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, 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 equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics.
 - 2) 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) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
 - b. Contractor certifies that if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item 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 will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding and may not be reversed through an appeal under any provision of the Contract.

- E. Treatment as a Substitution Request: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. Contractor's Request; Governing Criteria: Unless the specification or description of an item of equipment or material 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 equipment or material under the circumstances described below. To the extent possible such requests must 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 equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.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 equipment or material that Contractor seeks to furnish or use. The application:
 - a. will 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 the item specified; and
 - 3) be suited to the same use as the item 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 the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.

- d. will 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 will be final and binding and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 Concerning Subcontractors and Suppliers

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers 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 or Supplier 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 bid process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. 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 or Suppliers 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 or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, 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 or Supplier, whether initially or as a replacement, will 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 solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 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 an 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 will be disclosed 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.

7.09 Permits

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. 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.

7.10 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.

7.11 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. 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 is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written 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 written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 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.

7.13 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.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. 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.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.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).
- E. 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.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that 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.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. 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.
- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will 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.

7.14 Hazard Communication Programs

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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 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 by an emergency or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 Submittals

A. Shop Drawing and Sample Requirements

1. Before submitting a Shop Drawing or Sample, Contractor shall:

- a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
- b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal.
 - 2) 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
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must 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 Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

- B. Submittal Procedures for Shop Drawings and Samples: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. Shop Drawings
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must 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.C.
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.C.
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. Engineer's Review of Shop Drawings and Samples

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. 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, comply with the requirements of 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 will 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 or other appropriate Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 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, will 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 or Sample will 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.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

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 Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
 - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

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 is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, or improper modification, 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.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 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. The end of the correction period established in Paragraph 15.08.

8. Any inspection, test, or approval by others; or
 9. Any correction of defective Work by Owner.
- E. 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 will 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 losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage 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 will 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.

7.19 Delegation of Professional Design Services

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19.
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

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 third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. 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.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

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 for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, 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. 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 will 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, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will 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 or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- 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.
 - 1. 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 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 8.03.B.
 - 2. 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 Contractor.
- C. 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 will 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 (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 10.07. 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 Resident 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 the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 Engineer's Authority

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications, and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.
- E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 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.

10.06 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.

10.07 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, will 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 Contractor under 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 10.07 also apply to the Resident Project Representative, if any.

10.08 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 of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 Amending and Supplementing the Contract

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that 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, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in 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 11.05, (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 that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 Work Change Directives

- A. 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 11.07 regarding change of Contract Price.
- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 Field Orders

- A. 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.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 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. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work 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 must be performed under the applicable conditions of the Contract Documents.

- C. Nothing in this Paragraph 11.05 obligates 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.

11.06 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.C.2.

11.07 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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must 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).
 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 11.07.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 11.07.C).
- C. Contractor's Fee: When applicable, the Contractor's fee for overhead and profit will 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 will be 15 percent.
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 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 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.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 5 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 will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

- d. No fee will 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 of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
- f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 Change Proposal

- A. Purpose and Content: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.
- B. Change Proposal Procedures
 - 1. Submittal: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. Supporting Data: 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.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change Proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must 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.

3. Engineer's Initial Review: Engineer will advise Owner regarding the Change Proposal and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
 4. Engineer's Full Review and Action on the Change Proposal: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must 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.
 5. Binding Decision: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. 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 in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. Post-Completion: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 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 are subject 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.
 - 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; and
 - 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- 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 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, 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 will 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 will 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 will 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 will 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 will 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 will 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 will be incorporated in a Change Order or other written document 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. When needed 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 will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will 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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and

other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, 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, will 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will 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, which 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 will 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 or retained for services specifically related to the Work.
5. Other costs consisting of 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, 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.
 - 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

- c. Construction Equipment Rental
 - 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will 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 does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general 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. The cost of purchasing, renting, or furnishing small tools and hand tools.
3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
5. 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.
6. Expenses incurred in preparing and advancing Claims.
7. 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

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. Documentation and Audit: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

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 for any of the foregoing will be valid.
- C. Owner's Contingency Allowance: Contractor agrees that an Owner's 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 for Work covered by allowances, and the Contract Price will 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. Adjustments in Unit Price

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

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 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 with such procedures and programs 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 those costs incurred in connection with tests or inspections of covered Work will 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 will 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 will 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 written 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 will 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, 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 will 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 defective Work as required by Engineer, then Owner may, after 7 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 for 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.
2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) 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.
3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. 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.
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto.
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work.
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; 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 based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from 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 has occurred that would constitute a default by Contractor and therefore justify a termination for cause.
 - j. Liquidated or other 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; or
 - l. Other items entitle 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 will 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 will be treated as an amount due as determined by Paragraph 15.01.D.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 7 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 will 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 7 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 15.03.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 6.04 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 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must 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 duly pending Change Proposals and Claims; 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 Final Application and Recommendation of Payment: 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 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will 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. 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. Notice of Acceptability: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. 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 and issuance of notice of the acceptability of the Work.
- E. Final Payment Becomes Due: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 Waiver of Claims

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.
- 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 as a Claim 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 Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect 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 adjacent areas.
 - 2. correct such defective Work.
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, 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 from the corrective measures.

- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, 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 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). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. 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.
- E. 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.
- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to 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 directly attributable to any such suspension. Any Change Proposal seeking such adjustments must 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) 10 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) written 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 7 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 will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 Owner May Terminate for Convenience

- A. Upon 7 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 bid.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, 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 7 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, 7 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, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise 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.
 - 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 requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business.
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

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 will not constitute a waiver of that provision, nor will 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 of the Contract or 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 Assignment of Contract

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 Successors and Assigns

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 Headings

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

END OF SECTION

**SECTION 00 73 00
SUPPLEMENTARY CONDITIONS**

PART 1 GENERAL

1.1 SUPPLEMENTARY CONDITIONS

- A. The provisions of the Supplementary Conditions as described herein change, amend, or supplement the General Conditions and shall supersede any conflicting provisions of this CONTRACT. All provisions of the General Conditions which are not changed, amended, or supplemented, remain in full force.

1.2 INSURANCE

- A. The CONTRACTOR shall purchase and maintain such insurance as will protect it from claims set forth below which may arise out of, or result from, the Contractor's execution of the WORK, whether such execution be by the CONTRACTOR, any SUBCONTRACTOR, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:
1. Claims under workers' compensation, disability benefit and other similar employee benefit acts.
 2. Claims for damages because of bodily injury, occupational sickness or disease, or death of employees.
 3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than employees.
 4. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person.
 5. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting there from.
- B. Evidence of Contractor's Insurance: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. Evidence of Owner's Insurance: After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

1.3 CONFLICTS

- A. The General Conditions of the Contract shall govern in the event of any conflict with any other provisions of the Contract Documents unless notice to the contrary shall have been issued by the Owner. In the event of conflict, the Supplementary General Conditions control over the General Conditions and the Contract controls over the Supplementary and General Conditions. The Engineer has no authority to amend the General Conditions, orally or in writing, either expressly or by implication.
- B. The following principles shall govern the settlement of disputes which may arise over conflicts in the Contract Documents: (a) as between figures given on drawings and the scaled measurements, the figures shall govern; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings and specifications, the requirements of the specifications shall govern; and (d) as between the contract and the specifications, the requirements of the contract shall govern. Conflicts noted shall be reported to the Design Professional.

1.4 ACCEPTANCE AND FINAL PAYMENT

- A. When the work provided for under this CONTRACT shall have been completed by the Contractor, and all parts thereof have been approved by the ENGINEER according to the CONTRACT, the ENGINEER shall, within ten (10) days unless otherwise provided, make final inspection and advise the Contractor as to preparing a final estimate, showing the value of work as soon as the necessary measurements and computations can be made, all prior certificates or estimates upon which payments have been being made approximated only, and subject to correction in the final payment. The amount of the final estimates, less any sums that may have been deducted or retained under the provisions of this CONTRACT, will be paid to the Contractor within sixty (60) days after approval by the Engineer, provided that the Contractor has properly maintained and operated the PROJECT as specified under these Specifications, and provided, that it has furnished to the Owner a sworn affidavit in form satisfactory to Owner's attorney to the effect that all bills are paid and no suits are pending in connection with the work done or labor and material furnished under this CONTRACT.

1.5 SUBSURFACE AND PHYSICAL CONDITIONS

- A. No Geotechnical Investigation was conducted.
- B. All excavation is considered unclassified excavation.

1.6 CONTRACTOR'S WARRANTY

- A. The Contractor's warranty is as defined in the General Conditions.

1.7 BUILDING PERMITS

- A. No building permit required.

END OF SECTION

SECTION 00 73 16
STANDARD INSURANCE REQUIREMENTS

Prior to the Commencement of Work, the Contractor shall provide a Certificate of Insurance Indicating the Following Coverages and Liability Limits.

The following coverage must apply:

1. **General Liability Insurance (CGL):**

Commercial general liability on an occurrence coverage form. The limits of liability shall not be less than:

\$1,000,000 each occurrence (combined single limit for bodily injury and property damage).

\$1,000,000 for personal and advertising injury liability.

\$2,000,000 general aggregate.

\$2,000,000 aggregate on products and completed operations.

Liability policy shall name the Owner and all parties required by contract as additional insured using the additional insured endorsements **CG 2010 7 04 & CG 2037 7 04** or equivalent endorsements. These endorsements should be attached to the certificate of insurance. The additional insured coverage afforded will apply on a "primary and noncontributory" basis.

2. **Automobile Liability Insurance:**

\$1,000,000 Combined single limit each accident for bodily injury and property damage. Include coverage on all owned, hired, and non-owned automobiles.

3. **Umbrella/Excess Liability insurance:**

A minimum of \$2,000,000 each occurrence in excess of the liability insurance is required.

Additionally, the subcontractor shall maintain the coverage during the period of construction, and for two years following owner's acceptance of the project.

4. **Workers Compensation (Statutory) and Employer's Liability:**

\$1,000,000 each accident for bodily injury by accident.

\$1,000,000 each employee for bodily injury by disease.

\$1,000,000 policy limit for bodily injury by disease.

5. City of Jefferson (and any applicable Authority) should be shown as an additional insured on General Liability, Auto Liability and Umbrella Liability policies.

6. The cancellation should provide 10 days' notice for nonpayment and 30 days' notice of cancellation.

CITY OF JEFFERSON – MIDDLE OCONEE PUMP STATION & GRAVITY SEWER

**City of Jefferson
147 Athens Street
Jefferson, GA 30549**

Insurance Company should be licensed to do business by the Georgia Department of Insurance.

7. Certificates of Insurance, and any subsequent renewals, must reference specific proposal/contract by project name and project/proposal number.
8. All insurance coverages required to be provided by the Contractor will be primary over any insurance program carried by the CITY.
9. Contractor shall incorporate a copy of the insurance requirements as herein provided in each and every subcontract with each and every Subcontractor in any tier and shall require each and every Subcontractor of any tier to comply with all such requirements. Contractor agrees that if for any reason Subcontractor fails to procure and maintain insurance as required, all such required Insurance shall be procured and maintained by Contractor at Contractor's expense.
10. No Contractor or Subcontractor shall commence any work of any kind under this Contract until all insurance requirements contained in this Contract have been complied with.
11. The Contractor shall agree to waive all rights of subrogation against the COUNTY, its officers, officials, employees, and volunteers from losses arising from work performed by the contractor for the COUNTY.

END OF SECTION

ADDENDUM:

ADDENDUM DATE:

BID DATE:

Where an item on the original Plans and Specifications is amended, voided, or superseded by a modification contained in the **ADDENDUM**, the provisions of such item not specifically amended, voided, or superseded shall remain in effect.

GENERAL INFORMATION

CONTRACT TECHNICAL SPECIFICATIONS

CONTRACT DRAWINGS

CONTRACTOR QUESTIONS

Please acknowledge receipt of ADDENDUM NO. by initialing and providing company name in the spaces provided below to .

Thank you.

YES, _____, of _____
(Individual Name) (Company Name)

has received **ADDENDUM NO.** .

**SECTION 01 11 00
SUMMARY OF WORK**

PART 1 GENERAL

1.1 DESCRIPTION

- A. Work to be done under this Contract shall include the furnishing of all materials, equipment, labor and means of construction necessary for the construction of the City of Jefferson – MIDDLE OCONEE PUMP STATION & GRAVITY SEWER and all other work as shown on the Contract Drawings and/or as specified herein including.
- B. Work shall include clean-up and dress-up and all repair work necessary to restore pavement, lawns, and finished areas as closely as possible to their original condition following installation of the work.
- C. All work pertaining to any requirements contained herein shall be included in the overall bid submitted unless such cost is designated as a separate pay item in the Bid Schedule.
- D. Contractor shall be responsible for obtaining and paying for all necessary local and state licenses, permits and taxes.
- E. The Contractor will be required to deliver all equipment, pipe, valves, and other materials to the location of installation. Care shall be exercised in handling all materials and equipment, and the Contractor will be held responsible for all breakage or damage to same.

1.2 WORK AND MATERIALS BY THE OWNER

- A. The Owner will furnish all water for construction operations and for testing.
- B. The Contractor shall make his own arrangements to convey the water from the Owner's tap to points of construction.
- C. The Owner shall provide personnel to operate all necessary valves in existing system and will oversee all necessary taps and connections to existing lines made by the Contractor's personnel.

1.3 OR APPROVED EQUIVALENT CLAUSE

- A. Whenever a material or article required is specified or shown on the Contract Drawings by using the name of the proprietary product or of a particular manufacturer or vendor, any material or article which will meet design criteria and is equal in function and durability, as determined by the Engineer, will be considered acceptable.

1.4 COMPLIANCE OF WORK WITH SPECIFICATIONS

- A. The Contractor will be supplied with three sets of the Drawings and Specifications. Of these sets, one complete set shall always be available on the job site.
- B. Should any portion of the Drawings and/or Specifications be obscure or in dispute, it shall be referred to the Engineer and he shall decide as to the true meaning and intent. He shall have the right to correct errors and omissions at any time when those corrections are necessary for the proper fulfillment of the Drawings and Specifications.
- C. The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether or not the work performed, and materials used are in accord with the requirements and intent of the Specifications and Drawings. The Contractor shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Engineer and with other contractors in every way possible.
- D. The Contractor shall employ only competent and skilled personnel on the work. At all times when the work is in progress, the Contractor shall have a competent Superintendent or Foreman present with authority to receive orders, execute the work and to promptly supply materials, tools, plant equipment and labor as may be required. Should the Engineer so demand, the Contractor shall immediately remove any Superintendent, Foreman, or worker whom the Engineer considers incompetent, undesirable, or both.
- E. The Project Engineer shall be authorized to inspect all work done and all materials furnished, including the preparation, fabrication, and manufacture of the materials to be used. The Project Engineer shall be authorized to alter or waive the requirements of the Specifications. He may reject materials and suspend the work.
- F. No work shall be done, nor materials used without suitable supervision and/or inspection by the Engineer or his representative. Failure to reject defective work and/or materials shall not in any way preclude later rejection when that defect is discovered or obligate the Owner to final acceptance.
- G. Inspection of the work shall not relieve the Contractor of his obligation to fulfill his contract. Defective work shall be made good even if such work and/or materials have been previously inspected by the Engineer or his representative and accepted or included in an estimate for payment. All rejected work and/or materials shall immediately be removed and replaced with materials and work in accord with the Specifications and Drawings. If the Contractor fails to remove the defective work and/or materials within ten days after having been ordered to do so, the Owner shall have the right and authority to stop the Contractor and suspend the work at once and to supply personnel and material to remove and replace that defective work and/or materials at the expense of the Contractor.

1.5 CONFLICTING REQUIREMENTS

- A. In case of conflict between the requirements in the Technical Specifications, that requirement which is in compliance with all the applicable codes, and which is, in the opinion of the Engineer, more advantageous to the Owner, shall govern. This shall apply to all requirements indicated by the Technical Specifications of the Contract Documents.

1.6 EROSION CONTROL MONITORING

- A. The contractor shall comply with the requirements of the State of Georgia General NPDES Permit for Storm Water Discharges from Construction Activities, General Permit No. GAR 100000. The cost of the work from the Notice of Intent to the Notice of Termination and all other activities related to the Erosion and Sedimentation Control Program shall be included in the Lump Sum Bid Item for Erosion Control Monitoring in the Bid Schedule.

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 - GENERAL

1.1 SCOPE

- A. The General Contractor shall include with the bid price the following allowance items and amounts for this Contract.
- B. The Contractor will be reimbursed for labor, material, and equipment with a markup of 15%.
- C. Contractor will be reimbursed for subcontracted labor, material, and equipment with a markup of 5%.
- D. The Contractor shall cause work covered by these allowances to be performed for such amounts and by such persons as the Owner/Engineer may direct, but he will not be required to employ persons against whom he makes a reasonable objection.
- E. If the cost, when determined, is more than or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order.
- F. **Contractor is not entitled to overhead, profit and mark-up on allowance monies not spent.**

1.2 SCHEDULE OF ALLOWANCE ITEMS:

A. Power Connection Allowance

- 1. Bid Item 19 – Power Connection Allowance is the lump sum amount to be used for payment for any power company costs for the connection to the new pump station at the direction of the Owner and the Engineer which is not included in the other Bid Items on the Bid Form.
- 2. **Total Allowance - \$50,000**

B. SCADA Allowance

- 1. Bid Item 20 – SCADA Allowance is the lump sum amount to be used for payment for Work related to SCADA by City directed provided at the discretion and direction of the Owner and the Engineer which is not included in the other Bid Items on the Bid Form.
- 2. **Total Allowance - \$50,000**

C. Owner Contingency Allowance

- 1. Bid Item 21 – Owner Contingency Allowance is the lump sum amount to be used for payment for additional Work at the discretion and direction of the Owner and the Engineer which is not included in the other Bid Items on the Bid Form.
- 2. **Total Allowance - \$100,000**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

**SECTION 01 22 00
MEASUREMENT AND PAYMENT**

PART 1 GENERAL

1.1 SCOPE

- A. The Bid lists each item of the Project for which payment will be made. No payment will be made for any items other than those listed in the Bid.
- B. Required items of work and incidentals necessary for the satisfactory completion of the work which are not specifically listed in the Bid, and which are not specified in this Section to be measured or to be included in one of the items listed in the Bid, shall be considered as incidental to the work. All costs thereof, including Contractor's overhead costs and profit, shall be considered as included in the lump sum or unit prices bid for the various Bid items. The Contractor shall prepare the Bid accordingly.
- C. Work includes furnishing all labor, equipment, tools and materials, which are not furnished by the Owner and performing all operations required to complete the work satisfactorily, in place, as specified and as indicated on the Drawings.

1.2 DESCRIPTIONS

- A. Measurement of an item of work will be by the unit indicated in the Bid.
- B. Final payment quantities shall be determined from the record drawings. The record drawing lengths, dimensions, quantities, etc., shall be determined by a measurement by the Engineer for any Unit Price Bid items after the completion of all required work. The precision of final payment quantities shall match the precision shown for that item in the Bid.
- C. Payment will include all necessary and incidental related work not specified to be included in any other item of work listed in the Bid.
- D. Unless otherwise stated in individual Sections of the Specifications or in the Bid, no separate payment will be made for any item of work, materials, parts, equipment, supplies, or related items required to perform and complete the work. The costs for all such items required shall be included in the price bid for item of which it is a part.
- E. Payment will be made by extending unit prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all labor, equipment, tools, and materials not furnished by the Owner and for performing all operations required to provide to the Owner the entire Project, complete in place, as specified and as indicated on the Contract Drawings.

1.3 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS:

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. Material and equipment not properly stored.
6. Defective Work not accepted by Owner.
7. Material remaining on hand after completion of work.

1.4 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

- A. Partial Payment: No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings or preliminary operation and maintenance manuals are acceptable to Engineer.
- B. Final Payment: Will be made only for products incorporated in work; remaining products, for which partial payments have been made, shall revert to Contractor unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

1.5 CLEARING AND GRUBBING

- A. This work includes clearing, grubbing, removing and disposing of vegetation, buildings and debris within the entire Right-of Way and/or easement areas adjacent to the Right-of-Way as required for installation of sewer main.
- B. The cost of moving and re-establishing landscape features, including labor and materials, shall be included in the Unit Price for this Bid Item affected by the moving or relocation.
- C. No separate payment shall be made for Clearing and Grubbing. All costs shall be included in the Unit Price Bid for the item to which it pertains.

1.6 RESTORATION

- A. This work includes restoration of disturbed surface to grade, restoration of pavement, and restoration of miscellaneous items: curbing, curb and gutter sections, pedestrian walks, fencing, driveway surfacing, or other improvements are removed or in any way damaged or undermined to original condition.
- B. No separate payment shall be made for Restoration unless agreed to by Engineer. All costs shall be included in the Unit Price Bid for the item to which it pertains.

1.7 EROSION AND SEDIMENTATION CONTROL

A. General:

- 1. No separate payment shall be made for temporary and/or permanent erosion and sedimentation controls. All other temporary and/or permanent erosion and sedimentation control costs shall be included in the price bid for the item to which it pertains. When ordered by the Engineer, additional work or increases in the quantities of certain classes of work over those called out on the Drawings may be required. Quantities for payment shall be based upon actual quantity constructed and authorized by the Engineer.
- 2. No payment will be made for any portion of the Project for which temporary erosion and sedimentation controls are not properly maintained.

B. Construction Exits: All costs for construction exits, including installation, maintenance, repair, and removal shall be included in the Unit Price for this Bid Item.

C. Type Sensitive Silt Fence: All costs for reinforced silt fence, including installation, maintenance, repair, replacement, and removal shall be included in the Unit Price for this Bid Item. Each run of silt fence shall be counted; double row silt fence shall be counted as two feet for every linear foot of installation.

D. Tree Fence: All costs associated with the installation, maintenance, replacement, repair, and removal of the tree fence shall be included in the unit price for this bid item.

E. Separate Unit Bid Item is included for Silt Fence Removal. Upon completion of removal silt fencing, payment per Unit Bid Price will be made. Costs beyond this Unit Bid Price will be included in the Contractor's Unit Bid Price for Silt Fence as noted in the preceding paragraph.

F. Permanent Grassing:

- 1. No separate payment will be made for temporary grassing.

2. Payment shall be made only for the final permanent perennial grassing. All costs for grassing, including seed bed preparation, topsoiling, seeding, fertilizing, mulching as well as temporary measures, shall be included in the Unit Price for this Bid Item.
- G. Temporary Stream Crossings: All costs for temporary stream crossings, including all materials, installation, maintenance, repair, replacement, and removal shall be included in the Unit Price for this Bid Item. All pipe and stone required for each crossing shall be included in the Unit Price for this Bid Item.
- H. Erosion Control Monitoring: All costs for compliance with NPDES permit requirements including the employment of an Environmental Professional and payment of fees shall be included in the Unit Price for this Bid Item.

1.8 TRIPLEX SUBMERSIBLE PUMP STATION

- A. The Lump Sum Price for the 60-HP Triplex Pump Station shall include pump station, wetwell, force main, fittings, blocking, water service, erosion control measures and all work shown on the Contract Drawings at or around the pump station. Included in this Bid Item are the costs for pumping equipment and sales tax on pumping equipment.
- B. The Lump Sum Price for the 60-HP Duplex Pump Station includes 24-inch DIP gravity pipe at the pump station from and including 5-ft diameter manhole No. 1 upstream of the pump station indicated on the Drawings.
- C. Unit prices for 24-inch and 12-inch PVC C900 DR 18 gravity begin at Manhole No. 1 and continue upstream.
- D. The Lump Sum Price for the 60-HP Duplex Pump Station includes the 8-inch HDPE Force Main connection to the air release valve in manhole, doghouse valve vault and existing 8-inch D.I. force main indicated on the Drawings.
- E. Surface infrastructure including, but not limited to, the jib crane and diesel standby emergency pump shall be dark brown to blend into the landscape.
- F. The Lump Sum Price for the 60-HP Triplex Pump Station includes the water service extension from decommissioned McDonalds Lift Station to the new pump station.

1.9 PVC GRAVITY SEWER

- A. Gravity sewer which is to be paid for on a unit price basis will be measured for payment after installation based on the pipeline stationing as determined by the pipeline installation surveys, with all stations carefully measured.
- B. The measurement of each line or run of pipe of each size which is to be paid for on a Unit Price basis, will not include lengths occupied by manholes installed between the ends of each such line.

- C. Cut classification for gravity sewer shall be determined from the Construction Drawings unless the Contractor notifies the Engineer prior to installation of the pipe that the actual topographic conditions are different from what is shown on the Drawings to cause a change in cut classification. Upon such notification, the Engineer will make the necessary measurements to confirm or refute a discrepancy. However, no claim for additional payment will be allowed when a change in alignment or grade has been made without approval of the Engineer; and, in this case, or when no change in cut classification is confirmed, the Contractor shall pay to the Owner all additional costs incurred in making such a determination.

1.10 MANHOLES

- A. The price for manhole construction shall be divided into two prices. The price for manholes shall include the price for 4-foot base section, invert, casting and testing.
- B. The price for the riser shall be for the riser and transition section. Measurement for the riser shall be from the top of the 4-foot base section to the top of the manhole, including the transition section. The measurement computation will be by measuring the height from the top of the manhole to the invert (lowest point) and deducting 4.00 feet to account for the base coating shall be included in the price.

1.11 TRENCH EXCAVATION AND BACKFILL

- A. No separate or additional payment shall be made for any special or unique method, means, techniques or equipment necessary for the Contractor's compliance with these Specifications, regulatory requirements, permits, laws or regulations which govern this Project.
- B. Trench Excavation: No separate payment shall be made for trench excavation. All costs shall be included in the Unit Price for this Bid Item.
- C. Sheeting, Bracing and Shoring: No separate payment will be made for providing sheeting, bracing, shoring and timbering.
- D. Trench Rock Excavation: No separate payment will be made for trench rock excavation.
- E. Dewatering Excavations: All costs of equipment, labor and materials required for dewatering shall be included in the Unit Price for this Bid Item.

1.12 SITE UTILITIES

- A. Solid sleeves, fittings and piping necessary for connections to existing site utilities, if not shown on the Contract Drawings, shall be included in the Unit Price for that pipe associated with the connection. No payment will be made for fittings

provided due to the Contractor's sequence of construction, layout problems, tie-ins or repairs.

1.13 CASING PIPE

- A. Where casing pipe is to be shown as bored and jacked, the actual length of usable casing shall be paid for at the Unit Price bid. Casings which are bored offline, or off grade, and late abandoned, will not be paid for.
- B. Where casing pipe is to be shown as directionally drilled, the actual length of usable casing shall be paid for at the Unit Price bid. Casings which are directionally drilled offline, or off grade, and late abandoned, will not be paid for.

1.14 PIPE IN CASING

- A. Where a gravity sewer pipe is to be installed in a casing, it shall be paid for at the unit price bid for the 0-8' deep cut classification.
- B. Where a force main is to be installed in a casing, it shall be paid for at the unit price bid for force main.

1.15 MAINTENANCE OF TRAFFIC

- A. No separate payment shall be made for maintenance of traffic required for construction. All costs shall be included in the Unit Price for the associated Bid Item.

1.16 STABILIZATION STONE

- A. Where called for by the Engineer, stone, in addition to that required as bedding or sand cushion, shall be used to stabilize poor soil. The extent of stabilization stone shall be determined by the Engineer at the time when the stone is placed. Measurement will be on a volume basis and a unit stone weight of 100 pounds per cubic foot shall be used.

1.17 STAKING

- A. Owner shall provide Contractor electronic base file from which to stake proposed infrastructure.
- B. Contractor shall provide all staking including limits of disturbance, gravity sewer and force main. Surveying shall include staking proposed gravity sewer at each manhole and one intermediate point and construction limits once only. Surveyor will stake in increments of 1,000-LF of gravity sewer and force main ahead of construction or some mutually agreeable distance. Staking shall include offset and cut stakes.

- C. Any replacement stakes or other survey services shall be at the expense of the contractor.
- D. Staking shall be done 7-days prior to the construction of the sewer and stream restoration work to allow time for Owner and Engineer to verify locations or proposed utilities.
- E. Staking shall be done 7-days prior to the construction of the water main work to allow time for Owner and Engineer to verify locations or proposed utilities.

1.18 MCDONALDS LIFT STATION DECOMMISSIONING

- A. The Lump Sum Price for McDonalds Lift Station Decommissioning shall include all costs for removing and disposing of existing structures and equipment.
- B. The Lump Sum Price for McDonalds Lift Station Decommissioning shall include all costs necessary for temporary connections between McDonalds Lift Station and Middle Oconee Pump Station and shall include providing all required site dewatering.
- C. McDonalds Lift Station operations may not be interrupted during the construction of the new pump station without approval from the City of Jefferson.

1.19 POWER CONNECTION ALLOWANCE

- A. This Bid Item will include \$50,000 for any costs charged by the power company to transfer power to new station.

1.20 SCADA ALLOWANCE

- A. This Bid Item will include \$50,000 for SCADA equipment and commissioning.

1.21 OWNER CONTINGENCY ALLOWANCE

- A. This item shall be used for payment for additional Work performed at the discretion and direction of the Owner and the Engineer which is not included in the other Bid Items on the Bid Form. The Contingency or portion thereof shall not be paid to the Contractor except for additional work ordered in writing by the Engineer. A cost proposal for each item of additional work shall be prepared by the Contractor in accordance with the General Conditions for the Engineer's review as required by the General Conditions and other Sections of the Specifications. The total amount of Contingency funds paid to the Contractor shall be the total amount agreed to and ordered performed, which shall not necessarily be the total amount shown in the Bid Schedule.

END OF SECTION

**SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.1 PRE-CONSTRUCTION CONFERENCE

- A. The Engineer shall schedule the pre-construction conference prior to the issuance of the Notice to Proceed.
- B. Representatives of the following parties are to be in attendance at the meeting:
 - 1. Owner.
 - 2. Engineer.
 - 3. Contractor and superintendent.
 - 4. Major subcontractors.
 - 5. Representatives of governmental or regulatory agencies when appropriate.
- C. The agenda for the pre-construction conference shall consist of the following as a minimum:
 - 1. Distribute and discuss a list of major subcontractors and a tentative construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel and emergency telephone numbers.
 - 4. Processing of field decisions and change orders.
 - 5. Adequacy of distribution of Contract Documents.
 - 6. Schedule and submittal of shop drawings, product data and samples.
 - 7. Pay request format, submittal cutoff date, pay date and retainage.

1.2 COORDINATION WITH PROJECT ENGINEER

- A. During the course of work under this Contract, the Contractor shall be responsible for keeping the Project Engineer informed of his work schedule and of his requirements concerning staking and inspection as herein specified.
- B. In the event that any work subject to inspection or testing by the Project Engineer is installed without notification in time for such testing or inspection to be done, that work shall be subject to removal and replacement by the Contractor at no additional cost to the Owner.

- C. The Contractor shall not put workers on the job or perform any work on any portion of the project without prior knowledge of the Project Engineer that such work is to be done, the place of work, and the scheduled starting time. A minimum 24-hour notification to the Project Engineer is required.

1.3 PROGRESS MEETINGS

- A. Contractor shall schedule and hold periodic progress meetings at least every month just prior to submittal of the monthly partial payment request and at other times as requested by Engineer or required by progress of the work. Contractor, Engineer, and all Subcontractors active on the site shall be represented at each meeting. Contractor may at his discretion request attendance by representatives of his suppliers, manufacturers, and other Subcontractors.
- B. Contractor shall preside at the meetings and provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.
- C. The periodic progress meetings will generally have the following agenda:
 - 1. Review work progress since last meeting.
 - 2. Discussion of Construction Schedule for next period.
 - 3. Status of major equipment and material deliveries.
 - 4. Construction problems impacting progress.
 - 5. Field observations.
 - 6. Status of pending changes.
 - 7. Other business.

1.4 CONSTRUCTION SCHEDULE

- A. The Contractor shall submit to the Owner an Estimated Construction Progress Schedule immediately after execution and delivery of the Contract and before the first partial payment is made.
- B. The Schedule shall show the anticipated dates of commencement and completion of each of the various types of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the Progress Schedule.
- C. The construction costs employed in making up these Schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis of additions to or deductions from the Contract price.

1.5 PROJECT LAYOUT

- A. The Engineer will furnish the Contractor with a list of coordinates for the various project structures, as well as benchmark locations and elevations. The Contractor shall be responsible for verifying these elevations and locations and for laying out the Work.

1.6 SAFETY REQUIREMENTS

- A. All construction work on public rights-of-way shall be done in accordance with the rules and regulations of the agency having control. All safety equipment and markings shall be furnished by the Contractor.
- B. Work done on such rights-of-way shall be done only with the written consent of and in strict accordance with the Specifications of the right-of-way owner.
- C. It shall be the responsibility of the Contractor to notify the right-of-way owner's field engineer before doing any work within the right-of-way.
- D. All construction work shall be performed in accordance with established construction safety standards, and the Contractor shall be responsible for the safety of his employees and the public. All applicable local, state, and Federal regulations, including the Department of Labor, Occupational Safety and Health Administration, (OSHA), 29 CFR Part 1926, Subpart P, latest edition shall be adhered to by the Contractor.

END OF SECTION

**SECTION 01 33 00
SUBMITTAL PROCEDURES**

PART 1 GENERAL

1.1 SCOPE

- A. The work under this Section includes submittal to the Engineer of shop drawings, product data and samples required by the various Sections of these Specifications.
- B. Within 30 days after Notice to Proceed is issued, the Contractor shall review, approve, and submit one (1) electronic copy in PDF format of all shop drawings and/or manufacturers' descriptions sheets for all materials and/or equipment for the approval of the Engineer.

C. Definitions: Submittals are categorized as follows:

1. Shop Drawings:

- a. Shop drawings shall include technical data, drawings, diagrams, procedures and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements, and similar information as applicable to the specific item for which the shop drawing is prepared.
- b. Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detailed shop drawings. Show dimensions and note dimensions that are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the work without appropriate final "Action" markings by the Engineer.
- c. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, Specification Section, schedule or room numbers shown on the Contract Drawings.
- d. Minimum assembly drawings sheet size shall be 11 x 17-inches.
- e. Minimum detail sheet size shall be 8-1/2 x 11-inches.
- f. Minimum Scale:
 - 1. Civil / Site: 1-inch = 30 feet.
 - 2. All others: 1/4-inch = 1 foot.

2. Product Data:

- a. Product data includes standard printed information on materials, products, and systems, not specially prepared for this Project, other than the designation of selections from among available choices printed therein.
- b. Collect required data into one submittal for each unit of work or system and mark each copy to show which choices and options are applicable to the Project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements that have been checked and special coordination requirements.

3. Samples:

- a. Samples include both fabricated and un-fabricated physical examples of materials, products, and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.
- b. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide a full set of optional samples where the Engineer's selection is required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. Samples shall be submitted to the Engineer for review to confirm the color, pattern, texture and "kind". The Engineer will note "test" samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.
- c. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, Project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work but not processed as shop drawings, product data or samples.

1.2 SPECIFIC CATEGORY REQUIREMENTS

- A. General: Except as otherwise indicated in the individual work sections, comply with the general requirements specified herein for each indicated category of submittal. Submittals shall contain:
 1. The date of submittal and the dates of any previous submittals.

2. The Project title.
3. The submittal number as indicated as follows:
 - a. Submittal Identification and Packaging: Shop drawing submittals to the Engineer shall be numbered beginning with 1, with the applicable Specification Section in parenthesis after the submittal number. Should any submittal be returned for resubmittal, that resubmittal shall be numbered 1.1 and so on. The Contractor shall identify as an activity in the CPM schedule, all major equipment submittals as well as those involving complex reviews and long lead deliveries. Submittal schedule information shall be updated monthly with the Contractor's updated Project CPM schedule.
 - b. Contractor
 - c. Supplier
 - d. Manufacturer
4. Identification of the product, with the Specification Section number, permanent equipment tag numbers and applicable Drawing No.
5. Field dimensions clearly identified as such.
6. Relation to adjacent or critical features of the work or materials.
7. Applicable standards, such as ASTM or Federal specification numbers.
8. Notification to the Engineer in writing of any deviations to the requirements of the Contract Documents. The notification of deviation shall be clearly marked by the Contractor in the body of the submittal and stated in text in the Contractor's remarks on the transmittal document of the submittal. Indicate the reasons for the deviations and the benefits to the Project.
9. Identification of revisions on re-submittals.
10. An 8 x 3-inch blank space for Contractor and Engineer stamps.
11. A stamp, initialed or signed, certifying the Contractor's review of the submittal and indicating the submittal's status relative to the requirements of the Contract Documents.

1.3 ROUTING OF SUBMITTALS

A. Submittals and routine correspondence shall be routed as follows:

1. Supplier to Contractor (through representative if applicable)
2. Contractor to Engineer
3. Engineer to Contractor and Owner
4. Contractor to Supplier

1.4 SUBMITTAL LOG

- A. The submittal log shall be created by the Engineer and issued to the Contractor as the complete listing of submittals required for the Project.

PART 2 PRODUCTS

2.1 SHOP DRAWINGS

- A. Unless otherwise specifically directed by the Engineer, make all shop drawings accurately to scale and large enough and in sufficient detail to show all pertinent features of the submitted item and its method of connection to the work.
- B. Submit all shop drawings larger than 11" x 17" in the form of one clean black and white copy.

2.2 MANUFACTURER'S LITERATURE

- A. Where the content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Engineer's review.

2.3 SAMPLES

- A. Samples shall illustrate the material, workmanship and established standards by which completed work is judged.
- B. Unless otherwise specifically directed by the Engineer, all samples shall be made of and derived from the proposed product to be furnished.
- C. Submit the number of samples that are desired by the Contractor to be returned plus one sample, which will be retained by the Engineer on site. Samples shall be reviewed and comments, if any, returned to the Contractor electronically with the status of the submittal indicated.

2.4 COLORS

- A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.

- B. Submit the number of color and pattern charts that are desired by the Contractor to be returned plus three charts to be retained by the Engineer.
- C. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

PART 3 EXECUTION

3.1 CONTRACTOR'S COORDINATION OF SUBMITTALS

- A. Prior to submittal for the Engineer's review, the Contractor shall use all means necessary to fully coordinate all material and products, including the following procedures:
 - 1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
 - 2. Coordinate as required with all trades and all public agencies involved.
 - 3. Submit a written statement of review and certification of compliance with the requirements of all applicable technical Specifications as well as the requirements of this Section.
 - 4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents. Clearly mark the deviation in the body of the submittal and state the deviation on the transmittal form of the submittal. Describe the benefits and reasons for the deviation.
- B. Each shop drawing sheet and the cover page of all data shall bear the Contractor's stamp showing that the submittal has been fully reviewed. Shop drawings submitted to the Engineer without the Contractor's stamp will not be reviewed by the Engineer. The submittal will be returned to the Contractor for conformance with this requirement.
- C. The Owner, at its discretion, may charge the Contractor for the Engineer's review cost if more than two reviews of a submittal occur before a "No Exceptions Taken" status is achieved.

D. Packaging of Submittals:

1. Submittals shall be packaged. Submittals in packages shall be submitted simultaneously. Unless otherwise specifically permitted by the Engineer, make all submittals in packages containing all submittals indicated by the submittal log to be packaged together.
2. No review will be given to partial submittals or incomplete packages of submittals. It is the Contractor's responsibility to assemble the shop drawings for interconnecting and interdependent items, check them and then make one submittal to the Engineer along with Contractor's comments as to compliance, non-compliance or features requiring special attention.
3. The Engineer will provide the Contractor the list of packages with the submittal log.

- E. List of Submittals: The Engineer will create the submittal log and identify how the submittals are to be packaged. The Contractor may propose changes and supplements to the log.

3.2 TIMING OF SUBMITTALS

- A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and re-submittal, and for placing orders and securing delivery. Time lost due to unacceptable submittals shall be the Contractor's responsibility.
- B. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal.

3.3 REVIEWED SUBMITTALS

A. Engineer Review:

1. Allow 30 days for the Engineer's processing of each submittal, including re-submittals, requiring review and response, except allow longer periods for submittals needing coordination with subsequent submittals. The Engineer shall inform the Contractor promptly when it is determined that a submittal being processed must be held for coordination. Allow a minimum of two weeks for reprocessing each submittal requiring coordination.
2. Acceptable submittals with no review comment shall be marked "No Exceptions Taken".
3. Acceptable submittals with a minor comment or comments offered merely to alert the Contractor to some issue or provide information will be marked "No Exceptions Taken with Comment".

4. Submittals requiring minor corrections will be marked "Make Corrections Noted". The Contractor may order, fabricate and ship the products, provided the indicated corrections are made. A submittal with an "Make Corrections Noted" status must be re-submitted for review and marked "No Exceptions Taken" prior to installation or use of the submitted product.
 5. Submittals marked "Rejected" are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.
- B. No product shall be installed that does not have a corresponding submittal bearing a status of "No Exceptions Taken" or "No Exceptions Taken with Comment". The Contractor shall maintain at the job site a complete set of current submittals indicating the review status established by the Engineer.
- C. Substitutions: In the event the Contractor obtains the Engineer's approval for the use of products other than those which are listed first in the Contract Documents, the Contractor shall, at the Contractor's own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.

Use of the "No Exceptions Taken" notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Engineer's review shall not relieve the Contractor of responsibility for errors of any kind on the submittals. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.4 RE-SUBMISSION REQUIREMENTS

- A. Clearly mark and alert the Engineer to the presence of changes within the re-submittal that are other than those required by the Engineer's comments on the previous submittal.

END OF SECTION

**SECTION 01 40 00
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. Abbreviations used in the Contract Documents are defined as follows:

1. AASHTO	American Association State Highway and Transportation Officials
2. ACI	American Concrete Institute
3. AISC	American Iron and Steel Institute
4. ANSI	American National Standard Institute
5. ASTM	American Society for Testing and Materials
6. AWWA	American Water Works Association
7. CRSI	Concrete Reinforcing Steel Institute
8. Fed Spec	Federal Specifications
9. IBBM	Iron Body, Bronze-Mounted
10. IPS	Iron Pipe Size
11. MIL	Military Specification
12. NPT	National Pipe Thread
13. UL	Underwriter's Laboratories

1.2 DEFECTIVE WORK

A. All materials furnished and work done by the Contractor at any time during the progress of the work shall be subject to the inspection of the Engineer, who shall have full power to accept or reject any part thereof. The Contractor shall remedy any defective or unsatisfactory work or material at no additional cost to the Owner. In the event the Contractor fails to initiate corrections within 48 hours after written notice, the Engineer shall have full right to have same done and to bill the Contractor for cost thereof. Any condemned material must be removed from the work within 24 hours at no additional cost to the Owner.

1.3 COMPETENT LABOR

A. The Contractor shall employ only competent and skilled personnel on the work. Either the on-site project manager or the field superintendent, as listed in the Contractor's statement of qualifications, must be on site full time for the duration of the project. The on-site project manager or the field superintendent shall have the authority to receive orders and execute the Work. Should there be a change from the listed on-site project manager and/or field superintendent, the Contractor is to submit resume of proposed personnel to Engineer for approval.

1.4 TESTING AND INSPECTION

- A. Testing will be performed according to the procedures detailed for each portion of the utility system improvements. Payment for testing not specifically stated to be paid for by the Owner, is to be included in the construction costs proposed for the item to be tested.

END OF SECTION

**SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.1 SCOPE

- A. This Section includes requirements for the installation, maintenance and removal of temporary utilities, controls, facilities, and construction aids during construction.

1.2 SANITARY FACILITIES

- A. Contractor must provide portable toilet facilities during construction activities. The Contractor shall pay all costs for sanitary facilities.

1.3 PARKING AND WORK AREAS

- A. The Contractor must park equipment, construction, and private vehicles, in a safe manner off all travel lanes, if possible.

1.4 EROSION CONTROL

- A. The Contractor shall comply with the requirements of the State of Georgia General NPDES Permit for Storm Water Discharges from Construction Activities, General Permit No. GAR100002. The cost of the work from the Notice of Intent to the Notice of Termination and all other activities related to the Erosion and Sedimentation Control Program shall be included in the overall cost of the project. No separate payment will be made for this work.
- B. All erosion and sedimentation control measures and Best Management Practices (BMPs) must be in conformance to the State of Georgia Erosion and Sedimentation Control Act of 1975, as currently amended. All erosion and sedimentation control measures must be installed in accordance with the Manual for Erosion and Sedimentation Control in Georgia, as currently amended.
- C. At a minimum the General Permit includes having BMP plan on site, initial inspection for BMP record keeping, rain measurement, repairs, etc.
- D. Contractor is responsible for all sampling in order to comply with the General Permit.
- E. All Erosion and Sedimentation control measures must be installed prior to initiation of construction activity.

1.5 TEMPORARY UTILITIES

- A. Potable Water: Potable water will be available from the Owner for drinking from a cooler, etc. Contractor shall pay for all costs to transfer water from source to point of use.
- B. Telephone: Telephone service is not available from the Owner. Contractor shall pay all costs to establish a separate telephone service.
- C. Internet: Contractor must maintain an e-mail account over the duration of the contract.

1.6 DUST CONTROL

- A. The Contractor shall provide dust control at all times, including holidays and weekends, as required to abate dust nuisance on and about the site which is a result of construction activities. Dust control shall be by means of sprinklered water or by other approved methods, except that chemicals, oil, or similar palliatives shall not be used.
- B. Quantities and equipment for dust control shall be sufficient to effectively prevent dust nuisance on and about the jobsite; and when weather conditions warrant, sprinklering equipment shall be on hand at all times for immediate availability.
- C. The Engineer shall have authority to order dust control work whenever conditions warrant, and there shall be no additional cost to the Owner, therefore. Dust control shall be effectively maintained whether or not the Engineer orders such work.
- D. Complaints from the public shall be reported to the Engineer and shall be acted on immediately.
- E. Where earthwork operations are in progress, keep exposed earth surfaces dampened continuously. Also, keep dirt access ways and roads dampened continuously.
- F. If portions of the site are temporarily inactive or abandoned for whatever reason, provide dust control and abatement continuously during such periods of inactivity.
- G. Where dust resulting from construction activities has collected on public sidewalks and streets, hose down such sidewalks and streets to abate flying dust particles. Clean all sidewalks and streets from accumulated dirt and dust.

1.7 MUD CONTROL

- A. The Contractor shall take measures to prevent tracking of mud onto public streets, drives, and sidewalks.
- B. All egress from the site shall be maintained in a dry condition, and any mud tracked onto streets, sidewalks, or drives shall be immediately removed, and the affected area shall be cleaned. The Engineer may order such work at any time the conditions warrant.
- C. Where trucks will leave a muddy site and enter paved road surfaces, the Contractor shall maintain a suitable truck wheel-washing facility and crew. All trucks, or other vehicles leaving the site, shall be cleaned of mud and dirt, including mud and dirt clinging to exterior body surfaces of vehicles.
- D. All trucks coming to the jobsite or leaving the jobsite with materials or loose debris shall be loaded in a manner that will prevent dropping of materials or debris on streets. Spillage resulting from hauling operations along or across any public travel way shall be removed immediately.

1.8 EXISTING WASTEWATER MANAGEMENT

- A. Bypassing of raw wastewater onto the ground or into a receiving stream is prohibited.

END OF SECTION

**SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL

1.1 GUARANTEE OF WORK

- A. All work shall be guaranteed against defects in workmanship and material for a period of one year after the date of acceptance by the Owner.

1.2 PUNCH LIST

- A. The Engineer and Owner will perform a Punch List inspection after Substantial Completion.
- B. The punch list is the basis for establishing Final Completion for the Work. The schedule for completing and/or correcting punch list activities shall be no longer than 30 consecutive calendar days for intermediate milestones and 60 consecutive calendar days for final contract completion but shall be scheduled to conclude on or before the contract completion date and it shall be initiated immediately upon Substantial Completion. The overall Contract duration is based upon a 60-day period following the contractual date for Substantial Completion to establish the contractual date for Final Completion. Later delivery of Substantial Completion shall not revise the Final Acceptance date. Assessment of liquidated damages for late Substantial Completion shall not relieve assessment of liquidated damages for Final Acceptance should Final Acceptance be established beyond the contractual completion date.

1.3 PROJECT RECORD DRAWINGS

- A. Project Record Drawings shall be submitted to the Engineer prior to Final Acceptance for Payment.
- B. Legibly make drawings to record actual construction including, but not limited to:
 - 1. Measured horizontal and vertical locations of underground utilities
 - 2. Field changes of dimensions and details
 - 3. Details not on original Contract Drawings
 - 4. Marker Ball Information

END OF SECTION

**SECTION 01 78 23
OPERATING AND MAINTENANCE DATA**

PART 1 GENERAL

1.1 SCOPE

- A. The Contractor shall provide one (1) electronic copy in PDF format of a complete and comprehensive reference manual containing operating and maintenance data to enable operators and plant engineers to correctly operate, service, and maintain all equipment and accessories covered by these Specifications. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instruction, maintenance procedures, calibration procedures and safety precautions and procedures for the equipment involved. Safety precautions and procedures shall be stressed.

1.2 RELATED SECTIONS

- A. Section 26 00 00 Electrical
- B. Section 33 32 00 Wastewater Utility Pumping Station
- C. Section 33 32 01 Emergency Standby Pump
- D. Section 33 35 00 Valves and Appurtenances

PART 2 PRODUCTS

2.1 SUBMITTAL

- A. The Contractor shall submit, for the Engineer's approval, one electronic copy in PDF format of the data reference manual with all specified material before the Work covered by these Contract Documents is 50 percent complete. Before the Work is 80 percent complete, the Contractor shall submit one electronic copy in PDF format of each manual, complete in detail as specified below. The Engineer will notify the Contractor, in writing, of any deficiencies in the manual and will return the manual for completion and/or correction. The Contractor shall submit one electronic copy in PDF format of any revised or additional data required to complete the manual or as required by the Engineer.

1. Submittal shall include:

- a. The date of submission and the dates of any previous submissions.
- b. The Project Title: City of Cumming – Spot Road Station, Gravity Sewer and Force Main

- c. Numerical submittal numbers, starting with 1.90, 2.90, etc. Revisions to be numbered 1.91, 1.92, etc.
 - d. The names of: Contractor, Supplier & Manufacturer
 - e. Identification of the product, with the Specification section number, permanent equipment tag numbers and applicable Drawing Number.
- B. At the time of the inspection for Project completion, the Engineer will notify the Contractor of any revisions, corrections or incomplete data required for the satisfactory completion of the Operating and Maintenance Manual. The Engineer will not recommend final acceptance of the Work until the Operating and Maintenance Manual is complete and satisfactory to the Engineer.

2.2 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

- A. A complete, detailed listing of all equipment, components and accessories showing component name, manufacturer, model number and quantity information shall be furnished for each component as outlined below:
- 1. Equipment function, normal operating characteristics and limiting conditions for all equipment furnished.
 - 2. Detailed assembly, installation, alignment, adjustment and checking instructions for all equipment furnished.
 - 3. Detailed operating instructions for start-up, calibration, routine and normal operation, regulation and control, shutdown and emergency conditions for all equipment furnished.
 - 4. Detailed lubrication instructions and schedules for all equipment furnished including identification of lubricant (description, specification and trade name of at least two (2) manufacturers), and diagrams illustrating lubrication points.
 - 5. Detailed guide to "troubleshooting" for all equipment furnished.
 - 6. Detailed parts lists identified by generic title, materials of construction and part number (actual manufacturer's number, not supplier's) list of recommended spare parts identified as specified above, and predicted life of parts subject to wear, and an exploded view of each equipment assembly for all equipment furnished.
 - 7. Detailed disassembly, overhaul and reassembly instructions for all equipment furnished.

8. Electrical and instrumentation schematics for all equipment furnished, including motor control centers, control panels, instrument panels and analyzer panels.
9. List of all special tools supplied and description of their use for all equipment furnished. Special tools include any tool not normally available in an industrial hardware or mill supply house.
10. Detailed preventative maintenance procedures and schedules for all equipment furnished.
11. Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valve, rupture discs, etc.
12. One (1) copy of all record shop drawings and engineer data for all equipment furnished.
13. Performance and characteristic operating curves for all equipment furnished.
14. List of names and addresses of nearest service centers for parts, overhaul and service.
15. One (1) copy of any instructions and parts list attached to equipment when delivered.
16. Procedures for storing, handling, and disposing of any chemicals or products used with the equipment or system.
17. The supplier's operation and maintenance information will address the particular equipment furnished, with specific details on operation and maintenance practices. General data is not acceptable.

PART 3 EXECUTION

3.1 ASSEMBLY OF OPERATING AND MAINTENANCE MANUAL

- A. Each copy of the manual shall be assembled in one or more loose leaf binders, each with title page, typed table of contents, typed list of tables, typed list of figures, and heavy section dividers with reinforced holes and numbered plastic index tabs. Binders shall be 3-ring, hardback type, with transparent vinyl pocket front cover suitable for inserting identifying cover and with a transparent vinyl pocket on the spine for label. All data shall be punched for binding; composition and printing shall be arranged so that punching does not obliterate any data. The cover and binding edge of each manual shall have the project title, specification division number and title, and manual title printed thereon, all as approved by the Engineer.

- B. All copies of shop drawings, figures and diagrams shall be reduced to either 8-1/2 x 11-inches, or to 11-inches in the vertical dimension and as near as practical to 17-inches in the horizontal dimensions. Such sheets shall be folded to 8-1/2 x 11-inches. The manual and other data shall be printed on first quality paper, 8-1/2 x 11-inch size with standard 3-hole punching. Binders shall be labeled Vol. 1, Vol. 2, etc., where more than one is required. The table of contents for the entire set, identified by volume number, shall appear in each binder. Text, figures and drawings shall be clearly legible and suitable for dry process reproductions.
- C. No separate payment will be made for the Operating and Maintenance Manual and the cost of said manual shall be included in the Contract Price.

END OF SECTION

**SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES**

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 03 30 00 Cast-In-Place Concrete

PART 2 PRODUCTS

2.1 CONCRETE FORMS

- A. Forms shall be of plywood or of tongue-and-groove lumber and shall be of grade and type suitable to obtain the finish required. Forms constructed of tongue-and-groove lumber shall be lined when used for exposed surfaces. Form lining, where used, shall be of tempered fiberboard of not less than 1/8-inch thickness. Metal forms, and other types of manufactured forms, shall not be used unless their use has been authorized by the Engineer. Form ties shall be of the cone nut threaded rod, or standard snap-tie type, and designed so that when removed no metal will be left closer than 1-inch from the finished wall face. The cavities left in faces of concrete work by removal of form ties shall be pointed-up with non-staining, non-shrink mortar. Form ties shall have a working strength of not less than 3,000 lbs. when fully assembled and shall be as approved by the Engineer.
- B. Concrete form release shall be a non-residual, non-staining chemical type form release such as EZ Strip or Debond Form Locating, as manufactured by L & M Construction Chemicals, Inc., or approved equal.
- C. Concrete curing agent shall be DRESS & SEAL, as manufactured by L & M Construction Chemicals, Inc., or approved equal.
- D. Concrete hardening agent shall be SEAL HARD, as manufactured by L & M Construction Chemicals, Inc., or approved equal.
- E. Water shall be fresh, clean, and free from injurious amounts of oil, acid and alkali.
- F. Water reducing agents, such as Boral SP, shall be used in all walls to reduce potential for honeycomb areas. The water reducing agents shall be used in accordance with the manufacturer's recommendations.

2.2 FORM TIES

- A. Form ties shall be of the removable end, permanently embedded body type and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders.

PART 3 EXECUTION

3.1 FORM WORK

- A. Before concrete is placed, forms shall be thoroughly cleaned and coated with a non-staining form release agent, such as EZ Strip or Debond Form Coating, as manufactured by L & M Construction Chemicals, or other approved equal.
- B. Where concrete is placed against gravel or crushed rock which does not contain at least 25% material passing a No. 4 sieve, such surfaces shall be covered with polyethylene film to protect the concrete from loss of water. Joints in the film shall be lapped at least 4".
- C. Form work shall be constructed, braced, and removed in accord with the following:
 - 1. Form work shall be built to conform to the shape, lines, and dimensions of the concrete work. Forms shall be set to line and grade, and shall be braced, tied and secured in a manner which will withstand placing of the concrete, and which will maintain shape and position. Forms shall be tight and be substantially assembled to prevent bulging and the leaking of concrete. Joints shall be arranged vertically or horizontally. Temporary openings shall be arranged, where required, at the bottoms of wall forms and elsewhere, to facilitate cleaning and inspecting. Lumber used once in forms shall have nails removed, and surfaces in contact with concrete work thoroughly cleaned, before re-use. Wall sleeves, inserts, and openings shall be properly set in form work.
 - 2. Shores shall be used where necessary. If adequate foundations for shores cannot be obtained, trussed supports shall be provided. Structural members, and other work, which will be subject to additional loads during construction, shall be adequately shored to protect that work from distortion and damage.

3. Forms shall not be removed until the member supported thereby has acquired sufficient strength to safely support its own weight, and the load imposed on it. Tie rod clamps shall be loosened 24 hours after concrete has been placed. Standard snap ties shall be removed when forms are stripped; care shall be taken to avoid spoiling concrete surface. Cutting ties back from the face of the wall will not be permitted. Under normal conditions, the time elapsing before the forms may be stripped shall be not less than that shown in the following schedule: the use of the schedule shall not relieve the Contractor from his responsibility for the safety of the structure. Wood forms shall be completely removed from all portions of the work so that no material will remain for termite infestation.
 - a. Slabs: 14 Days
 - b. Columns and Pedestals: 7 Days
 - c. Walls and Vertical Faces Not Supporting Other Work: 2 Days

3.2 EDGES AND CORNERS

- A. Chamfer strips shall be placed in forms to bevel all salient edges and corners except the top edges of walls and slabs which are to be tooled and edges which are to be buried. Unless otherwise noted, bevels shall be 3/4" wide.

3.3 FORM REMOVAL

- A. Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead and live loads. Care shall be taken in form removal to avoid surface gouging, corner or edge breakage, and other damage to the concrete.

END OF SECTION

**SECTION 03 20 00
CONCRETE REINFORCING**

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 01 33 00 Submittals Procedures
- B. Section 03 10 00 Concrete Forming and Accessories
- C. Section 03 30 00 Cast-In-Place Concrete

1.2 SCOPE

- A. The work covered by this Section of Specifications consists of furnishing all materials and equipment and performing all labor necessary for furnishing and installing all reinforcing steel, as indicated on the Drawings, as specified, and as required for completion of all work under this Contract.

1.3 SUBMITTALS

- A. The Contractor shall furnish to the Engineer, for checking and approval, seven (7) copies of bending and placing details for steel bar reinforcing which shall show bar size, spacing, bending and tagging identification. No manufacture or fabrication shall commence until such drawings have been approved.

PART 2 PRODUCTS

2.1 REINFORCING STEEL

- A. Bar reinforcement shall be furnished by domestic steel mills.
- B. Steel bar reinforcement shall conform to the requirements of ASTM A615-75, (Grade 60), as amended to date, subject to the following restrictions:
 - 1. Billet Steel: Billet steel shall be made by the open-hearth process.
 - 2. Cold Twisted Bars: The use of cold twisted bars will not be permitted.
 - 3. Test Specimens: Test specimens shall be a minimum of 48 inches.
 - 4. Deformed Bars: Steel bar reinforcement shall be of an approved deformed type, such that a mechanical bond will be provided between concrete and steel at frequent intervals.

- C. Steel bar reinforcement shall be cold bent to shapes indicated on the Drawings. Bending shall be done in the shop before shipment unless otherwise specified. Bending details for steel bar reinforcement shall conform to the requirements of the ACI Building Code (ACI-318-83) unless otherwise indicated on the Drawings or specified. Steel bar reinforcement shall be bent, bundled, and tagged in accordance with details furnished by the fabricator.
- D. Steel bar reinforcement shall be furnished full length unless otherwise indicated on the Drawings or approved by the Engineer. Splices, where permitted, shall be well distributed or located at points of low tensile stress. Splices and dowels, except when used in cantilever wall or slab construction shall lap not less than 30 times the diameter of the bar. Splices and dowels used in cantilever wall or slab construction shall lap 40 diameters. Splices in horizontal reinforcement shall be staggered. The minimum clear distance between spliced bars, except when bar clamps are specified, shall be 1-1/2 bar diameters, but in no case less than 1-inch, nor less than 1-1/2 times the maximum size of coarse aggregate.
- E. Hooks of 180 degrees shall have a radius of bend on the axis of the bar of not less than three bar diameters plus an extension of four bar diameters at the free end. Hooks of 90 degrees shall have a radius of bend on the axis of the bar of not less than four bar diameters plus an extension of twelve bar diameters at the free end.
- F. Openings 12-inches and larger through concrete walls and slabs shall have a minimum of 8 extra diagonal bars in each face of the wall or slab of the same size as the largest bar in the wall or slab. The length of extra diagonal bars at openings shall be as shown on the Drawings, or as directed by the Engineer.
- G. Concrete walls, slabs, and other concrete work shown on the Drawings to have no reinforcing, shall have a minimum area of steel bar reinforcing equal to 0.003 times the cross-sectional area of the concrete work.

PART 3 EXECUTION

3.1 STEEL BAR REINFORCEMENT

- A. Steel bar reinforcement shall be placed in the locations shown on the Drawings and held securely in place during the placing of concrete. The pushing of short bars into new concrete work will not be permitted. Bar reinforcing in walls shall be spaced the proper distance from the face of the wall by the use of approved precast concrete mortar blocks. Bar reinforcing in slabs or beams shall be spaced the proper distance from the bottom of the slabs or beams by use of approved precast concrete mortar blocks or stainless steel chairs. Vertical stirrups shall always pass around main tension members and be securely attached thereto. Bar spacing, covering, minimum clearance, bond and anchorage shall conform to the requirements of the ACI Building Code (ACI-318-83), as amended to date, except as otherwise indicated on the Drawings or specified.

- B. Steel bar reinforcing, when properly placed, shall be securely wired together at intersections with 18-gauge black annealed wire. Prior to the placing of concrete, all mortar and other foreign matter which may reduce or destroy bond shall be removed from the reinforcement. No concrete shall be deposited until the placement of the reinforcing has been approved by the Engineer.
- C. Steel reinforcement shall be stored above the surface of the ground upon platforms, skids, or other supports, and shall be protected as far as practicable from mechanical injury and surface deterioration. When placed in the work, it shall be free from rust, dirt, scale, paint, oil, or other foreign matter which may reduce or destroy bond.

END OF SECTION

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 01 33 00 Submittal Procedures
- B. Section 03 10 00 Concrete Forming and Accessories
- C. Section 03 20 00 Concrete Reinforcing

1.2 SCOPE

- A. The work covered by this Section consists of furnishing all materials and equipment and performing all labor necessary for the complete construction of all cast-in-place concrete work as shown on the Contract Drawings and as specified.
- B. The work shall include the installation of all sleeves, inserts, piping, hangers, anchors, frames, and all other items to be built into the concrete work and all other work and appurtenances, for proper execution of the work.
- C. All items of work shall be inspected and approved by the Engineer before any concrete is placed.

1.3 GENERAL REQUIREMENTS

- A. Concrete shall be composed of cement, fine aggregate, coarse aggregate, and water proportioned and mixed to produce a plastic workable mix in accord with the requirements of this Section.
- B. Concrete shall be classified as Class "A" or "B"; shall have normal setting characteristics; shall have 28-day compressive strengths (two-cylinder average strength) not less than those listed below. High early strength cement may be used under special conditions and its use must be approved by the Engineer. Concrete containing high early cement shall have a 7-day compressive strength not less than those listed below.
 - 1. Class "A" concrete shall have a compressive strength of not less than 4,000 psi and shall be used for all reinforced concrete work, unless otherwise indicated.
 - 2. Class "B" concrete shall have a compressive strength of not less than 3,000 psi and shall be used for concrete duct bank, pipe thrust block and all other work as indicated on the Drawings.
- C. Concrete shall comply with all provisions of ACI 350-01, or latest edition.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Admixture shall be added to Class "A" and Class "B". The admixture shall be Master Builders' "Pozzolith", or approved equal, and shall be added in accord with the admixture manufacturer's printed instructions. A standard dispenser shall be used to introduce the admixture into the mix, and the services of the admixture manufacturer's representative to install and establish the operation of the dispenser shall be furnished by the Contractor. Plasticizing agents or other moisture reducing agents should be used to increase concrete workability for low W/C ratio mixes. Air-entraining admixtures shall conform to "Specification for Air-Entraining Admixtures for Concrete", ASTM C260.
- B. Fine aggregate shall be natural and consisting of hard, strong, durable, and uncoated particles having fineness modulus of not less than 2.30 nor more than 3.00; variation in fineness modulus shall be limited to +0.20 from the average of all tests. Aggregate shall satisfy the requirements of Federal Specifications SS-A-281b, Class 1, Grade A, or ASTM C33, and have gradation as follows:

<u>Sieve Size</u>	<u>Percent Passing, By Weight</u>
No. 4 Sieve	94 to 100
No. 16 Sieve	50 to 85
No. 50 Sieve	10 to 30
No. 100 Sieve	2 to 10

- C. Coarse aggregate shall be washed gravel or crushed stone consisting of hard, strong, durable, and uncoated particles, and shall contain neither vegetable matter nor soft, friable, thin, and elongated particles in quantities considered deleterious by the Engineer. Coarse aggregate shall satisfy the requirements of Federal Specifications SS-A-281b, Class 2, Grade A, or ASTM C33; and have gradation as follows:

<u>Sieve Size</u>	<u>Percent Passing, By Weight</u>
1 to 1/2" Sieve	100
1" Sieve	95 to 100
2" Sieve	25 to 60
No. 4 Sieve	0 to 10
No. 8 Sieve	0 to 5

- D. Cement shall satisfy the requirements of ASTM C150; cement for normal Class "A" and "B" concrete shall be Type IA or IIA; cement for high early strength Class "A" concrete shall be Type IIIA. Type III cement shall be used only if its use is approved by the Engineer. In lieu of Type IA, IIA or IIA cement, Type I, II or III cement may be used with approved air entrainment add mixtures as specified below.
- E. Ground granulated blast-furnace slag shall not be used in Class "A" concrete.

2.2 LIMITING REQUIREMENTS FOR CLASS "A" AND CLASS "B"

- A. Total Water Content for Class "A": Total water content of concrete shall not exceed 5.40 gallons of water per hundred pounds of cement in the mix, i.e., W/C less than 0.45 by weight.
- B. Slump for Class "A" and Class "B": Concrete slump shall be kept as low as possible consistent with proper handling and thorough compaction. Unless otherwise authorized by the Engineer, slump shall not exceed 4", before the addition of admixtures.
- C. Air-Entrainment for Class "A": The minimum air-entrainment shall be 5 percent, plus or minus 1 percent.
- D. Total Water Content for Class "B": The total water content of concrete shall not exceed 6.90 gallons of water per hundred pounds of cement in the mix, i.e., water content less than 0.57 by weight.

2.3 DESIGN MIX

- A. Design mix for each classification of concrete to be used in the work shall be prepared and tested by the independent, commercial, testing laboratory selected by the Contractor and approved by the Engineer for the testing of materials. Design mix shall be on the basis of 95% of 28-day two-cylinder averages being greater than the required design strength. The design mix shall be prepared using samples of the cement, admixture (if required), and the aggregates to be used in the work. Not fewer than eight (8) cylinders shall be made from the design mix for each classification of concrete; two (2) shall be tested at 7 days, two (2) tested at 14 days, two (2) tested at 28 days and two (2) shall be tested at 56 days. Cylinders shall be made and tested in accord with ASTM C31 and C39.
- B. If the design mix, based on trial batches, does not have sufficient data to establish a standard deviation, it shall not be considered acceptable if the concrete resulting from the design mix does not produce an average 28-day compressive strength at least 1,200 psi higher than specified for Class A concrete.

2.4 PROPORTIONING

- A. Proportioning of material shall be accomplished in a manner which will produce a workable mixture having a slump within the required limits and having minimum water content.

- B. The exact portion of materials to be used in concrete shall be as determined by the Laboratory Design Mix, and as directed by the Engineer. The equipment necessary to positively determine and control actual amounts of materials entering into the concrete shall be furnished by the Contractor. The proportions of materials used in the mix shall be changed whenever, in the opinion of the Engineer, a change is necessary to obtain the required strength and the desired density for uniformity and workability. In structures intended to be watertight, good workability will be considered to be of primary importance.
- C. All materials shall be measured by weight, except for water, which may be measured by volume. One (1) bag of Portland cement shall be considered to weigh 94 lbs., and one (1) gallon of water to weigh 8.33 lbs.
- D. Cement content for each class of concrete shall be as follows and each cubic yard of concrete shall contain not less than the following quantities:

Class "A"	_____	564 lbs. (6 Bags)
Class "B"	_____	520 lbs. (5.53 Bags)

- E. In calculating the total water content of mixes, the amount of water borne on the surfaces of the aggregate particles shall be included. The amount of water to be used in the mix shall, in all cases, be the least amount necessary to produce a plastic mix having the required strength and the desired density, uniformity, workability, and characteristics within the required slump limits.
- F. The total volume of aggregates to be used in each cubic yard of concrete, and the proportion of fine aggregate to coarse aggregate, shall be that necessary to produce a dense mixture having the required workability, as determined by the Laboratory Design Mix, and as directed by the Engineer.

PART 3 EXECUTION

3.1 MIXING

- A. Concrete may be proportioned and mixed by the Contractor on the job site or may be proportioned and mixed at a central plant.
- B. When concrete is proportioned and mixed at the job site, the Contractor shall provide the equipment necessary to positively determine and control the actual amounts of materials entering into the mix. Mixing shall be done in a batch mixer of approved design and shall ensure a uniform distribution of the material throughout the mass. The entire contents of the drum shall be discharged before recharging. The volume of the mixed material, per batch, shall not exceed the rated capacity of the machine.

- C. The Contractor shall, during the mixing and placing of concrete, have no fewer than two concrete mixers on the site so as to maintain continuity of the placing in the event of mechanical failure of one of the mixers. The mixing of each batch shall continue not less than 1-1/2 minutes after all materials are in the mixer, during which time the mixer shall rotate at a peripheral speed of not fewer than 200 feet per minute.
- D. When concrete is proportioned and mixed at a central plant, plant layout and equipment shall be subject to approval by the Engineer. Concrete shall be proportioned, mixed and transported under the following conditions:
 - 1. The Contractor shall furnish the services of a representative of an approved testing laboratory, who shall be present at the central mix plant when Class "A" concrete is proportioned and mixed for the work, and shall control proportioning and mixing operations, except when otherwise approved by the Engineer.
 - 2. Loading tickets shall be initialed by the laboratory representative, and the time of loading stamped thereon. Tickets shall be handed to the inspector upon arrival of the mixer trucks at the job site, and before placing the load.
 - 3. Concrete shall be transported to the job site in approved mixer trucks, which will mix the concrete en route.
 - 4. The mixing and handling of ready-mix concrete, except as otherwise specified above, shall satisfy the requirements of ASTM C94. In the event the above conditions are not satisfied, the concrete will be subject to rejection.

3.2 BATCHING AND MIXING

- A. Concrete shall be furnished by an acceptable ready-mixed concrete supplier and shall conform to ASTM C94.
- B. The consistency of concrete shall be suitable for the placement conditions. Aggregates shall float uniformly throughout the mass and the concrete shall flow sluggishly when vibrated or spaded. The slump shall be kept uniform.
- C. A delivery ticket shall be prepared for each load of ready-mixed concrete. A copy of each ticket shall be handed to the Engineer by the truck operator at the time of delivery. Tickets shall show the quantity delivered, the amount of each material in the outdoor temperature in the shade, the time at which the cement was added, and the numerical sequence of the delivery.

3.3 PLACING:

- A. Before concrete is placed, the depth and character of the foundations, the adequacy of forms and falsework, and the placing of steel and appurtenant work shall be inspected and must be approved by the Engineer; that approval, however, shall not relieve the Contractor from the responsibility to produce the finished work.
- B. Accumulated water and debris shall be removed from excavations and from form work into which concrete is to be placed; flow of water into those places shall be diverted into side drains or sumps and be removed without disturbing newly placed concrete. Forms, unless lined, shall be thoroughly wetted with water before concrete is placed so as to tighten joints and prevent leakage of the mix. Runways for buggies and wheelbarrows, if used, shall not be supported by form work. Concrete shall be conveyed in a manner which will not disturb forms.
- C. Concrete shall be placed in daylight; placing of concrete in a portion of the work shall not be started if that portion of the work cannot be completed during daylight, unless otherwise specifically approved by the Engineer. That approval will not be given unless an adequate lighting system is provided, and that system is approved by the Engineer.
- D. Concrete shall not be placed when the atmospheric temperature is cooler than 35°F. If, after placing concrete, the atmospheric temperature becomes cooler than 35°F, the Contractor shall enclose, heat, and protect the concrete in a manner which will keep the air surrounding the fresh concrete at a temperature not cooler than 45°F for a period of 5 days after concrete is placed. The Contractor shall assume all risk connected with the cool weather placing and protecting of concrete, and should that concrete be unsatisfactory, it shall be rejected.
- E. Concrete shall be transported from the mixer to the point of deposit with a crane-handled bottom-dump concrete bucket, with concrete buggies, or with wheelbarrows. In the event the quality of the concrete as it reaches the forms, and the method and placing thereof, in the opinion of the Engineer, is not satisfactory, the Contractor shall change his method of operation so as to place concrete in a manner approved by the Engineer.

- F. Concrete shall be placed in a manner which will prevent the segregating of aggregates, displacing reinforcing, and coating and splattering chutes, and canvas tremies shall be arranged and used in a manner which will ensure that the concrete is placed in the manner specified. The placing of concrete within form work shall be regulated in a manner which will ensure that the pressure within the form work shall not exceed the design pressure of the form work. Concrete shall be placed in continuous horizontal layers, the thickness of which, in general, shall not exceed 12 inches. When placing concrete, each batch and each layer shall be placed immediately following the preceding batch and layer so that there will be no "cold joints" in the work. Care shall be used to fill each part of the forms; concrete shall be deposited to as near final position as possible. After concrete has taken its initial set, care shall be used to avoid jarring the form work and placing strain and vibration on the ends of projecting concrete reinforcements. If concrete must be dropped more than five feet (5'), it shall be deposited through a tremie.
- G. Concrete when placed shall be compacted with mechanical, internal vibrating equipment supplemented with hand-spading with a steel slicing rod. Vibrating shall not be used to transport concrete within forms. Vibrating equipment shall maintain an impulse rate of not less than 5,000 impulses per minute, when submerged in concrete. Not less than one (1) spare vibrator shall be maintained on the job site as a relief. The duration of vibration shall be limited to that necessary to satisfactorily consolidate the concrete without causing objectionable segregation. The vibrator shall not be inserted into lower layers which have begun to set.
- H. Thin section work shall be thoroughly worked with a steel rod; faces shall be shaped, and mortar flushed to the surface of the form. Small diameter holes shall be drilled in form work beneath large wall sleeves and inserts to prevent the entrapment of air beneath those sleeves and inserts when concrete is placed.
- I. Concrete shall be placed and compacted in a manner which will form a dense, compact, impervious structure having smooth faces on exposed surfaces. Concrete found to be porous, plastered, and otherwise defective, in the opinion of the Engineer, shall be removed and replaced in whole, or in part, as directed by the Engineer, at no additional expense to the Owner.

3.4 CONSTRUCTION JOINTS

- A. Surface of concrete construction joints shall be cleaned and laitance removed.
- B. Immediately before new concrete is placed, all construction joints shall be wetted and standing water removed.
- C. Construction joints shall be located where shown and were directed by the Engineer. Concrete shall be placed continuously between construction joints so that the unit will be monolithic in construction. Not less than 72 hours shall elapse between casting of adjoining units, unless otherwise approved by the Engineer.

- D. Construction joints in footings and walls, required for proper execution of the work, but not shown on the Drawings shall be located where directed by the Engineer, and across regions of low shearing stress so as to least impair the strength and appearance of the work. Special provisions shall be made for joining successive units as shown and as directed by the Engineer.
- E. Construction joints in slabs, required for proper execution of the work but not shown on the Drawings, shall be located where directed by the Engineer. Special provisions, including concrete footings for construction joints in slabs on earth shall be made for joining successive units, as shown and as may be directed by the Engineer.
- F. Keys shall be constructed in construction joints where shown, and as directed by the Engineer. Keys and water stops shall be placed in those construction joints which will be subject to water pressure.

3.5 EXPANSION JOINTS

- A. Expansion joints shall be constructed as detailed on the drawing and in the locations shown.

3.6 BONDING

- A. The surfaces of recently poured concrete work shall be thoroughly roughened and made free from all foreign matter and latence, the forms placed and tightened, and the surfaces of that concrete slushed with grout before placing new concrete work. New concrete shall be placed before grout has attained its initial set; bonding work shall be accomplished in a manner which will ensure complete bonding. Two to four inches (2"-4") of grout shall be applied to construction joints.

3.7 FINISHING

- A. Exterior concrete surfaces shall be finished to levels not shallower than 12 inches below finish grade levels; interior concrete surfaces and concrete surfaces exposed to view shall be finished.
- B. Interior of basins shall be finished to a level not less than 12 inches below water level. Concrete not exposed to view shall have edges tooled off and shall be pointed and spot finished to fill irregularities. Concrete to be painted or waterproofed shall be finished.
- C. When concrete has set sufficiently to permit, forms and form ties shall be carefully removed. Depressions resulting from removal of form ties, and other holes and rough places, shall be thoroughly wetted with water and pointed with non-staining, non-shrink sand-cement mortar.

- D. After pointed surfaces have sufficiently set, surfaces specified to be finished shall be kept wet with water and shall be rubbed with a carborundum stone of medium fineness, or other equally as good abrasive, to bring the surface to a smooth texture and to remove all form and other marks. The paste formed by the rubbing may be rubbed down by floating with a canvas, carpet-faced, or cork float, or may be rubbed down with dry burlap.
- E. Recesses from form ties shall be filled flush with mortar. Fins and other surface projections shall be removed from all formed surfaces except exterior surfaces that will be in contact with earth backfill.
- F. Slabs, pavement, curbs, and other unformed surfaces shall be screeded and given an initial float finish followed by additional floating or belting. Unformed surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float, or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance with no unnecessary working on the surface.
- G. Initial floating shall be followed by belting or a second floating at the time of initial set. The belting or second floating shall produce a finish of uniform texture and color. The completed finish for unformed surfaces shall be the finish produced by the belting or second floating.

3.8 CURING AND PROTECTING

- A. Concrete shall be protected from loss of moisture by water saturation or membrane curing for at least 7 days after placement.
- B. Water saturation of concrete surfaces shall begin as quickly as possible after initial set of the concrete. Unformed surfaces shall be covered with polyethylene film, tarpaulins, or sand to retain the water. Water shall be applied as often as necessary to keep the concrete saturated for the entire curing period.
- C. Two (2) coats of an acrylic copolymer solution may be used in lieu of water curing. The curing compound shall be Dress & Seal, as manufactured by L & M Construction Chemicals, Inc., or another approved equal. When the concrete surface is to have another surface applied to it, L & M cure shall be used. All curing membranes shall be applied in strict accordance with the manufacturer's recommendations.
- D. Concrete shall be protected against freezing for at least 7 days after placement.

3.9 WATERTIGHTNESS

- A. Concrete required to be watertight shall be proportioned, mixed, and placed in strict accordance with this Section.

- B. All concrete structures for holding and transporting water, and pits below ground level, shall be tested and shall be watertight; a drop in the water level of more than 1-1/4" in 24 hours will not be permitted when water holding structures are filled. All exposed surfaces of water holding structures and interiors of pits below groundwater level shall be free from visible damp spots and seepage before acceptance.

3.10 SILICONE JOINT SEALANT

- A. Provide silicone joint sealant that exceeds both Federal Specifications TT-S-001543A Class A (one-part silicone sealants) and TT-S-00230C Class A (one-component sealants) that were written for construction sealants requiring extremely high movement capability.
- B. Install silicone joint sealant in accordance with manufacturer's recommendations.
- C. Dow Corning⁷ 888 meets the above specifications and is represented locally by Fred R. Hiller Company (770) 451-4551.

3.11 BACKER ROD

- A. Provide cylindrical flexible sealant backings composed of closed cellular material, as defined in ASTM C1330 for use with cold applied sealants.
- B. Install in accordance with manufacturer's recommendations.
- C. HBR⁷, manufactured by Nomaco, Inc., meets the above specifications and is represented locally by Fred R. Hiller Company (770) 451-4551.

3.12 IMPERFECT AND DAMAGED WORK

- A. All imperfect and damaged work shall be satisfactorily removed; new work and materials, which are in accordance with the requirement of the Drawings and construction Specifications shall be furnished and installed at no additional expense to the Owner. Removal of concrete work and installation of subsequent work and materials shall be accomplished in a manner which will not impair the strength of the structure.

3.13 REPAIRING DEFECTIVE CONCRETE

- A. Defects in concrete surfaces, such as honeycombs or cracks, shall be repaired to the satisfaction of the Engineer.
- B. Concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Repair work shall be adequately cured.

3.14 CLEANING UP

- A. Upon completion of work, all forms, equipment, protective covering and rubbish resulting there from shall be removed from the premises. Finished concrete surfaces shall be left in a condition satisfactory to the Engineer.

3.15 CONCRETE FLOORS AND SLABS

- A. All piping which will be under floors and slabs shall be tested and retested until there are no leaks before constructing concrete slabs.
- B. The subgrade for slabs on earth shall provide a solid bearing and shall be brought to a true and even plane. Where floor drains occur, floors shall be pitched thereto, as shown. The concrete shall have a comparatively dry consistency, and shall be screeded level, or to the proper grade. After compacting and vibrating the concrete, the surface shall be prepared to receive the specified finish. All floors, walks, platforms, stairs and other slab work shall have a wood float finish. Settling basin and tank floors shall have a smooth steel troweled finish. After screeding to the required grade while the concrete is still green, but has hardened sufficiently to bear the finisher's weight, the concrete surface shall be floated with wood float to a true and even plane, have no visible coarse aggregate, and be sufficiently rough to prevent slipping.

3.16 STORAGE

- A. Cement shall be stored in suitable moisture-proof enclosures. Cement which has been caked or lumpy shall not be used.
- B. Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6" of aggregate piles in contact with the ground shall not be used.
- C. Reinforcing steel shall be carefully handled and shall be stored on supports which will keep the steel from contact with the ground.

3.17 SAMPLING AND TESTING

- A. Cement aggregates shall be tested by a recognized testing laboratory which has been selected by the Contractor and accepted by the Engineer. The testing laboratory shall prepare written reports of such tests which shall certify that the material covered by the report complies in all respects with these Specifications. The tests and reports shall be made on each shipment of cement and on each bin or stockpile of aggregates used in the work. When aggregate is being furnished from the same source, tests subsequent to the initial tests may be suspended when specifically, authorized by the Engineer. These tests, however, may be resumed when requested by the Engineer. When specifically authorized by the Engineer, mill test certificates shall be submitted for cement shipments.

Certified test reports and certificates shall be submitted to the Engineer in duplicate.

- B. The Contractor shall determine the source, kind and quality of cement and aggregates to be used in the work well in advance of the scheduled start of the work, in order to permit proper sampling and testing. He shall be fully responsible for delays in the progress of the work due to delays in sampling, testing and reporting on cement or aggregates. No cement or aggregates shall be incorporated in the work prior to receipt and acceptance of certified test reports or certificates by the Engineer. The cost of sampling and testing cement aggregates will be borne by the Contractor.
- C. Concrete cylinder for testing purposes shall be made in accord with the procedure described in ASTM C31. Compression tests shall be made at the age of 7 days, 14 days and two (2) at 28 days by the testing laboratory in accord with the procedure described in ASTM C39, and as required by the Engineer. After beginning work, the number of tests shall be as listed in the following table but shall not be less than one for each type of concrete for each pour. Each test shall consist of at least 8 specimens. Two (2) cylinders shall be held in reserve and tested at 56 days, if required.

<u>Total Cu. Yds. Concrete Placed</u>	<u>Minimum Number of Tests</u>
0 to 100	Two each Pour
101 to 1,000	One per each 100 Cu. Yds.
1,001 to 2000	One per each 150 Cu. Yds.
2,001 and over	One per each 250 Cu. Yds.

- D. Slump test of concrete shall be made in the field by the Contractor for each pour with an accurately made sheet iron test cone, and in accord with the procedure described in ASTM C143. The slump of concrete shall be not less than 3 inches, or more than 4 inches, before the addition of admixtures.

END OF SECTION

**SECTION 03 62 00
NON-SHRINK GROUTING**

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 01 33 00 Submittal Procedures
- B. Section 03 10 00 Concrete Forming and Accessories
- C. Section 03 20 00 Concrete Reinforcing
- D. Section 03 30 00 Cast-In-Place Concrete

1.2 GENERAL

- A. The work covered by this Section of the Specifications consists of furnishing all equipment, materials, labor, and performing all operations required for the installation of non-shrink cementitious grouts at locations shown on the Contract Drawings or as directed by the Engineer.
- B. Nonshrink cementitious grouts are used for static and low dynamic loading associated with column baseplates, sole plates, pumps, anchor bolts or in areas in conjunction with high operating temperatures.
- C. The following codes and standard specifications establish the minimum requirements for cementitious grouts. Referenced test methods, specifications and recommended practices are to be used to verify material properties and identify acceptable practices applicable to cementitious grouts:
 - 1. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic-Cement Mortars (using 2 in or 50 mm cube specimens)
 - 2. ASTM C230 Standard Specifications for Flow Table in Tests of Hydraulic Cement
 - 3. ASTM C827 Standard Test Method for the Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
 - 4. ASTM C1090 Test Method for Measuring Change in Height of Cylindrical Specimens from Hydraulic-Cement Grout
 - 5. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- D. Submittals: The Contractor must submit the manufacturer's literature and certified test data to the Engineer prior to installation. The Engineer may choose to buy any submitted material in the open market at the Contractor's expense, without the Contractor or manufacturer's knowledge, and test the material at an independent lab to verify compliance with this Specification.

- E. Delivery, Storage and Handling: All materials shall be delivered to the job site in original, unopened packages, clearly labeled with the manufacturer's identification and printed instructions. All cementitious materials shall be stored and handled in accordance with the recommendations of the manufacturer and the American Concrete Institute.
- F. Project/Site Conditions: Refer to the manufacturer's literature or contact the manufacturer directly for any physical or environmental limitations required by the project.
- G. Warranty: The material manufacturer shall warranty that the nonshrink grout shall never go below its initial placement volume when tested in accordance with ASTM C827.
- H. Grout shall be Five Star7 Grout, Five Star7 Grout 100 or Five Star7 Instant Grout as manufactured by Five Star Products, Inc. Fairfield, CT (203)336-7900. No like, equivalent, or "or equal" items or no substitution is permitted.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Nonshrink cementitious grout shall be a preproportioned product packaged according to ASTM C1107 requiring only the addition of potable water and shall not contain metallic substances or aluminum powder.
 - 1. Dimensional Stability/Compressive Strength: The grout shall meet the requirements of ASTM C1107 Grade C, when prepared according to manufacturer's instructions and tested at 40EF and 90EF (5EC and 32EC).
 - 2. Placability: The grout shall be capable of maintaining at least a flowable consistency for a minimum of 45 minutes at 70EF (21EC) measured under ASTM C230, using 5 drops in 3 seconds.
 - 3. Mixing Water: Water shall be clean and free of oils, acids, alkalis, organics and other deleterious materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect concrete surfaces to receive grout and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints, impregnations and all loose material or foreign matter likely to affect the bond or performance of the grout.
- B. Inspect the baseplate or anchor system for rust, oil and other deleterious substances that may affect the bond or performance of the grout.

- C. Confirm newly placed concrete has been cured sufficiently to attain its design strength and limit further shrinkage.

3.2 PREPARATION

- A. Roughen all concrete surfaces by sandblasting or other mechanical means to assure bond. Loose or broken concrete shall be removed.
- B. All grease, oil, dirt, curing compounds, laitance and other deleterious materials that were identified in the inspection process shall be completely removed from the concrete and bottom of baseplate.
- C. Concrete surfaces shall be saturated with water.
- D. All standing water shall be removed just prior to placement of grout.
- E. Forms for grout shall be built of materials with adequate strength to withstand the placement of grout.
- F. Forms for grout shall be watertight. An approved form release agent shall be used for easy form release.
- G. Forms shall be 4 to 6 inches (100 to 150 mm) higher than the baseplate on one side of baseplate when using hydrostatic head pressure for placement.
- H. Air relief holes a minimum of 2" (6 mm) in diameter must be provided when required by the baseplate configuration to minimize the amount of air entrapped under the plate.

3.3 INSTALLATION

- A. Grout shall be mixed in accordance with manufacturer's recommendations. Carefully read and understand the manufacturer's instructions as printed on each unit.
- B. A mortar mixer with moving blades shall be used for mixing of grout. A wheelbarrow and a mortar hoe are acceptable for smaller quantities. Pre-wet the mixer and empty excess water before mixing begins.
- C. Nonshrink cementitious grout shall be added to a premeasured amount of water that does not exceed the manufacturer's maximum.
- D. Mix the cementitious grout for 3 to 5 minutes for uniform consistency.
- E. Grout may be dry packed, flowed or pumped into place. All grouting shall take place from one side of a baseplate to the other to avoid trapping air.

- F. Retempering of grout by adding more water after stiffening is not permitted.
- G. Hydrostatic head pressure shall be maintained by keeping the level of the grout in the headbox above the bottom of the baseplate. The headbox should be filled to the maximum level and the grout worked down to top of baseplate.

3.4 CURING

- A. The grout must be cut back to the lower edge of the baseplate after it has reached its initial set. A 45° angle or a vertical cut back is recommended.
- B. Equipment and tools shall be cleaned as recommended by the grout manufacturer.
- C. Grout shall be cured in accordance with manufacturer's specifications and recommendations. It shall be kept moist for a minimum of three days. The method needed to protect the grout will depend on temperature, humidity and wind. Wet burlap, a soaker hose, sun shading, ponding and, in extreme conditions, a combination of methods shall be employed.
- D. Grout shall be maintained above 40°F (5°C) for a minimum of three days or above 70°F (21°C) for a minimum of 24 hours to avoid damage from subsequent freezing.

3.5 FIELD QUALITY CONTROL

- A. Nonshrink cementitious grouts should be tested for the 24-hour compressive strength under ASTM C109.

END OF SECTION

**SECTION 09 91 00
PAINTING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work included under this Section shall consist of furnishing all materials and equipment and performance of all labor necessary to paint and waterproof exterior and interior surfaces as outlined in this Section.

1.2 RELATED SECTIONS

- A. Section 01 33 00 Submittal Procedures
- B. Section 26 00 00 Electrical
- C. Section 33 32 00 Wastewater Utility Pumping Station
- D. Section 33 32 01 Emergency Standby Pump

1.3 PAINTING INCLUDED

- A. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout the project, except as otherwise specified. Surface preparation, priming and coats of paint specified under this Section are in addition to shop-priming and surface treatment specified under other Sections, except as otherwise specified.
- B. The work includes field painting of all bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the mechanical and electrical work, except as otherwise specified.
- C. "Paint", as used herein, means all coating systems materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- D. Paint all exposed surfaces whether or not colors are designated in "schedules", except where the natural finish of the material is obviously intended or specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color or finish is not designated, the Engineer will select these from standard colors available for the materials systems as specified.

1.4 PAINTING NOT INCLUDED

- A. The following categories of work are not included as part of the painter-applied finish work, or are included in other Sections of these Specifications, unless otherwise shown or specified.
1. Shop Priming: Unless otherwise specified, shop priming of ferrous and other metal items is included under the various Sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for fabricated components such as wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories.
 2. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures, acoustic materials, pre-finished woodwork, and casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, doors and equipment.
 3. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, and duct shafts. Paint all piping, equipment, and other such items in concealed spaces, unless otherwise indicated.
 4. Finished Metal Surfaces: Metal surfaces of aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, except as otherwise indicated.
 5. Operating Parts and Labels: Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Material shall be delivered in unbroken original containers bearing the manufacturer's name, trade name, mixing instructions, and application instructions.
- B. The Owner will select the colors from manufacturer's standard color chart.
- C. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
- D. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only within recommended limits.
- E. Acceptable manufacturers include Induron, Carboline and Tnemec according to the following schedules.

Surface	Induron Coatings, Inc.	Induron Application
1. Structural Steel and Miscellaneous Iron and Steel	PermaClean II Primer	<u>Shop Primer</u> One (1) Coat 3.0 to 5.0 mils dft
A. All interior miscellaneous iron and steel	PermaClean II	<u>Finish Coat</u> Two (2) Coats 3.0 to 5.0 mils dft per coat
B. All exterior miscellaneous iron and steel	PermaClean II Indurethane 6600 Plus	<u>Intermediate Coat</u> 3.0 to 5.0 mils dft per coat <u>Finish Coat</u> 2.0 to 3.0 mils dft per coat
C. All miscellaneous iron and steel in vaults, pits, galleries and in areas	PermaClean II	<u>Finish Coat</u> Two (2) Coats 3.0 to 5.0 mils dft per coat

exposed to
extreme
humidity and
condensation

Surface	Induron Coatings, Inc.	Induron Application
D. All structural Steel	PermaClean II	<u>Finish Coat</u> Two (2) Coats 3.0 to 5.0 mils dft per coat
E. All equipment, iron and steel in areas covered with sewage	PermaClean II Primer	<u>Primer Coat</u> One (1) Coat 0.3 to 5.0 mils dft per coat
	Ruff Stuff 2100 Coal Tar Epoxy	<u>Finish Coat</u> One (1) Coat 16.0 to 18.0 mils dft per coat
2. Exposed Cast Iron Piping System (primed in shop)	PermaClean II Primer	<u>Prime Coat</u> 3.0 to 5.0 mils dft per coat
	PermaClean II	<u>Intermediate Coat</u> 3.0 to 5.0 mils dft per coat
	Indurethane 6600 Plus	<u>Finish Coat</u> 2.0 to 3.0 mils dft per coat
3. Galvanized Iron	Vinyl Wash Primer	<u>Prime Coat</u> 0.5 mils dft
	PermaClean II	<u>Intermediate Coat</u> 3.0 to 5.0 mils dft per coat
	Indurethane 6600 Plus	<u>Finish Coat</u> 2.0 to 3.0 mils dft per coat
4. Exposed Electrical Work	Vinyl Wash Primer	<u>Prime Coat</u> 0.5 mils dft

	PermaClean II	<u>Intermediate Coat</u> 3.0 to 5.0 mils dft per coat
	Indurethane 6600 Plus	<u>Finish Coat</u> 2.0 to 3.0 mils dft per coat
5. Interior & Exterior Concrete Block, non-submerged	Polyfill Epoxy Block filler (Interior) AC403 Elastomeric Block Filler (Exterior) Induraguard Epoxy (Interior) AC403 Elastomeric (Exterior)	<u>Prime Coat</u> Fill Porous Surface (Interior) 0.5 to 1.0 mils dft (Exterior) <u>Finish Coat</u> Two (2) coats (Interior) 3.0 to 5.0 mils dft each coat Two (2) coats (Exterior) 6.0 to 12.0 mils dft each coat

Surface	Induron Coatings, Inc.	Induron Application
6. Ferrous metal Doors and Frames	PermaClean II Epoxy Primer PermaClean II	<u>Prime Coat</u> 3.0 to 5.0 mils dft per coat <u>Finish Coat</u> Two (2) coats 3.0 to 5.0 mils dft per coat
7. Equipment	E-Bond 100 Indurethane 6600 Plus	<u>Field Prime Coat</u> 1.0 to 2.0 mils dft per coat <u>Finish Coat</u> 2.0 to 3.0 mils dft per coat
8. Interior and Exterior Wood Surface	Aquanaut Primer Aquanaut II	<u>Prime Coat</u> 2.0 to 3.0 mils dft per coat <u>Finish Coat</u> Two (2) Coats

		2.0 to 4.0 mils dft per coat
9. Galvanized Steel Trusses and Roof Deck	Vinyl Wash Primer	<u>Prime Coat</u> 0.5 mils dft
	PermaClean II	<u>Finish Coat</u> Two (2) Coats 3.0 to 5.0 mils dft per coat
10. Concrete Wet Well and manholes (as called out)	PermaClean II Primer	<u>Prime Coat</u> One (1) Coat 3.0 to 5.0 mils dft per coat
	Ruff Stuff 2100 Coal Tar Epoxy	<u>Finish Coat</u> One (1) Coat 16.0 to 18.0 mils dft per coat

Surface	Carboline Company	Carboline Application
1. Structural Steel and Miscellaneous Iron and Steel	Carboguard 60	<u>Shop Primer</u> One (1) Coat 4.0 to 6.0 mils dft
A. All interior miscellaneous iron and steel	Carboguard 890	<u>Finish Coat</u> Two (2) Coats 4.0 to 6.0 mils dft per coat
B. All exterior miscellaneous iron and steel	Carboguard 890	<u>Finish Coat</u> One (1) Coat 4.0 to 6.0 mils dft
	Carbothane 134 HG	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft

Surface	Carboline Company	Carboline Application
C. All miscellaneous	Carboguard 890	<u>Finish</u> Two (2) Coats

s iron and steel in vaults, pits, galleries and in areas exposed to extreme humidity and condensation		4.0 to 6.0 mils dft per coat
D. All structural Steel	Carbocoat 60	<u>Finish</u> Two (2) Coats 4.0 to 6.0 mils dft per coat
E. All equipment, iron and steel in areas covered with sewage	Carboguard 60	<u>Shop Primer</u> One (1) Coat 4.0 to 6.0 mils dft
	Carboline Bitumastic 300 M Coal tar Epoxy	<u>Finish</u> Two (2) Coats 8.0 mils dft per coat
2. Exposed Cast Iron Piping System (primed in shop)	Carboguard 890	<u>Prime Coat</u> One (1) Coat 4.0 to 6.0 mils dft per coat
	Carbothane 134 HG	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft
3. Galvanized Iron	Sanitile 120	<u>Prime Coat</u> One (1) Coat 1.0 to 2.0 mils dft
	Carbocrylic 3359	<u>Finish Coat</u> Two (2) Coats 2.0 to 3.0 mils dft per coat
4. Exposed Electrical Work	Sanitile 120	<u>Prime Coat</u> One (1) Coat 0.5 mils dft
	Carbocrylic 3359	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft per

		coat
5. Interior & Exterior Concrete Block, non-submerged	Sanitile 100	<u>Prime Coat</u> One (1) Coat 12.0 to 14.0 mils dft
	Sanitile 155 WB (Exterior) Carboguard 890 (Interior)	<u>Finish Coat</u> 2.0 to 3.0 mils dft (Exterior), 4.0 to 6.0 mils dft (Interior)

Surface	Carboline Company	Carboline Application
6. Ferrous Metal Doors and Frames	Sanitile 120	<u>Prime Coat</u> 1.0 to 2.0 mils dft
	Carbocrylic 3359	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft
7. Equipment	Carbocrylic 3359	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft
8. Interior and Exterior Wood Surface	Sanitile 120	<u>Prime Coat</u> 1.0 to 2.0 mils dft
	Carbocrylic 3359	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft
9. Galvanized Steel Trusses and Roof Deck	Carboline Rustbond Penetrating Sealer Carboguard 890	<u>Prime Coat</u> One (1) Coat 1.0 to 2.0 mils dft <u>Finish Coat</u> Two (2) Coats 4.0 to 6.0 mils dft per coat
10. Concrete Wet Well and	Carboline Bitumastic 300 M Coal tar	<u>Prime Coat</u> One (1) Coat 2.0 to 4.0 mils dft

manholes (as called out)	Epoxy	
	Carboline Bitumastic 300 M Coal tar Epoxy	<u>Finish</u> One (1) Coat 16.0 to 18.0 mils dft

Surface	Tnemec Company, Inc.	Tnemec Application
1. Structural Steel and Miscellaneous Iron and Steel	Series N69F	<u>Shop Primer</u> One (1) Coat 3.0 to 5.0 mils dft
A. All interior miscellaneous iron and steel	Series N69	<u>Finish Coat</u> Two (2) Coats 2.0 to 3.0 mils dft per coat
B. All exterior miscellaneous iron and steel	Series 1074	<u>Finish Coat</u> Two (2) Coats 2.0 to 3.0 mils dft per coat

Surface	Tnemec Company, Inc.	Tnemec Application
C. All miscellaneous iron and steel in vaults, pits, galleries and in areas exposed to extreme humidity and condensation	Series N69 Series 435	<u>Prime Coat</u> One (1) Coat 3.0 to 4.0 mils dft per coat <u>Finish</u> One (1) Coat 15.0 to 20.0 mils dft
D. All structural Steel	Series N69	<u>Finish</u> Two (2) Coats 2.0 to 3.0 mils dft per coat
E. All equipment, iron and steel in areas	Series N69-1211	<u>Prime Coat</u> One (1) Coat 3.0 to 5.0 mils dft

covered with sewage		
	Series 435	<u>Finish Coat</u> One (1) Coat 15.0 to 20.0 mils dft
2. Exposed Cast Iron Piping System (primed in shop)	Series N140-1255	<u>Prime Coat</u> One (1) Coat 3.0 mils dft
	Series 73	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft
3. Galvanized Iron	Series 115 Direct to Galvanized	<u>Prime Coat</u> One (1) Coat 2.0 to 3.0 mils dft
	Series 1029	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft
4. Exposed Electrical Work	Series 151 Direct	<u>Prime Coat</u> One (1) Coat 2.0 to 3.0 mils dft
	Series 1029	<u>Finish Coat</u> One (1) Coat 2.0 to 3.0 mils dft

Surface	Tnemec Company, Inc.	Tnemec Application
5. Interior & Exterior Concrete Block, non- submerged	Series 130-6602 (Interior)	<u>Prime Coat</u> 100 sf per gallon (Interior and Exterior)
	Series 130-6602 (Exterior)	
	Series 113 (interior)	<u>Finish Coat</u>
	Series 1080 (exterior)	Two (2) Coats 3.0 mils dft per coat (Int)
		One (1) Coat

8.0 to 10.0 mils dft (Ext)		
6. Ferrous Metal Doors and Frames	Series 151	<u>Prime Coat</u> One (1) Coat 1.5 to 2.5 mils dft
	Series 1029	<u>Finish Coat</u> Two (2) Coats 1.5 to 2.5 mils dft
7. Equipment	Series 1029	<u>Finish Coat</u> Two (2) Coats 1.5 to 2.5 mils dft
8. Interior and Exterior Wood Surface	Series 10-99W	<u>Prime Coat</u> One (1) Coat 2.0 mils dft
	Series 1029	<u>Finish Coat</u> Two (2) Coats 1.5 to 2.5 mils dft
9. Galvanized Steel Trusses and Roof Deck	Series 115 Direct	<u>Prime Coat</u> One (1) Coat 3.0 mils dft
	Series 1029	<u>Finish Coat</u> One (1) Coat 3.0 to 4.0 mils dft
10. Concrete Wet Well and manholes (as called out)	Series 201	<u>Prime Coat</u> One (1) Coat 3.0-4.0 mils dft
	Series 435	<u>Finish Coat</u> Two (2) Coats 30.0 to 40.0 mils dft

PART 3 EXECUTION

3.1 PAINTING

- A. Paint shall not be applied on damp or frosty surfaces, nor during wet, foggy, or weather below 50° F, or above 85% relative humidity. Comply with manufacturer's product data as to environmental conditions. Surfaces to be painted shall be made free of dust and other foreign matter before paint is applied; surfaces shall be completely dry before paint is applied. Iron and steel which have been shop primed, shall have all abrasions in the priming coat cleaned to bright metal to remove all scale, ridges, rust, and faults in the prime coat. Weld splatter shall be removed and that area re-primed. Voids and open and hollow places shall be repaired with a material compatible with the surface to be repaired.
- B. Paint shall be spread and brushed out so that there shall be no drops, runs, or sags in the coating. Where runs, sags, and drops do occur, they shall be removed, and the surface shall be re-coated. Paint shall be dry before additional coats are applied. Drop cloths shall be used to protect surfaces of the structure and equipment in place, and upon completion of work, paint spots shall be removed from surfaces and defaced surfaces shall be re-finished. Painting found to be defective, and that applied under adverse conditions, shall be removed and new paint shall be applied. Where more than one coat is required, undercoats shall be job-tinted.

END OF SECTION

**SECTION 26 00 00
ELECTRICAL WORK**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This Section specifies electrical work including electrical material, equipment, installation and testing requirements. The electrical drawings included in this project manual are functional in nature and do not specify exact locations of equipment or equipment terminations.
- B. Horsepower ratings indicated in Contract Documents are obtained from reliable sources, but they are not guaranteed.
- C. Contractor shall install all wiring and conduit associated with the standby diesel pump/engine. Interconnections include wiring to the float switches in the wetwell, to the low voltage panelboard, and to the SCADA.
- D. All panelboards, transformers, switches, and breakers shall be furnished by the same manufacturer.

1.2 RELATED SECTIONS

- A. Section 01 33 00 Submittal Procedures
- B. Section 33 32 00 Wastewater Utility Pump Station

1.3 REFERENCES

- A. This section contains references to the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI A58.1-82	Minimum Design Loads for Buildings and Other Structures
IEEE 81-83	Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C57.12.01-89	General Requirements for Dry-Type Distribution and Power Transformers
NEMA 250-85	Enclosures for Electrical Equipment (1000 volt Maximum)
NEMA ICS 1-88	General Standards for Industrial Controls and Systems
NEMA ICS 2-88	Industrial Control Devices, Controllers and Assemblies
NEMA ICS 6-88	Enclosures for Industrial Controls and Systems
NEMA ST20-86	Dry-Type Transformers for General Application
NEMA WD 1-83	General Requirements for Wiring Devices
NEC 1996	National Electric Code (NEC)
SBC 1991	Standard Building Code
UL 67-88	Panelboards
UL 489-86	Molded-Case Circuit Breakers and Circuit Breaker Enclosures
UL 506-79	Specialty Transformers

1.4 IDENTIFICATION OF LISTED PRODUCTS

- A. Electrical equipment and materials shall be listed by an independent testing laboratory for the purpose for which they are to be used. Three such organizations are Underwriters Laboratories, Inc. (UL), Canadian Standards Association (CSA), and Electrical Testing Laboratories (ETL). The independent testing laboratory shall be acceptable to the inspection authority having jurisdiction.

1.5 SUBMITTALS

- A. The following information shall be provided for all electrical equipment and materials in accordance with Section 01 33 00:
1. Verification of fault withstand and interrupting ratings of all applicable power equipment and devices.
 2. Submit manufacturer's catalog data including technical specifications, application information, ratings, and other information required to verify the equipment and/or material meets the requirements of this specification.

1.6 POWER SERVICE

- A. Power service to the pump station will be 480/277 volts, 3 phase, 4-wire from the electrical provider's pad mounted transformer. The Contractor shall coordinate with the electrical provider and provide metering conduits as required by them.

1.7 PROJECT/SITE CONDITIONS

- A. Unless otherwise specified, equipment and material shall be sized and rated for an ambient temperature of 40° C at an elevation ranging from sea level to 3000 feet without exceeding the manufacturer's stated ratings.

PART 2 PRODUCTS

2.1 GENERAL

- A. Equipment and materials shall be new and free from defects. All equipment of the same or similar type shall be of the same manufacturer throughout the work. Standard production materials shall be used wherever possible.

2.2 RACEWAY, FITTINGS, AND SUPPORT

- A. General: Conduits shall be provided for power, control, instrumentation, grounding, lighting, receptacles, and signaling systems.

B. Raceway:

1. Exposed conduit shall be threaded, rigid aluminum conduit. Minimum size shall be $\frac{3}{4}$ inch. Bushings shall be aluminum, with a feed through compression lug. Unions shall be aluminum. Threadless fittings are not acceptable. Running threads shall not be used in lieu of conduit nipples. Thread hubs shall be used to terminate conduits entering boxes.
2. Liquidtight, flexible steel conduit shall be formed from spirally wound, galvanized steel strip with successive convolutions securely interlocked and jacketed with liquidtight plastic cover. Minimum size shall be $\frac{3}{4}$ inch. Fittings for liquidtight conduit shall have cadmium-plated, malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral and O-ring seals around the conduit and box connection and insulated throat. Forty-five- and 90-degree fittings shall be used where applicable.
3. Embedded or encased conduit shall be schedule 40, high impact, polyvinyl chloride (PVC). Minimum size shall be 1 inch. All underground raceways shall have rigid galvanized steel elbows.
4. Fittings for PVC conduit shall be solvent welded type.

C. Boxes:

1. Boxes for the use outdoors and in process areas shall be hot-drip, galvanized cast ferrous alloy type FD with integrally cast threaded hubs for conduit entry. Boxes larger than FD boxes shall be welded steel and hot-dip galvanized after fabrication.
2. Boxes installed in areas where electrical metallic tubing is specified shall be standard UL approved electro-galvanized sheet steel, 4-inch square or octagon minimum trade size.
3. Conduit bodies shall be ferrous alloy type with screw taps for fastening covers. Gaskets shall be made of neoprene.

- D. Raceway Support: Aluminum or stainless-steel framing channel shall be used to support groups of conduit. Individual conduit supports shall be one-hole aluminum straps with aluminum clamp backs and nesting backs where required. Ceiling hangers shall be adjustable, stainless steel rod hangers. Straps or plumbers' tape is not acceptable. Hanger rods shall be $\frac{1}{2}$ inch all thread rod.

2.3 CONDUCTORS, WIRE, AND CABLE

- A. General: Conductors, wires, and cables shall be provided for power, control, lighting, receptacles, instrumentation, grounding, and signal circuits. The quantity and size of conductors shall be as specified. All service entrance and motor feed conductors shall be XHHW.
- B. Power and Control Conductors: Power and control conductors shall be single conductor stranded, annealed copper with 600 Volt THWN-2/THHN polyvinyl chloride (PVC) insulation, Okonite, Okoseal-N, CABLEC; or equal.
- C. Lighting and Receptacle Circuit Conductors:
 - 1. Conductors for lighting and receptacle circuits shall be single conductor, annealed copper with 600 Volt THWN-2 PVC insulation. Conductor sizes No. 10 AWG and larger shall be stranded. Minimum conductor size shall be No. 12 AWG. Conductors shall be Okonite, Okoseal-N; CABLEC; or equal.
 - 2. Grounding Conductors: Grounding conductors shall be as specified in this section.
 - 3. Instrumentation and Signal Cable: Cable for instrumentation and signal circuit shall be twisted shielded pair of triad as specified, No. 16 AWG 7-strand copper with 600 Volt PVC insulation, 100 percent aluminum-Mylar tape shield, No.18 AWG tinned copper drain wire and overall PVC jacket, Okonite, Okoseal-N type P-OS, or equal.
 - 4. Splicing and Terminating Materials:
 - a. Connectors: Connectors for stranded conductors shall be tool applied, tin-plated copper, compression type of the correct size and UL approved for the application.
 - b. Connectors for wire sizes No.10 AWG and smaller shall be nylon self-insulated, ring tongue or locking-space terminals. Connectors for wire sizes No. 8 AWG and larger shall be one-hole lugs up to size no.3/0 AWG and two-hole or four hole for size 4/0 AWG and larger. Mechanical clamp, dimple, or screw type connectors are not acceptable.
 - c. 480 Volt motor terminations shall be made using bolt connected lugged connectors and factory engineered kits consisting of heat shrinkable, polymeric insulating material with high dielectric strength mastic sealant.

- d. Termination of solenoid valves, 120 Volt motors and other devices furnished with pigtail leads shall be made using self-insulating, tubular compression connectors.
- 5. Terminal Blocks: Terminal blocks shall be provided for external control and power wires size No.10 AWG and smaller. Terminal blocks shall be 600 Volts, heavy-duty, rated 20 amperes for control and 30 amperes for power.
- 6. Wire Markers: Wire markers shall be yellow or white shrink tubing, Thermofit Marker System (TMS) by Raychem Co., or equal for conductors No. 10 AWG and smaller and locking tab cable markers, W.H. Brady Co., or equal, for conductors No.8 and larger. Letters and numbers identifying each conductor shall be machine printed in permanent black ink.

2.4 WIRING DEVICES

- A. General: Receptacles, plugs, switches, and appurtenances shall be provided as specified on the drawings. Wiring devices shall be UL approved for the current and voltage specified and shall comply with NEMA WD-1. Receptacles and switches shall be premium, specification grade.
- B. Receptacles: Receptacles shall be grounding type. Receptacles for use outdoors and in process areas shall be corrosion resistant, marine duty with polycarbonate weatherproof lift covers, Hubbell 53CM62/53CM21, General Electric, or equal.

2.5 GROUNDING MATERIAL

- A. Cable: Grounding cable shall be concentric stranded, annealed bare copper. Cable size shall be as specified.
- B. Ground Rods: Ground rods shall be copper-covered steel, $\frac{3}{4}$ inch diameter, and 10 feet long. Rods shall have threaded type, removable caps so that extension rods of the same diameter and length may be added where necessary.
- C. Compression Connectors: Compression connectors shall be cast copper as manufactured by Thomas and Betts, or equal.
- D. Bolted Connectors: Bolted connectors shall be Burndy, O.Z. Gedney, or approved equal.

2.6 NAMEPLATES

- A. Nameplates shall be made from laminated phenolic plastic. The nominal size of the nameplates shall be $\frac{3}{4}$ inch high by 2 inches long. Nameplates shall have black backgrounds with $\frac{3}{16}$ -inch white letters. If abbreviations are required because of space limitations, abbreviations shall be submitted to the Construction Manager prior to manufacture. Nameplates shall be fastened using self-tapping stainless-steel screws. The use of adhesives will not be permitted on the outside of enclosures.

2.7 PRODUCT DATA

- A. The following information shall be provided:
 - 1. Applicable operating and maintenance instructions.
 - 2. Lighting fixture information as follows:
 - a. Polar plots on 8 ½ x 11-inch paper providing candlepower versus angle and foot-lamberts (brightness) versus angle for longitudinal and transverse axis.
 - b. Table of utilization factors for calculation of illumination levels by the zonal cavity method.
 - c. Catalog information describing fixture make, materials, and dimensions.

2.8 PANELBOARDS

- A. Shall be bolt-in circuit breaker type with a rated main breaker or rated main lugs only as noted on drawings. All shall have UL approved interrupting capacity of equal to or greater than the Fault Currents indicated on the Power Riser Diagram. All multiple breakers shall be common trip type only. GFCI (Ground Fault Circuit Interrupter) breakers shall be provided where specifically indicated. All panels shall be fully rated, no series ratings are acceptable. All circuit breakers shall have 75 degree C rated lugs.
- B. End and side gutter shall have minimum clearance as required by the NEC. Depth shall be 5 ¾" minimum.
- C. Approved manufacturer is Square D, Cutler Hammer, or ABB/GE.

- D. Circuit breakers shall be numbered and connected to panel bus in the following sequence: Circuit 1, Phase A and Circuit 3, Phase B and Circuit 5, Phase C. Where bus diagrams are indicated on the drawings, breakers shall be positioned in panel to conform to diagrams; otherwise, single pole breakers shall occupy top positions in panel with blank spaces in lower positions and two and three pole breakers in between.
- E. Main lugs of panels or main circuit breaker shall be UL listed for copper or aluminum conductors. Lugs shall be of the proper range for feeder conductors indicated on the drawings. Each circuit protective device shall be identified with numeral designation, cross referenced with typewritten circuit directory on interior of panel door. A copy of each panel directory, reflecting all field changes shall be included in the bound data to be provided by the contractor at the time of final inspection.
- F. Conductors within panels shall be grouped and laced with nylon tie straps. Splicing of conductors within panels is not acceptable. Only one conductor shall be installed under terminal of individual circuit breaker.
- G. Circuit breakers shall be provided with trip rating class and poles as indicated on the drawings. Class indicated is designation according to Federal Specification W-C-375C/2000 and indicates the frame size and interrupting rating required. Operation of multiple breakers shall be by single handle; tie handles are not acceptable.
- H. Circuit breakers used for the control of discharge lighting and fluorescent lighting shall be designated for the purpose and bear the marking "HID" or "SWD" as required.

2.9 MOLDED CASE CIRCUIT BREAKER

- A. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- B. Circuit breakers ampere symmetrical interrupting rating shall match drawing.
- C. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.
- D. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF in addition to providing International I/O markings.

- E. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
- F. Circuit breaker handle accessories shall provide provisions for locking handle in the ON and OFF position. All circuit breaker accessories shall be UL listed.
- G. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.
- H. The main breaker shall service entrance rated and be housed in a Nema 4X SS enclosure.

PART 3 EXECUTION

3.1 GENERAL

- A. Unless otherwise detailed or dimensioned, electrical layout drawings are diagrammatic. The Contractor shall coordinate the location of electrical material and equipment with the work.
- B. Electrical equipment shall be protected from dust, water, and damage.

3.2 RACEWAY, FITTINGS, AND SUPPORTS

A. General:

- 1. The Contractor shall limit the number of directional changes of conduit to a total of not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to 400 feet, less 100 feet for each 90 degrees change in direction.
- 2. Signal conduit shall be separated from AC power and control conduits. The minimum separation shall be 12 inches for rigid steel and 24 inches for PVC conduits.
- 3. All exterior hubs shall be watertight – Myers Hubs or approved equal.
- 4. All conduits shall enter the enclosures from the bottom.

B. Exposed Conduits:

1. Metallic conduit shall be assembled to provide a continuous ground path. Joints shall be made with standard couplings or threaded unions. Bends and offsets shall be made with a hicky or conduit bending machine or shall be factory pre-formed bends.
2. Exposed conduit shall be run on supports spaced not more than 10 feet apart and shall be constructed with runs parallel and perpendicular to walls, structural members, or intersections of vertical planes and ceiling. No conduit shall approach closer than 6 inches to any object operating above 30°C.
3. Conduit supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors, die cast, rustproof alloy expansion shields, or cast-flush anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts are not acceptable as a base for securing conduit supports.
4. Liquidtight, flexible steel conduit shall be used for the final connection to equipment, devices, and instruments where flexibility is required.
5. The length of liquidtight flexible steel conduit shall not exceed the lesser of 15 times the trade diameter of the conduit or 36 inches.

C. Embedded or Encased Conduit: Conduits constructed in concrete which is in contact with earth shall be separated from earth by at least 3 inches of concrete. Clearances equal to the nominal conduit diameter but not less than 2 inches shall be maintained between encased or embedded conduits except where conduits cross or terminate.

3.3 CONDUCTORS, WIRE AND CABLE

A. General:

1. Raceway construction shall be complete, cleaned, and protected from the weather prior to wire and cable being installed. Pulling wire and cable into conduit shall be completed without damaging or putting undue stress on the cable insulation. Soapstone, talc, or UL listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable. Nylon pull rope shall be pulled through the conduit immediately after concrete pour.
2. Each power, control, signal, and instrumentation conductor shall be identified at each terminal to which it is connected utilizing the wire markers specified in paragraph 16000-2.3 G.

B. 600 Volt Conductor and Cable:

1. Slack shall be provided in junction and pull boxes. Slack shall be sufficient to allow cable or conductors to be routed along the walls of the box.
2. Conductors crossing hinges shall be bundled in groups not exceeding 12 and shall be so arranged that they will be protected from chaffing when the hinged member is moved.
3. Raceway fill limitations shall be as defined by NEC and the following:
 - a. Lighting and receptacle circuits may be together in the same conduit in accordance with derating requirements of the NEC. However, lighting and receptacle circuits shall not be in conduit with other circuits.
4. Solid wire shall not be lugged nor shall electrical spring connectors be used on any except for solid wires in lighting and receptacle circuits. Lugs and connectors shall be installed with a compression tool.

C. Signal and Instrumentation Cables:

1. Signal and instrumentation circuits shall be run as individual shield twisted pairs or triads. Triads shall be used wherever three wire circuits are required. Terminal blocks shall be provided at cable junction for running signal leads and shield drain wires. Each conductor shall be identified at such junctions.
2. Shields shall not be used as a ground path.

3.4 WIRING DEVICES

- A. Switches and receptacles for use outdoors and in process areas shall be mounted in "FD" type boxes. Unless otherwise specified, switches shall be mounted 48 inches above the floor. Receptacles shall be mounted 18 inches above the floor in finished areas and 48 inches above the floor in process areas and outdoors unless otherwise specified.

3.5 GROUNDING

- A. Electrical equipment and enclosures, metal surfaces of equipment, and metal structural members shall be grounded. Grounding system shall be provided in compliance with the NEC and as specified on the drawings.

- B. Embedded and buried cable connections shall be made by cast copper compression connectors utilizing diamond or hexagon dies and a hand compression tool for wire sizes 2 AWG and smaller and a hydraulic pump and compression head for wire size 2/0 AWG and larger. Embedded ground cables and fittings shall be securely attached to concrete reinforcing steel with tie wires.
- C. Grounding conductors which extend beyond concrete surfaces for equipment connection shall be extended a sufficient length to reach the final connection point without splicing. Grounding conductors which project from a concrete surface shall be located as close as possible to a corner of the equipment pad, protected by conduit or terminated in a flush grounding plate.
- D. Exposed ground connections shall be made by bolted connectors. Exposed grounding conductors shall be supported by non-corrosive metallic hardware at 4-foot intervals or less.
- E. Grounding conductors entering enclosures shall be bonded together to the enclosure if it is metallic and to metallic raceway within terminating at the enclosure. Metal surfaces shall be cleaned prior to making grounding connections and bonds.

3.6 LIGHTING FIXTURES

- A. The location and type of fixtures and receptacles are shown on the drawings. Raceways and wire shall be provided from the fixtures, switches, and receptacles to the lighting panel in accordance with the NEC.
- B. Fixtures labeled to require conductors with a temperature rating exceeding 75°C shall be spliced to circuit conductors in a separately mounted junction box. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal or greater than that of the fixture.
- C. Photoelectric cells shall be oriented toward the north.
- D. Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned when the project is ready for acceptance.

3.7 PANELBOARDS

- A. The Contractor shall type in the circuit descriptions on the circuit directory as shown on the final drawings or panel schedule.

3.8 TESTING

A. General:

1. Prior to energizing the electrical circuits, the tests shall be performed as specified. Unless otherwise specified, a 1000-Volt megohmmeter shall be used for resistance measurements.

B. Insulation Resistance Measurements:

1. General: General insulation resistance measurements shall be made on conductors and energized parts of electrical equipment. Minimum acceptable values of insulation resistance shall be in accordance with the applicable ICEA, NEMA, or ANSI standards for the equipment or material being tested, unless otherwise specified. The ambient temperature at which insulation resistance is measured shall be recorded on the test form.
2. Conductor and Cable Tests: The phase-to-ground insulation resistance shall be measured for all circuits at 480 Volts. Measurements may be made with motors and other equipment connected.

C. Functional Checkout:

1. Prior to energization of equipment, the Contractor shall perform a functional checkout of the control circuit. Prior to functional testing, all protective devices shall be adjusted and made operative. Checkout shall consist of energizing each control circuit and operating each control, alarm or malfunction device and each interlock in turn to verify that the specified action occurs. Contractor shall submit a description of his proposed functional test procedures prior to the performance of functional checkout.
2. The Contractor shall verify that motors are connected to rotate in the correct direction. Verification may be accomplished by momentarily energizing the motor, provided the Contractor confirms that neither the motor nor the driven equipment will be damaged by reverse operation.

D. Grounding System Tests:

1. The Contractor shall test each grounding connection to determine the ground resistance. The grounding test shall be IEEE Standard 81. A plot of ground resistance readings for each isolated ground rod or ground mat shall be provided to the Construction Manager on 8-1/2 x 11-inch size graph paper. The current reference rod shall be driven at least 100 feet from the ground rod or grid under test. The measurements shall be made at 10-foot intervals beginning 25 feet from the test electrode and ending 75 feet from it, in direct line between the ground rod or center of grid and the current reference electrode.
2. A grounding system that shows greater than 5-ohm resistance for the flat portion of the plotted data shall be considered inadequately grounded. The Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurements meet the 5-ohm requirement. Ground rods required over that specified will be paid for as extra work.

3.9 PERMITS AND INSPECTION

- A. Contractor shall obtain all necessary permits to perform the work and arrange for inspection by authorities having jurisdiction. Contractor shall pay all necessary fees.

3.10 GUARANTEES AND TESTS

- A. Work shall be guaranteed for 12 months after date of acceptance. Work shall be free from improper grounds and short circuits.
- B. Contractor shall demonstrate to the Engineer that all of the control systems are operating properly. Contractor shall provide assistance to the submersible pump manufacturer in testing of the pumps.
- C. Contractor shall provide assistance to the generator manufacturer during the start-up and testing of the set.

3.11 COORDINATION

- A. Work under this Section shall be coordinated with that of other trades. Outlets, switches, fixtures, etc., shall be relocated to avoid interference with other work at no additional cost to Owner.

3.12 RECORD DRAWINGS

- A. Record drawings refer to those documents maintained and annotated by the Contractor during construction include record drawings, and the following additional schedules, lists, and drawings.

END OF SECTION

**SECTION 32 92 00
TURF AND GRASSES**

PART 1 GENERAL

1.1 SCOPE

- A. Work under this Section shall include seeding or sodding all disturbed areas. Such areas shall be restored as nearly as possible to original condition.
- B. Sod replacement due to erosion on steep slopes will be done at no additional cost to the Owner.

1.2 DELIVERY, STORAGE AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer and indication of conformance with state and federal laws, as applicable.

1.3 PROJECT CONDITIONS

- A. Weather Limitations: proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 PRODUCTS

2.1 FERTILIZER:

- A. Before planting, a fertilizer of 10:10:10, or other approved composition, shall be hand-raked into the topsoil at a rate of 10 pounds per 1,000 square feet and then watered. Apply lime as per soil test made by Contractor.

2.2 SEED

- A. The area shall be seeded with either common hulled Bermuda, at a rate of 15 lbs. per acre, or Kentucky 31 tall fescue, at a rate of 50 lbs. per acre.

2.3 MULCHES

- A. The area shall be mulched with hay at a rate of 2-1/2 tons per acre.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, or chemicals has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable, and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements and other facilities, trees, shrubs and plantings from damage caused by planting operations.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus ½ inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.3 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions in right angles to each other.
- B. Do not use wet seed or seed that is moldy or otherwise damaged.

- C. Sow seed at a total rate of 3 to 4 lb./1,000 sq. ft.
- D. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly and water with fine spray.

3.4 CLEAN UP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks or other paved areas.
- B. All seeding shall be watered thoroughly as soon as completed and shall be watered at least twice daily, or more often is necessary, to provide continuous growth without setback until all growth from seed is thoroughly established.
- C. An acceptable stand of grass shall be obtained by the Contractor, as determined by the Engineer and defined as covering 98% of the area to be grassed with no bare area greater than one square foot and the entire area fully stabilized against erosion.
- D. If the schedule of construction is such that grassing cannot be accomplished before final inspection of all other items of the Work, the Contractor shall obtain a signed proposal to the Owner for an approved local landscaper for the work specified. The Owner shall deduct the amount of the proposal from the final payment. The work of spreading and compacting topsoil shall be performed, as specified above, by the local landscaper at time of grassing and this work shall be included in his proposal.

END OF SECTION

**SECTION 33 32 00
WASTEWATER UTILITY PUMPING STATIONS**

PART 1 GENERAL

1.1 SCOPE

- A. The work to be done under this Section consists of furnishing all material and equipment and performing all labor necessary for the complete construction of one submersible pump station and all pipe, valves and other appurtenances within the fencing of the pump station as indicated on the Contract Drawings and/or as specified herein.

1.2 RELATED SECTIONS

- A. Section 01 33 00 Submittal Procedures
- B. Section 01 78 23 Operating and Maintenance Data
- C. Section 26 00 00 Electrical
- D. Appendix A

1.3 SUPPLIER

- A. Pumps and controls to be supplied by Xylem.

1.4 SUBMITTALS

- A. The following information shall be submitted for review in accordance with Section 01 33 00:
 - 1. Submit pump manufacturer's catalog data, descriptive literature, and assembly drawings. Show dimensions, materials of construction by specification reference and grade, linings, and coatings.

1.5 REQUIREMENTS

- A. Install three (3) submersible non-clog wastewater pumps in the Middle Oconee Pump Station. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pump shall be supplied with a mating cast iron discharge connection. Each pump shall be fitted with lifting chain or stainless-steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

Design Capacity, gpm	780 gpm
TDH @ Design, ft	149-feet
Outlet Size, inches	4-inches
Motor Horsepower, HP	60 HP
Motor Voltage, volts	460 V

Motor Frequency, Hz	60 Hz
Phase, Poles	3 Phase, 4
Number of Pumps	3

PART 2 PRODUCTS

2.1 PUMP DESIGN

- A. The pump shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wetwell. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring, or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.

2.2 PUMP CONSTRUCTION

- A. Major pump components shall be of gray cast iron, ASTM A48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- B. 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. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- C. 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.

2.3 COOLING SYSTEM

- A. Each unit shall be provided with an integral motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or

auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

2.4 CABLE ENTRY SEAL

- A. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary, using the same entry seal. The cable entry junction chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

2.5 MOTOR

- A. 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 inverted duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of no less than 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor 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. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.
- B. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of $\pm 10\%$. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

- C. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the control panel without the need of any splices. The outer jacket of the cable shall 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.
- D. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

2.6 BEARINGS

- A. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two-row angular contact ball bearing to handle the thrust and radial forces. The minimum L₁₀ bearing life shall be 50,000 hours at any usable portion of the pump curve.

2.7 MECHANICAL SEAL

- A. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.
- B. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.
- C. The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

- D. A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.
- E. Seal lubricant shall be FDA Approved, nontoxic.
- F. Provide 2 spare sets of seals for the pump station.

2.8 PUMP SHAFT

- A. The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel, ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

2.9 IMPELLER

- A. The impeller shall be of (ASTM A-48, Class 35B gray iron or ASTM A-532 (Alloy III A) 25% chrome cast iron) dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the gray iron impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkylid resin primer.

2.10 VOLUTE/SUCTION COVER

- A. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of (ASTM A-48, Class 35B gray iron or ASTM A532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

2.11 PROTECTION

- A. Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule and inspection.
- B. The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.
- C. Provide watertight cables for thermal switches and leak sensor. The cables shall be of adequate length to reach the control panel without splicing.

2.12 CONTROL PANEL

- A. The control function shall provide for the operation of the pumps under normal conditions and shall alternate the pumps on each pump down cycle to equalize the run time. In the event the incoming flow exceeds the capacity of the lead pump, lag pump shall automatically startup to handle the increased flow. As the flow decreases the pump shall cut off at the elevations as shown on the Contract Drawings. Mixer shall operate continuously except when submersible pumps operate.
- B. The enclosure shall be a 14 gauge, NEMA 4X rated enclosure manufactured from 304 stainless steel. The enclosure shall be a free-standing type with a minimum depth of 12", sized to adequately house all the components. The door gasket shall be rubber composition with a retainer to assure a positive weatherproof seal. The door shall open a minimum of 180 degrees.
- C. A polished, aluminum dead front shall be mounted on a continuous aircraft type hinge. It shall contain cutouts for mounted equipment, and provide protection of personnel from live, internal wiring. Cutouts for breaker handles shall be provided to allow operation of breakers without entering the compartment. All control switches, indicator pilot lights, elapsed time meters, duplex receptacle, and other operational devices shall be mounted on the external surface of the dead front. The dead front shall open a minimum of 150 degrees to allow access to equipment for maintenance. A 3/4" break shall be formed around the perimeter of the dead front to provide rigidity.
- D. The back plate shall be manufactured of 12-gauge steel and be finished with a primer coat and two (2) coats of baked on, white enamel. All hardware mounted to the subpanel shall be attached with machine thread, tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified.

- E. The panel power distribution shall include necessary components and be completely wired stranded copper conductors rated at 90 degrees C. All conductor terminations shall be as recommended by the device manufacturer.
- F. All circuit breakers shall be heavy duty thermal magnetic or motor circuit protectors similar and equal to Square D Type FAL. Each motor breaker shall be adequately sized to meet the pump motor operating characteristics with minimum interrupting capacity of 35,000 A R.M.S. symmetrical at 480 volts. The control circuit shall be controlled by heavy duty breakers.
- G. Circuit breakers shall be indicating type, providing "on-off-trip" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position indicating "trip."
- H. Thermal magnetic breakers shall be quick-make and quick-break on manual and automatic operation and have inverse time characteristics secured through the use of bimetallic tripping elements supplemented by a magnetic trip.
- I. Breakers shall be designed so that an overload on one pole automatically trips and opens all legs. Field installed handle ties shall not be acceptable.
- J. Motor starters shall be NEMA size 1 full voltage-non reversing starter for the mixer.
- K. Emergency High Level Alarm: Provide Flygt float-type level sensor for emergency high level.
- L. The control system shall provide for the automatic and manual control and alternation of the pumps to maintain a pumped down condition of the wet well. Levels shall be sensed through a measurement device adjusted to the specified levels. The device shall sense the "off", "lead", "lag", and "alarm" levels. As the level in the wet well rises, the lead pump, as determined by the alternator, shall start and pump the station to the "off" level. In the event the incoming flow exceeds the capacity of the lead pump, the lag pump shall start and both pumps shall run to the "off" level. If the level continues to rise, alarm functions shall be activated. The control system shall include, but not be limited to, the ancillary equipment listed below.
- M. The alarm light shall be a weatherproof, shatterproof, red-light fixture with a 40-watt bulb to indicate alarm conditions. The alarm light shall be turned on by the alarm relay.
- N. Each complete suppression unit shall be UL listed as a secondary surge arrester and bear CSA certification and meet ANSI/IEEE C62-11-1987; suitable for indoor and outdoor applications; suitable for use in service entrance location; meet requirements of NEC Article 280; rated at 650V phase-to-ground maximum.

- O. Control transformers shall be provided to produce the 120 VAC and/or 24 VAC for control circuits. Transformers shall be fused on the primary and secondary circuits. The secondary circuits shall be grounded.
- P. A line voltage rated, adjustable phase monitor shall be installed to sense low voltage, loss of power, reverse phase, and loss of phase. Control circuit shall de-energize upon sensing any of the faults and shall automatically restore service upon return to normal power.
- Q. Provide spare dry contacts for "Pump #1 Fail", "Pump #2 Fail", "Pump #3 Fail", "High Level Alarm", "Pump #1 Run", "Pump #2 Run", "Pump #3 Run" for Owner's use.
- R. A final, "As-built" drawing encapsulated in mylar shall be attached to the inside of the front door. A list of all legends shall be included.
- S. All component parts in the control panel shall be permanently marked and identified as they are indicated on the drawing. Marking shall be on the back plate adjacent to the component. All control conductors shall be identified with wire markers at each end, as close as practical to the end of the conductor.
- T. All panels shall be tested to the power requirements as shown on the plans to assure proper operation of all components. Each control function shall be activated to check for proper indication.
- U. All equipment shall be guaranteed for a period of three (3) years from date of shipment. The guarantee is effective against all defects in workmanship and/or defective components. The warranty is limited to replacement or repair of the defective equipment.
- V. The manufacturer shall be a UL listed shop for industrial control systems and shall serialization evidence of such on the control panel enclosure.

PART 3 EXECUTION

3.1 STAKING AND GRADING FOR WET WELL

- A. The Owner will stake the pump station at the wetwell corners, concrete pads and structure centers. The Contractor shall be responsible for the cost of offset staking and any stakes that must be replaced.
- B. The Contractor shall be responsible for providing laser beam equipment and using this equipment to grade and align all sewer lines between manholes. The Engineer will provide a list of benchmark elevations from which the Contractor may work.

3.2 WASTEWATER UTILITY PUMPING STATION

- A. Install wastewater utility pumping station as shown on the Contract Drawings and in accordance with the manufacturer's requirements.

END OF SECTION

SECTION 33 32 01
EMERGENCY STANDBY PUMP

PART 1 GENERAL

1.1 PROJECT SCOPE

- A. Requirements for providing permanently installed Dri-Prime Back-up System.

1.2 RELATED SECTIONS

- A. Section 013300 Submittal Procedures
- B. Section 033000 Cast-In-Place Concrete
- C. Section 260000 Electrical Work

1.3 SUPPLIER

- A. The pump shall be a Model Dri-Prime® CD140M DBS as manufactured by GODWIN PUMPS, Bridgeport, New Jersey. Pump shall be factory coated a color specified by Owner. Standard manufacturer color (orange) will not be acceptable. It shall be the contractor's responsibility to include the cost of coating.

1.4 GENERAL

- A. The specifications herein state the minimum requirements of The City of Cumming. All bids must be regular in every respect. Unauthorized conditions, limitations, or provisions shall be cause for rejection. The City of Cumming may consider as "irregular" or "non-responsive", any bid not prepared and submitted in accordance with the bid documents and specification, or any bid lacking sufficient technical literature to enable The City of Cumming to make a reasonable determination of compliance to the specification. It shall be the bidder's responsibility to carefully examine each item of the specification. Failure to offer a completed bid or failure to respond to each section of the technical specification (exception yes or no) will cause the proposal to be rejected, without review, as "non-responsive". All variances, exceptions, and/or deviations shall be fully described in the appropriate section. Deceit in responding to the specification will be cause for rejection.
- B. Equivalent Product: Bids will be accepted for consideration on any make and model that is equal to or superior to the specified quantity Godwin Dri-Prime® CD140M (4") four-inch skid mounted pump or equal, as interpreted by The City of Cumming. A blanket statement that equipment proposed will meet all requirements will not be sufficient to establish equivalence but will require an explanation at each deviation or substitution.

- C. Interpretations: In order to be fair to all bidders, no oral interpretations will be given to any bidder as to the meaning of the specification's documents or any part thereof. Every request for each a consideration shall be made in writing to The City of Cumming. Based upon such inquiry, The City of Cumming may choose to issue an Addendum in accordance with local public contract laws.
- D. General Specifications: Units described shall be new, unused, and of the current year's production. The style of pump being bid must be in production for a minimum of __ years (include users list). Unit shall be of the latest design and in current production completely serviced, ready for work and shall include all standard and optional equipment as specified herein. All bidders must have demonstrated the unit they are bidding, prior to bid date.
- E. Proposers must have a fully stocked parts and service facility within 50 miles of the City of Cumming. The City of Cumming shall have the right to inspect the office and shall be the sold judge of its adequacy to fulfill this requirement.
- F. Proposers, on request of The City of Cumming, must be prepared to review their specifications with The City of Cumming and must, if requested, also be prepared to provide a unit for the convenience of The City of Cumming. These services, if needed, are considered as part of the bidder's proposal and will be provided without cost or obligation to The City of Cumming.

1.5 SYSTEM DESCRIPTION

- A. The permanent skid mounted trash pump specified in this section will be used to pump raw sewage.
- B. Pump shall be fitted with a fully automatic priming system capable of repeated priming from a completely dry pump casing.
- C. The pump and accessories shall be supplied by the pump manufacturer.
- D. The pump offered shall be the manufacturer's standard production model. It shall have been in continuous use by municipal and industrial owners for a minimum of five years. A list of five user contacts including contact names and telephone numbers shall be provided with the bid submittal. Failure to supply a verifiable users list will be cause for rejection of the bid.

1.6 DESIGN REQUIREMENTS

Operating Speed	1 600 RPM
Maximum Solids Handling Size	3-inch
Impeller Diameter	356 MM
Shaft Diameter (at seal)	50 MM
Suction Size	6-Inches
Discharge Size	6-Inches

Maximum Suction Lift	28-Feet
Pump Shut-Off Head	280-Feet
Maximum Duty Point	780GPM AT 150-ft TDH

1.7 REFERENCES

- A. ANSI B16.1 - Standard for Cast Iron Pipe Flanges and Flanged Fittings.

PART 2 PRODUCT

2.1 ACCEPTABLE MANUFACTURER

- A. The pump shall be Model CD160M, size 6-inches as manufactured by GODWIN PUMPS, Bridgeport, New Jersey.

2.2 EQUIPMENT

- A. Volute, Suction Cover, Separation Tank: Pump castings shall be cast iron. Pump design shall incorporate a direct suction flow path that is in axial alignment with the impeller eye. There shall be no turns, chambers, or valves between the suction flange and the impeller eye.
- B. Impellers: The pump impeller shall be of open non-clog type with pump out vanes on the back shroud. The impeller shall be two-bladed of hardened cast chromium steel construction. Shrouded or semi-shrouded (non-clog) impellers will not be accepted.
- C. Wearplates: Shall be fully adjustable and replaceable, fabricated of cast iron. Wearplate clearances shall have no relationship to the ability of the pump to achieve a prime. The pump wearplates shall be of a diameter equal to or greater than the impeller diameter, to ensure maximum protection to the pump casing. Under no circumstances will wear rings be accepted.
- D. Bearings and Shafts: Pump shall be fitted with a bearing bracket that contains the shaft and heavy-duty ball or tapered roller bearings of adequate size to withstand imposed loads. Minimum I.S.O. L10 bearing life to be 100,000 hours. Impeller shaft shall be of 1½% chromium alloy and have a minimum diameter of 50-mm at the pump seal.
- E. Seals: Seals shall be high pressure, back-to-back double mechanical self-adjusting type with solid silicon carbide faces capable of withstanding suction pressures to 72 psi. The mechanical seal shall be cooled and lubricated in an oil bath reservoir, requiring no maintenance or adjustment. Pump shall be capable of running dry, with no damage, for periods up to 24 hours. All metal parts shall be of stainless steel. Elastomers shall be Viton.

- F. Pump Suction and discharge Flanges: Shall be cast iron ANSI (B16.1) Class 150, flat faced.
- G. Pump Gaskets: Shall be compressed fiber and/or Teflon.
- H. Pump O-Rings: Shall be Nitrile & Viton.
- I. Priming System: Automatic priming system incorporates a twin-cylinder compressor and air ejector assembly, no vacuum pump. The compressor shall be installed on the engine auxiliary drive and shall be gear driven, lubricated and cooled from the engine. The priming system shall require no fail-safe protection float gear or any adjusting at high or low suction lifts. Pumps with self-priming chambers modified with vacuum priming systems shall not be accepted as equal. The pump must be capable of running totally dry for periods up to 24 hours, then re-priming and returning to normal pumping volumes. Pump and priming system is capable of priming the pump from a completely dry pump casing. The pump shall be capable of static suction lifts to 28 vertical feet, at sea level. It shall also be capable of operation using extended suction lines. Equipment acceptance shall be contingent upon the pump's ability to run continuously at full speed in a completely dry condition for periods up to 24 hours. The engineer may require a demonstration.
- J. Check Valve: Pump shall be supplied with an integral flap check valve mounted on the discharge flange of the pump, allowing unrestricted flow into the impeller. The check valve shall prevent in-line return of flow when the pump is shut off. Non-return valve elastomers shall be Nitrile rubber and shall be field replaceable.
- K. Drive Unit: The drive unit shall be a diesel water-cooled engine. The engine shall drive the pump by use of direct connected intermediate drive plate. Starter shall be 12 volt electric. Safety shut down switches for low oil pressure and high temperature shall be integral to the engine control panel. Battery shall have 180-amp hour rating. The engine control panel shall include a tachometer and an hour meter. Drive unit shall be a John Deere 4045HF280 or equal, rated at 99 HP (continuous) at 2000 RPM. A certified, continuous-duty engine curve shall be supplied to The City of Cumming/engineer.
- L. Engine Control Panel: Engine speed shall be adjustable to operate the pump between maximum and minimum design operation speeds in manual mode. See section 2.3 for Automatic mode.
- M. Fuel Tank: Integral structural steel skid type fuel tank shall be sized with sufficient capacity to provide at least 24-hours of operating time at full load. The engine shall be capable of operating satisfactorily on a commercial grade of distilled No. 2 fuel oil. Contractor shall provide full tank of fuel at time of acceptance by owner.

- N. Exhaust: Exhaust system shall include a hospital grade muffler housed in a separate chamber within the enclosure. All exhaust piping and manifolds shall be encased in fitted acoustic blankets. They shall be constructed of high-density fiberglass material with waterproof jacketing.
- O. Sound Attenuated Enclosure: The engine and pump shall be completely enclosed with 14-gauge sheet metal panels backed with 1" and 2" layers of polydamp acoustical sound deadening material. The acoustical enclosure shall reduce pump and engine noise to sixty-eight dBA or less at a distance of 30 feet. The panels shall be removable for easy access to the engine / pump for maintenance and repair. The engine control panel shall have a locking door with window for visual inspection. For maintenance and service needs, the pump discharge side shall have a hinged door for quick access to the engine oil fill, fuel fill port, oil dipstick and filters.
- P. Factory Painting: Pump, engine, base, and sound attenuated enclosure shall be shop primed and finish painted at the place of manufacturer. Materials and thickness for priming shall be in accordance with manufacturer's standards.

2.3 UL LISTED SKID BASE

- A. The pump base tank shall be a UL-142 approved double wall design constructed in accordance with Flammable and Combustible Liquids Code, NFPA 30; The Standard for Installation and use of Stationary Combustible Engine and Gas Turbines, NFPA 37; and The Standard for Emergency and Standby Power Systems, NFPA 110.
- B. The tank design shall be a Closed Top Dike Pump Base Tank. It shall be of double wall construction having a primary tank to contain the diesel fuel, held within another tank or dike, which is intended to collect and contain any accidental leakage from the primary fuel tank. The completed base tank assembly is to incorporate pump mounting locations and must be able to support four times the rated load.
- C. The primary tank shall be designed to withstand normal and emergency internal pressures and external loads. It shall be capable of withstanding internal air pressures of 3 to 5 psig without showing signs of excessive or permanent distortion and 25 psig hydrostatic pressure without evidence of rupture or leakage.
- D. The primary and secondary tanks or dike shall have venting provisions to prevent the development of vacuum or pressure capable of distorting them as a result of the atmospheric temperature changes or while emptying or filling. The vent shall also permit the relief of internal pressures caused by exposure to fires. The vent size shall be determined by using the calculated wetted surface area in square feet (the top is excluded) in conjunction with venting capacity table 10.1 of UL-142. The tank's vent shall also be equipped with a coupling device and

shall be located to facilitate connection to a vent piping system. The dike's vent may be an opening for venting directly to the atmosphere and protection from the entrance of natural elements or debris shall be provided.

- E. The primary tank is to be constructed of 7-gauge ASTM A569 or A-36 hot rolled steel. Internal baffles or reinforcement plates shall be located on a maximum of 24-inch centers in tanks up to 60-inch width and on a maximum of 19.5-inch centers in tanks over 60-inch width. At least one baffle shall separate the fuel suction pipe from the fuel return line.
- F. The outer tank is to be constructed in a manner to be able to support four times the wet load of the pump and housing. All of the load is to be carried by the outer tank, so no load or vibration stress is placed on the primary tank. If the pump base tank is wider than the pump set to be supported, structural rails are to be incorporated to span the width of the base tank so that the load is transferred to the side rails of the tank. Vertical reinforcements shall be welded to the outer sides of the secondary tank or dike at a maximum of 45-inch centers on tanks up to 30 inches high and on 24-inch centers on tanks greater than 30 inches high. At least one vertical reinforcement shall be positioned adjacent to each mounting hole location.
- G. Both primary and secondary tanks shall be fitted with the proper welded pipe fittings to accommodate the requirements for the fill port and normal and emergency venting.
- H. The completed assembly is to be cleaned with a heated pressure wash followed by a chromium free post treatment to ensure proper paint adhesion. The tank assembly is to be painted with an epoxy ester primer and high-quality polyurethane enamel with total paint thickness of 3.5 mils. The painted tank assembly is to be baked at 180 degrees for 30 minutes to provide a hard durable finish.
- I. Manufacturing and testing of this system shall be performed within the scope of Underwriters Laboratories, Inc. "Standard for Safety UL 142." A UL label shall be permanently attached to the tank system showing the following information:
 - 1. The registered UL mark and the name: Underwriters Laboratories, Inc.
 - 2. A control number and the word "listed."
 - 3. The product's name as identified by Underwriters Laboratories Inc.
 - 4. The serial number assigned by Underwriters Laboratories, Inc.
 - 5. Other manufacturer's information may also be included.

2.4 AUTOMATIC STARTING CONTROL SYSTEM

- A. The engine shall be equipped with a factory installed PrimeGuard 2 microprocessor-based controller as supplied by Godwin Pumps of America, Inc. and designed to start/stop the engine at a signal supplied by high- and low-level floats or a 4-20 mA transducer.

2.5 ENGINE / PUMP CONTROL SPECIFICATIONS

- A. The engine shall be started, stopped, and controlled by a PrimeGuard2 high performance state of the art digital controller as supplied by Godwin Pumps of America. The PrimeGuard2 Controller shall be weatherproof enclosed and contain an external weatherproof 12-position keypad accessible without the need to remove or open any protective cover or enclosure. It shall be designed to start/stop the engine at a signal supplied by high- and low-level floats or a 4-20 mA transducer. The PrimeGuard2 Controller shall provide the following functions without modification, factory recalibration or change of chips or boards by simply accessing the keypad.
- B. The keypad shall be a capacitive touch sensing system. No mechanical switches will be acceptable. The keypad shall operate in extreme temperatures, through ice, snow, mud, grease, etc. and maintain complete weather tight sealing of the PrimeGuard2 Controller.
- C. In automatic mode, the unit shall conserve energy and go to "sleep".
- D. The PrimeGuard2 Controller shall function interchangeably from; float switches, pressure switch, or transducer as well as manual start/stop by selection at the keypad. No other equipment or hardware changes are required.
- E. The PrimeGuard2 Controller shall be capable of varying the engine speed to maintain a constant level in a process without a change to the panel other than via the keypad.
- F. The start function can be programmed to provide three separate functions each day for seven days (i.e., a start, warm up, exercise cycle on two separate days at different times and for a varying length of time all via the keypad).
- G. Manual-Automatic Button:
 - 1. In Manual Mode, manual "Start" button starts engine and runs until "Stop" button is depressed or an emergency shutdown occurs.
 - 2. In Automatic Mode start/stop sequencing is initiated by either one-normally open and one-normally closed narrow angler float switches, pressure switch, transducer or a signal from a digital input.
- H. The controller shall integrate the engine safety shut-off for low and high oil temperature and provide over-speed protection.
- I. The controller shall include standard, field-adjustable parameters for engine cycle crank timer, shutdown time delay, warm-up time delay, and cool-down time delay.

- J. The PrimeGuard2 Controller shall have only one circuit board with 8 built in relays. Each relay can be named to provide any function all via the key play without changing relays, chips, printed circuits or any hardware or software.
- K. Standard components shall consist of (6) digital inputs, (8) analog inputs, (1) magnetic pick-up input, (6) 10-amp form "C" relays, (2) 20-amp form "C" relays, (1) RS485 port, (1) J1939 port, and (1) 320x240 pixel full graphic LCD display with backlight, (1) 12 position keypad, LCD lamps for visual indication of shutdown (red), warning (amber) and power (green).
- L. The industrially hardened PrimeGuard2 Controller shall withstand Vibration of 3 g, 3 axis, frequency swept 10-1000 Hz, in an operating temperature Range of 4° to 176°F (-20° to 80°C) and an operating humidity range of 0-95% Non-Condensing.
- M. Electronic Fuel Sender: The unit shall be supplied with (1) custom length fuel sensor assembly. Fuel sensor will have a 1½in NPT brass pipe plug and a sensor output of 33-240ohms. The sensor shall integrate with the engine control panel via the analog inputs on the PrimeGuard2.
- N. FIELD SMART TECHNOLOGY: The unit shall be equipped with Field Smart Technology (FST) integrated with the PrimeGuard 2 controller. Field Smart shall allow remote communication with the pumpset via password protected cloud-based webserver. FST shall have the ability to communicate anywhere in the world and offer 3 modes of communication—GPS, Cellular, Satellite. FST shall allow the unit to be started, stopped, and vary the speed from the web hosted platform and transmit the following data at a minimum:
- Timestamp
 - Engine hours
 - Engine on/off
 - Engine Temp
 - Battery Voltage
 - RPM
 - Oil Pressure
 - Optional voice alarm notifications

FST shall read data from the PrimeGuard 2 and, on electronic engines, directly from the ECU. All Data shall be recorded in one-minute intervals and available for download. The web hosted platform shall enable users to set alarms for engine on, engine off, geofence barriers and ECU alarms.

2.6 OPTIONS

- A. Auto-Throttle: The engine shall be fitted with an auto-throttle and integrated into the PrimeGuard control panel for variable engine speed control.
- B. Float Switches: One-normally open and one-normally closed narrow angle (10° to 20°) float switches integrate into automatic pump controller. The floats shall be constructed with tilt sensation switches enclosed within stainless steel. Each float will have a minimum 65 ft. waterproof cable wired into a twist-lock wiring harness that connects directly to a PrimeGaurd 2.
- C. Engine Block Heater: The drive unit shall be supplier with an integral thermostatically charged block heater. Heater to be supplied with three wire plug, 110 VAC required. The heater shall be of suitable size to keep the engine warm in
- D. Fully Automatic Trickle Charger: The unit shall include a fully automatic trickle charger powered by 10-amps, 115 VAC.
- E. Interior Light: The unit shall include a single switch operated 12 VDC interior dome light mounted within the enclosure.
- F. Working Light: The unit/s shall include two (2) externally base mounted, adjustable, 12 VDC flood light/s, rearward facing the suction and discharge piping operated by a single switch.

PART 3 EXECUTION

3.1 MANUFACTURER'S SERVICES

- G. The manufacturer shall furnish the services of a competent factory representative to do the following:
 - 1. Inspect the system prior to delivery, supervise the start-up and testing of the system, and certify the system has been properly furnished and is ready for operation.
 - 2. Instruct the owner's operating personnel in the proper operation and maintenance of the system for a period of not less than one half day.

2.7 TOOLS AND SPARE PARTS

- A. The manufacturer shall furnish the following with the Emergency Standby Pump System:
 - 1. A recommended list of spare parts.

2. The manufacturer shall be able to demonstrate an ability to provide 24-hour parts availability. Manufacturers not stocking replacement pump parts for this model pump will be cause for rejection.

2.8 WARRANTY

- A. The manufacturer shall furnish the following to the owner:
 1. A copy of the engine manufacturer's parts and labor warranty.
 2. A One Year Parts and Labor Warranty issued by the manufacturer on the Emergency Standby Pump System.

END OF SECTION

**SECTION 33 35 00
VALVES AND APPURTENANCES**

PART 1 GENERAL

1.1 SCOPE

- A. The work to be done under this Section of the Specifications consists of furnishing all materials and performing all labor necessary for the complete construction of valves, as indicated on the Contract Drawings and/or specified.

1.2 GENERAL

- A. All materials used in the construction shall be new and unused when delivered to the site and shall be subject to inspection by the Engineer before installation.

1.3 RELATED SECTIONS

- A. Section 01 33 00 Submittal Procedures
- B. Section 01 78 23 Operation and Maintenance Data
- C. Section 01 45 34 Product Delivery Storage and Handling

1.4 SUBMITTALS

- A. The following information shall be submitted for review in accordance with Section 01 33 00:
 - 1. Submit valve manufacturer's catalog data, descriptive literature and assembly drawings. Show dimensions, materials of construction by specification reference and grade, linings and coatings.
 - 2. Submit manufacturer's affidavit of compliance with referenced standards.
- B. Submit Warranty and Certification Form per Section 01 33 00.
- C. Submit Operation and Maintenance Manuals in accordance with Section 01 78 23.
- D. Test Reports to be submitted:
 - 1. Copies of all test results, as specified in Part 3 of this Section.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, handle, and store the equipment in accordance with Section 01 45 34.

1.6 WARRANTY

- A. The manufacturer shall warrant in writing all equipment against defects in materials and workmanship for a period of 12 months from the date of substantial completion. Within this 12-month period, any defective or malfunctioning equipment, component, or accessory shall be repaired or replaced upon notice at no additional cost to the Owner.
- B. Refer to Section 01 70 00 for additional information.

PART 2 PRODUCTS

2.1 GENERAL

- A. Valves are identified by both type and style.
- B. General Valve Requirements
 - 1. Select such that it is suitable for the intended service.
 - 2. Use the following in metal pipelines unless otherwise shown on the Drawings:
 - a. Two-inch diameter and smaller:
 - 1. All brass or bronze except for the handwheel.
 - 2. Screwed or soldered ends.
 - b. Two and one-half inches in diameter and larger:
 - 1. Iron body, bronze mounted.
 - 2. Flanged or mechanical joint ends for valves 4-inches in diameter and larger.
 - 3. Screwed connections may be used for smaller valves.
 - 3. Make valve the same size as connecting piping. Drawings indicate nominal size unless otherwise noted.
 - 4. Provide end connections that are compatible with connecting piping.
 - a. Cast flanges and mechanical joint bells at right angles to the casting axis.
 - b. Drill and shop coat with a rust preventive compound prior to shipment.
 - c. Provide a union adjacent to all valves with screwed or soldered connections to facilitate removal.

5. Open counterclockwise.
6. Equip non-rising stem valves with a suitable position indicator.
7. Provide rising stem valves with a clear stem guard that is calibrated to indicate stem position.
8. Connect extension stems to valves using bronze couplings.
 - a. Size to withstand all stresses without deformation. Use a minimum safety factor of six.
 - b. Fabricate and install stems to operate valve without binding.
9. Provide the manufacturer's name and valve size on the body or bonnet of the valve. Use
 - a. Cast letters, or
 - b. Provide permanently attached plate with information stamped in raised letters.
- C. Furnish valves complete with operators, extension stems, floor stands, operating wrenches and all other appurtenances necessary for them to perform as designed. Mount actuators and appurtenances in the factory and ship as a unit.
 1. Manual operators
 - a. Provide a handwheel for conveniently accessible valves.
 - b. Provide a chainwheel operator for all manual valves greater than 6 feet above the finished floor or working surface.
 1. Extend the chain to within 4 feet of the floor or working surface.
 2. Secure chain using hooks fastened to walls or other parts of the structure. Locate hooks so that the chain does not obstruct access ways.
 - c. Size handwheels and chainwheels and provide actuator gearing to limit the maximum operating force to 80 pounds. Include floor stands, floor boxes, and extended actuators were shown on the Drawings.
 - d. Include stem extensions, valve boxes, position indicators, and Tee wrenches for buried valves.
 1. Provide 2-inch square AWWA operating nut.
 2. Locate operating nut no more than 12 inches below grade.

2.2 BALL VALVES

A. Compressed Air Service

1. Size: ¼ inch to 3 inch for hot and cold water or compressed air service
2. Body: Forged brass
3. Ball: Chrome plated brass
4. Stem: Nickel plated brass
5. Seat: Virgin PTFE
6. End Connections:
 - a. Threaded up to 3 inches
 - b. Soldered up to 2 inches
7. Actuator
 - a. Provide type as specified
 - b. One-quarter turn to open or close
8. Manufacturers
 - a. Jamesbury, Series 300
 - b. Or equal

B. True Union Style

1. Size: ½ inch to 4-inch true union PVC ball valves
2. Design standard
 - a. ASTM D2467
3. Body, ball and stem:
 - a. PVC conforming to ASTM D1784, Classification 12454
 - b. Full port (1/2"-4")
 - c. Integral mounting pad to facilitate actuation (if required)

- d. CPVC conforming to ASTM D1784, Classification 23447.
- 4. Seat:
 - a. Teflon
- 5. End Connections:
 - a. True union
 - b. Socket
- 6. Actuator:
 - a. Provide manual type, unless noted otherwise
 - b. One-quarter turn to open or close
- 7. Manufacturers:
 - a. Hayward
 - b. NIBCO
 - c. Or equal

2.3 MISCELLANEOUS VALVES

A. Air/Vacuum and Combination Valves

- 1. Air vacuum valve for use on the discharge of vertical water pumps
 - a. Size: 1 inch through 12-inch
 - b. Design standard
 - 3. AWWA C512
 - 4. NSF 61
 - c. Body
 - 1. Cast iron conforming to ASTM A126, Class B.
 - 2. Ductile iron conforming to ASTM A536, Grade 65-45-12.
 - d. Trim:
 - 1. Type 316 stainless steel.

2. Buna-N seals.

e. Accessories:

1. Anti-slam device

f. End Connections:

1. Inlet – Flanged conforming to ANSI B16.1, Class 125.

2. Outlet – Flanged conforming to ANSI B16.1, Class 125.

g. Coatings and Linings:

1. Provide fusion bonded epoxy lining.

2. Prime coat exterior.

i. Comply with Section 09 91 00.

ii. Ensure primer is compatible with specified field coatings.

3. NSF 61 compliant.

h. Manufacturers:

1. Val-Matic Valve and Manufacturing Corporation

2. Crispin

3. Or equal

B. Pressure Relief Valve

1. PRV

a. Size: ½-inch through 2 inches

b. Outlet pressure range: 0 to 2 psi

c. Inlet pressure range: 20 to 40 psi

d. Design flow: 0 to 10 gpm

e. Manufacturers

1. GA Industries, Inc. Fig. 667-D

2. Ross Valve Manufacturing Co., Inc.

3. Cla-Val

C. Reduced Pressure Backflow Preventer

1. Size: ¼ inch to 2 inch

- a. A reduced pressure zone assembly shall be installed at each potential health hazard location to prevent backflow due to back- siphonage and/or backpressure. The assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs.
- b. Seats and seat discs shall be replaceable in both check modules and the relief valve.
- c. There shall be no threads or screws in the waterway exposed to line fluids. Service of all internal components shall be through a single access bronze cover secured with stainless steel bolts.
- d. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks and an air gap drain fitting. The assembly shall meet the requirements of: USC; ASSE Std. 1013; AWWA Std. C511-92; CSA B64.4.
- e. Reduced pressure backflow preventer shall be as manufactured by Watts Series 009, Zurn 975XL or approved equal.

2. Size: 2-½ inch to 10 inch

- a. A reduced pressure zone assembly shall be installed at each cross-connection to prevent backsiphonage and backpressure backflow of hazardous materials into the potable water supply. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves and captured springs. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel. The assembly shall include two tightly closing shutoff valves before and after the valve and test cocks.
- b. The lead-free reduced pressure zone assembly shall comply with state codes and standards, where applicable, requiring reduced lead content.

- c. The assembly shall meet the requirements of ASSE Std. 1013; AWWA Std. C511-92; CSA B64.5; and UL Classified File No. EX3185. Listed by IAPMO (UPC). Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. Body: Cast iron conforming to ASTM A126.
- d. Reduced pressure backflow preventer shall be as manufactured by Watts Series LF909, Zurn 375 or approved equal.

2.4 SWING CHECK VALVE

- A. Swing Check Valves shall be per AWWA C508 and include bottom mounted buffer to permit free opening, but positive non-slam closure of the disc. The oil hydraulic buffer shall make contact with the disc during the final 10% of closure to control the disc until shut-off in a manner to prevent slam and water hammer.
- B. The buffer rod shall be 303 stainless steel per ASTM A582. The final closure is to be adjustable by means of a color-coded micrometer type control valve. Control valve to have a locking set screw to secure final setting.
- C. The oil reservoir shall be 316 stainless steel per ASTM A240. Hydraulic hoses are to be S.A.E. certified.
- D. The body shall be ASTM A126 Class B cast iron. End connections shall be flanged class 125/150 per ANSI B16.1. Valves 8" and larger shall have a drain plug located on the bottom of the valve.
- E. The body seat shall be 316 stainless steel per ASTM A276 with an o-ring seal and locked into place with stainless screws.
- F. The disc and arm shall be ASTM A536 ductile iron. The disc shall be attached to the disc arm with a double clevis hinge to assure self-leveling and even load distribution upon closure, minimizing seat wear. Disc shall have an independent adjustable full open disc stop. The disc arm, valve body or cover is not used as the disc stop. Disc seat shall be nitrile butadiene (NBR) and field replaceable without the use of special tools.
- G. The pivot shaft shall be one-piece 303 stainless steel per ASTM A582, protruding through the valve body with a lever and weight mounted on one side. The pivot shaft shall have an integral retainer to prevent axial shaft movement. The pivot shaft shall have O-ring seals on both sides of the shaft. Braided type packing is not acceptable.
- H. Valve is to be tested by the manufacturer as a complete assembly, including the bottom buffer, per AWWA C508.
- I. Check Valves to be APCO Model CVS-6000B as manufactured by DeZurik.

2.5 PLUG VALVES

- A. Plug valves shall be of the eccentric non-lubricated, manually operated type, and be designed for the use and working pressure intended.
- B. Valves shall have flanged ends or mechanical joint ends, as shown on the Drawings. Valve body shall be of semi-steel.
- C. Seats shall have a welded-in overlay of not less than 90% pure nickel on all surfaces which will contact the plug face.
- D. The plug shall be totally encapsulated with Buna-N rubber.
- E. Plug stem bushing shall be of stainless steel, and permanently lubricated type.
- F. Valves shall have a 2" square operating nut, with worm gear actuator and open LEFT.
- G. Valves placed in a valve box shall have a handwheel operator.
- H. Plug valves shall be as manufactured by DeZurik, Homestead, GA Industries or approved equal.

2.6 SEWAGE AIR RELEASE VALVE

- A. The sewage air release & vacuum break valve shall consist of all stainless-steel fabricated body.
- B. Connection to the valve inlet shall be facilitated by flanged ends conforming to ANSI B16.1 Class 125 or Class 250 Standards.
- C. Valves shall respond to the presence of air/gas by discharging it through the small orifice at any pressures within a specified design range, i.e., 7 psi to 150 psi and shall remain leak tight in the absence of air.
- D. Valves shall react immediately to pipe line drainage or liquid column separation to allow unobstructed air intake at the lowest possible negative internal pipe line pressure.
- 5. The sewage air release valves shall be Vent-O-Mat Model No. 050RGX1021, DeZurik/APCO ASU, Vent Tech Model SZG or A.R.I. Model D-025, with 2-inch inlet size.

2.7 GATE VALVES

- A. Gate valves shall be resilient-seated wedge type.

- B. Valve body, bonnet and wedge shall be constructed of ductile iron. The exterior of the ductile iron wedge shall be encapsulated with nitrile rubber.
- C. The wedge shall be symmetrical and seal equally well with flow in either direction. There shall be no exposed metal seams, edges or screws within the waterway.
- D. The stem shall be bronze in full compliance with Section 4.7 of AWWA C509.
- E. Wrench nut shall be constructed of ductile iron. Wrench nut shall have 4 flats at stem connection to assure even distribution of operating input torque to the stem.
- F. All Body-to-bonnet and bonnet-to-cover seals shall be O-rings. Flat gaskets shall not be allowed.
- G. Stem shall be sealed by 3 O-rings. The top 2 O-rings shall be replaceable with valve fully open and while subject to full rated working pressure. O-rings set in a cartridge shall not be allowed.
- H. Valve shall have thrust washers located above and below thrust collar to assure easy operation of the valve.
- I. All internal and external ferrous surfaces of the valve body and bonnet shall have a fusion bonded epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly. 250# raised face flanges shall be provided when required.
- J. Valves shall be American Flow Control's Series 2500 Ductile Iron Resilient Wedge Gate Valve or approved equal.

2.8 SEWAGE SURGE RELIEF VALVE

- A. Surge Relief Angle Valves shall be normally closed against the system pressure by external spring(s) in compression and shall open quickly to relieve pressure when the system pressure exceeds the pressure relief setting. The pressure relief setting shall be factory set and field adjustable by adjusting the spring compression. The valve will begin to close when the system pressure subsides below the pressure relief setting. The closing speed shall be adjustable to suit the application by means of infinitely adjustable, lockable flow control valve.
- B. Body shall be a 90-degree elbow design conforming to the center-to-face dimension for long-radius elbows per ASME B16.1 and ASME B16.42. Valve shall be a compact design to fit in tight installation spaces.
- C. Body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. Body Seat shall be 316 stainless steel. Flanges shall be flat faced and conform to ASME B16.42 Class 150. Valve shall be proof-of-design tested to 5,000 cycles.

- D. A self-contained, sealed hydraulic system shall provide closing speed control. The valve cover shall provide an air gap between the line fluid and the hydraulic oil that will indicate seal wear and prevent contamination of line fluid or hydraulic oil. The valve shall be capable of being mounted in any position without modification or customization of the hydraulic system components. A mechanical stroke counter with manual reset shall provide local indication of total valve cycles.
- E. External spring(s) located on the valve cover in a protective steel enclosure shall provide closing force. Springs shall be sized to optimally match customer-specified relief pressure setting to minimize pressure rise above the set-point in order to fully open valve. A single adjustment screw shall be provided for field adjustment of relief pressure setting.
- F. Valve Disc shall have a replaceable seat ring of Acrylonitrile-Butadiene (NBR); Terpolymer of Ethylene, Propylene and A Diene (EPDM) or Fluoro Rubber (FKM) for tight shutoff.
- G. All valves shall be APCO model SRA-3000A Surge Relief Angle Valves as manufactured by DeZURIK or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install valves as shown on the Contract Drawings and in accordance with manufacturer's requirements.

3.2 APPROVED SUPPLIERS

- A. Approved supplier for the Sewage Surge Relief Valve:
 - 1. GA Industries (VAG USA, LLC), 9025 Marshall Road, Cranberry Township, PA 16066, Phone (724) 776-1020, Email: info-ga@vag-group.com

END OF SECTION

**SECTION 40 91 00
SCADA SYSTEM**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The work described in this section shall consist of furnishing and installing the telemetry monitoring and control system described herein. The electrical work shown on the drawings and specified in this section shall be performed by the Supplier of the Telemetry system. System shall be supplied by the MR Systems, Inc., Southern Flow, Inc., or approved equal.
- B. The telemetry system supplier shall be responsible for obtaining necessary licensees to perform the work and shall pay all the required fees.
- C. Provide new HMI Screen (Trihedral) showing the new lift station and updating the existing overall screen to include the new lift station.
- D. Refer to drawings for monitoring points.
- E. Include one year of prepaid cellular service.

1.2 SUBMITTALS

- A. Submit shop drawings for Engineer's approval in accordance with Section 01 33 00 Submittal Procedures.
- B. Detailed drawings and descriptive literature are required for the following equipment:
 - 1. Telemetry monitoring and control system
 - 2. Conduits
 - 3. Power, control, and signal conductors
 - 4. Grounding electrodes and conductors
 - 5. Circuit Breakers
 - 6. Miscellaneous electrical components for use in modification work.

1.3 QUALITY CRITERIA

- A. The electrical work, under the requirements of the specification, shall be in conformance with the Nation Occupational Safety and Health Administration Requirements, the requirements of the National Electrical Code and all applicable local and state laws and ordinances.
- B. All the electrical materials shall be new and shall be manufactured to the following standards:
 - 1. American National Standards Institute (ANSI)
 - 2. Institute of Electrical and Electronics Engineers (IEEE)
 - 3. Insulated Cable Engineers Association (ICEA)
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. The Underwriter's Laboratories, Inc.

1.4 COORDINATION

- A. The Telemetry System Supplier shall coordinate his work with the Owner. Any work that requires utility outages or interferes with the normal operation of the Owner's water system shall be performed with Owner's written approval at times designated by the Owner.

1.5 OPEN SYSTEM

- A. The telemetry system shall be based on Allen Bradley PLCs and utilize open architecture with Ethernet / IP protocol so that future RTU's can be of any manufacturer that utilizes Ethernet / IP protocol. Proprietary systems will not be considered.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. A fully integrated cellular based telemetry monitoring system shall be designed, furnished and installed which provides the Owner with automated feedback control and information specified in this section AND on the drawings.

- B. The following significant items shall be furnished and installed complete in every detail:
 - 1. Remote Terminal Units (RTU's) with telemetry equipment and enclosures.
 - 2. Interface sensors and relays not furnished by Owner.
- C. The system shall have the capability of performing the following functions:
 - 1. Monitor system parameters (pumps run, pumps fault, wet well level, generator status, standby engine status, pressure, etc.)
 - 2. Monitor pressure, level, metering, and peripheral sensors both analog or digital
 - 3. Provide an operator interface with system
 - 4. Provide records of appropriate system transactions

2.2 QUALITY ASSURANCE

- A. The Supplier of the telemetry monitoring system must be able to demonstrate to the satisfaction of the Owner that similar existing systems, designed, furnished, and installed by the Supplier meet the functionality, technical correctness, durability, flexibility, and aesthetics expectations of the Owner.
- B. The Supplier must have the capability of accomplishing radio path surveys.
- C. Interface protection schemes shall be an integral part of the system including but not limited to the following measures and shall be included in the Supplier's bid:
 - 1. All hardwired interconnected panels and devices within a facility shall be grounded with a minimum of one #6 bare copper conductor attached with copper, bronze, or stainless-steel high-quality connectors.
 - 2. Cellular Antenna
 - 3. All RTU's shall be equipped with line and input and output interface boards which provide surge protection through suitable MOV's, dry contacts and/or opto-isolation devices.

2.3 POWER REQUIREMENTS

- A. RTU's shall be supplied with 5-amp hours battery backup power.

2.4 TRAINING

- A. A minimum of eight hours training shall be provided on the system operations and maintenance.

2.5 SYSTEM SUPPORT

- A. Unlimited telephone support shall be provided for a period of three years.
- B. Replacement parts shall be shipped within 24 hours of request.

2.6 MAINTENANCE

- A. The system Supplier shall maintain on call qualified field service electricians and electronic technicians to assist in normal system maintenance.
- B. In the event emergency repairs are required the system Supplier shall respond within a maximum of 24 hours.
- C. During 1 year warranty, the system supplier shall provide all maintenance including changing fuses, board swapping, checking batteries, and checking voltages.

2.7 WARRANTY

- A. A one-year field warranty shall be provided for the system.
This warranty shall cover all materials, labor, and system operation. The warranty shall cover any problems which prevent satisfactory operation including lightning and surge related problems.

2.8 TELEMETRY SYSTEM SUBMITTALS

- A. The Supplier shall provide the following submittal information to the Owner:
 - 1. Three references of similar projects with the bid Suggested Specifications
 - 2. Overview drawing
 - 3. System diagram
 - 4. Significant item cut sheets
 - 5. Interconnect diagrams
 - 6. Spare parts list
 - 7. Installation, operations, & maintenance manuals
 - 8. Warranty document
 - 9. Project schedule

2.9 REMOTE TERMINAL UNITS

- A. RTU shall have the following common characteristics:
 - 1. Capable of routing, storing & forward repeating
 - 2. Capable of executing system control computer (SCC) commands
 - 3. Capable of monitoring site functions and status.
 - 4. Process digital and analog inputs and outputs
 - 5. Operate on a battery backup
 - 6. Normal input power 120 volts AC
 - 7. Capability of being solar powered including cellular modem
 - 8. Have a unique group and station digital address.
 - 9. Report alarms as they occur
 - 10. Have overvoltage protection on I/O, line and antenna interconnects
- B. The RTU enclosures shall be NEMA-4X stainless steel
 - 1. NEMA-4X with hinged pad lockable door for remote RTU's
 - 2. Sized for equipment, environment, installation, and maintenance access.
- C. RTU general requirements are established in the interest of functionality, durability, flexibility, cost effectiveness, and standardization for operations and maintenance.
 - 1. Electrical Specification
 - a. AC power 120 volts, 60 watts
 - b. DC power 12 to 24 volts, minimum 30 watts - the DC power supply in the base station RTU shall be sized to power the indicated analog loops and shall have at least 40% spare capacity for future use.
 - c. Battery power 5 ah
 - 2. Input Specification
 - a. Analog inputs, 4-20ma/0-5vdc/1-5vdc
 - b. Digital inputs, on/off, 12vdc, 24vdc, 120vac, dry contacts, isolated.
 - c. Counter 16 bit or 32 bit, on/off, isolated
 - 3. Output Specification
 - a. Analog output, 4-20ma, 0-5 vdc
 - b. Digital outputs, on/off, 120 VAC, dry contacts

4. Unmanaged Ethernet Switch

- a. 4 Port switch for Ethernet / IP connection to the Pump Control Panel

2.10 TELEMETRY EQUIPMENT SPECIFICATION

- A. Cellular modems shall be provided as to interface to the existing master control system. Modems shall be consistent with the system design and telemetry strategy.

PART 3 EXECUTION

2.11 SERVICE

- A. The manufacturer shall provide the services of a factory trained service Engineer to supervise the initial operation of the system and to acquaint the owner's personnel with the maintenance and operation of the system.
- B. The manufacturer shall provide the services of a factory trained service Engineer to supervise the initial operation of the system and to acquaint the owner's personnel with the maintenance and operation of the system.

END OF SECTION



City of Jefferson, GA

**Appendix A
City of Jefferson
Standard Specifications
Water and Sewer Mains**

December 2023



City of Jefferson Public Utilities

WATER AND SEWER STANDARD SPECIFICATIONS



DECEMBER 2023



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SECTION 01 42 13
ABBREVIATIONS/DEFINITIONS

PART 1 GENERAL

1.1 SCOPE OF SERVICE

- A. Wherever in these Specifications the abbreviations, or pronouns in place of them are used, the intent and meaning shall be interpreted as specified herein.

1.2 ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
APHA	American Public Health Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcing Steel Institute
DOT	Department of Transportation
EPA	Environmental Protection Agency
EPD	Environmental Protection Division
FS	Federal Specifications
ICEA	Insulated Conductor Engineers Association.
IEEE	Institute of Electrical & Electronic Engineers.
MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
MUTCD	Manual on Uniform Traffic Control Devices
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NCSA	National Crushed Stone Association
NEMA	National Electrical Manufacturers Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCI	Prestressed Concrete Institute
RTU	Remote Telemetry Unit

SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories, Inc.
WEF	Water Environment Federation

1.3 DEFINITIONS

- A. CITY: Refers to the CITY.
- B. CONTRACTOR: The licensed utility contractor performing construction work on behalf of the DEVELOPER.
- C. DEVELOPER: The person, partnership, firm, or corporation who is executing the project and that has officially applied for permitting through the CITY.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

**SECTION 01 55 26
TRAFFIC CONTROL**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. DEVELOPER shall furnish all materials and labor for the installation and continuous maintenance of traffic control devices throughout the project.
- B. This item of work shall include furnishing, installing, maintaining, relocating and removing all traffic control devices used for the purpose of regulating, warning or directing traffic during the construction or maintenance of this project.
- C. Upon completion of work, warning devices shall be removed by the DEVELOPER.

1.2 SAFETY

- A. The governing factor in the execution and staging of work for this project is to provide the public with the safest possible travel conditions along the roadway through the construction zone. The DEVELOPER shall arrange his operation to keep the closing of any lane of a roadway to an absolute minimum.
- B. No work shall be started on any phase of the project until all appropriate traffic control devices are in place and in operation.
- C. DEVELOPER shall take all practical precautions to maintain traffic flow, and provide safety of workers and the general public.
- D. At the end of each workday, contractor is to clear the roadway of all dirt and debris and add additional safety devices to maintain safe travel lanes.
- E. When not in use, all traffic control devices shall be removed, placed or covered so as not to be visible to traffic.

1.3 REFERENCES

- A. Manual for Uniform Traffic Control Devices (MUTCD) (latest edition).
- B. Georgia Department of Transportation (GDOT) Standard Specifications for Construction of Roads and Bridges (latest edition), Section 150.
- C. Georgia Department of Transportation (GDOT) Standard Construction Details (latest edition).

PART 2 PRODUCTS

2.1 TRAFFIC CONTROL DEVICES

- A. Traffic Control Devices include: signs and their supports, signals, pavement markings, barricades with sand bags, channelizing devices, warning lights, arrowboards, flaggers, or any other device used for the purpose of regulating, warning or guiding traffic through the construction zone.
- B. All Traffic Control Devices shall conform to the approved construction drawings, GDOT Construction Details and Specifications (latest edition), and MUTCD (latest edition).
- C. Traffic Control Devices shall be in proper, acceptable condition when in use. Devices which are unclear, damaged, or not correctly positioned shall be promptly restored to fully operational condition.

PART 3 EXECUTION

3.1 PLAN AND PERMITS

- A. DEVELOPER is responsible for preparing his/her own traffic control plan and instituting the plan in compliance with all applicable Georgia DOT requirements.
- B. The DEVELOPER shall be responsible for the proper location, installation, and arrangement of all traffic control devices. Special attention shall be given to advance warning signs during construction operations in order to keep lane assignment consistent with barricade placement at all times. The DEVELOPER shall cover all Traffic Control Devices which are inconsistent with detour or lane assignment patterns during the transition from one construction stage to another.
- C. Construction signs referring to daytime lane closures during working hours shall be removed or covered during non-working hours.
- D. The DEVELOPER shall ensure all Traffic Control Devices are operational 24 hours a day, including weekends and holidays. Provide additional inspections at regular intervals.
- E. When traveling in lanes open to public traffic, the contractor's vehicles shall always move with, and not against or across, the flow of traffic. These vehicles shall enter or leave work areas in a manner which will not be hazardous to, or interfere with, traffic and shall not park or stop, except within designated work areas. Personal vehicles shall not park within the right of way, except in specific areas designated by the CITY.
- F. Private driveways and parking areas shall be accessible at all times unless temporary closings are necessary for construction work and the DEVELOPER has notified the affected individuals and has approval from them.

- G. If trenches are to remain open overnight, or for an extended period of time, DEVELOPER shall provide heavy duty cover plates to allow vehicles access.
- H. When flaggers are required, they are to be adequately trained, qualified and certified by the GDOT.

END OF SECTION

**SECTION 01 71 23
FIELD ENGINEERING**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Work covered in this Section includes the surveying and field engineering required to complete the project and meet the provisions of this document.

1.2 QUALITY CONTROL

- A. DEVELOPER will employ a Land Surveyor registered in the State of Georgia and acceptable to the CITY.

1.3 SUBMITTALS

- A. Submit name, address, telephone number and registration number of surveyor prior to beginning work. the CITY may or may not require attendance at meeting.

1.4 PRE-CONSTRUCTION MEETINGS

- A. Prior to any work beginning the DEVELOPER shall contact the CITY to schedule and conduct a pre-construction meeting.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 SURVEY REQUIREMENTS

- A. Construction Staking
 - 1. The DEVELOPER shall provide all construction staking using recognized surveying and engineering practices. The surveyor will locate lines, grades and locations called for in the approved construction drawings.

3.2 RECORD DOCUMENTS

- A. Prior to final acceptance of a development, or before issuance of a Certificate of Occupancy, DEVELOPER is required to provide the CITY with construction record documents.

BENCHMARK	Location of benchmarks, including surveyed monuments, right-of-way markers, property pins, etc.
BUFFER	Location and information of buffers for water bodies, detention ponds, wetlands, and property set-backs
CONTOUR_LABELS	Labels of the contour lines showing proper elevations
CONTOURS	Topography of the site at the conclusion of the project at 2-ft. intervals
ESMT_PERM	Location and size of permanent easement
NORTH	The north arrow with proper orientation
SCALE	Graphic scale reflecting correct paper scale
TEXT	Informative or descriptive text
EXBLDG	The footprint location of any existing structure located on the site (regardless of whether they are to be demolished or will remain)
EXBRIDGE	Location and type of any existing bridges
EXCL	The centerlines of any existing roads within the site with road names
EXCOMM	Location of any existing overhead or underground telephone lines, cable lines, fiber optics, cable boxes, pedestals or utility poles
EXCONTOURS	Topography of the site prior to any grading, all contour lines showing proper elevations at 2-ft. intervals
EXCREEK	Location of any existing creek, stream, pond, lake, or any other water body
EXCURB	Location of curb lines of any existing road within the site
EXDITCH	Location of the centerline of any existing ditch
EXEOG	Location of existing edge of gravel, including roads, parking, and driveways
EXEOP	Location of existing edge of pavement, including roads, alleys, parking, loading docks or driveways
EXFENCE	Location and type of any existing fences
EXFLOOD-LIMITS	Location and information of any existing flood limits
EXGAS	Location, type and size of any existing natural gas lines, valves or meters
EXGUARD	Location of any existing guard rails
EXPL	Location of existing property lines
EXPOWER	Location of any existing power lines, electricity transmission lines, transformers, or utility poles

EXRAIL	Location and information of any existing railways
EXRW	Location and information for existing right-of-ways
EXSAN	Location and information for existing sanitary sewer on the downstream manhole, upstream manhole and sewer line type and size
EXSTORM	Location and information for existing storm sewer of the downstream manhole, upstream manhole, pipe types and sizes, culverts, inlets, headwalls, and inverts
EXTREES	Location of any existing tree lines, trees bushes, shrubs or miscellaneous landscaping (regardless of whether they are to be demolished or will remain)
EXWALKS	Location of any existing sidewalks
EXWATER	Location, size and type of existing waterlines, water valves, water meters and fire hydrants
ABBLDG	Footprint of the building(s) located at the site with the finished floor elevation- to include awnings, out-buildings, etc.
ABCL	Road centerlines of any new or adjusted roads added to the development
ABCURB	Road curb lines of any new or adjusted road added to the development
ABDITCH	Centerline of any new ditches added to the development
ABEOP	Location of any new or adjusted edge of pavement, including roads, alleys, parking, loading docks or driveways
ABFENCE	Location and type of any new fences
ABFLOOD-LIMITS	Location and information of any new flood limits
ABGAS	Location, type and size of natural gas lines, valves or meters
ABGUARD	Location of guard rails
ABPOWER	Location of all power lines, electricity transmission lines, transformers, or utility poles
ABRAIL	Location and information of railways
ABSAN	Location and information on the sanitary sewer piping and manhole tops and inverts
ABSTORM	Location and information on the storm sewer pipe types and sizes, manhole tops, inverts, culverts, inlets and headwalls
ABTREES	Location of tree lines, trees bushes, shrubs or miscellaneous landscaping
ABWALKS	Location of all sidewalks within the site
ABWATER	Location, size and type of waterlines, water valves, water meters and fire hydrants on the site

- a. These exact layer names shall be used. If additional layers are needed, they shall be named and a description shall be provided. This description must be included on the media with the drawing and must be in .TXT (ASCII Text) format.
- b. Layer names beginning with EX define conditions **as they existed PRIOR to beginning of construction.**
- c. Layer names beginning with AB reflect the **site condition at the conclusion of the project.**

END OF SECTION

SECTION 02 01 00
PROTECTION, RELOCATION AND RESTORATION OF EXISTING UTILITIES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. DEVELOPER is responsible for determining the location of all existing utilities in the work area. **The Utilities Protection Center (UPC) must be contacted at least three regular business days before work begins. The UPC can be reached at the state-wide toll-free number: 1-800-282-4711.**
- B. DEVELOPER shall be required, at his own expense, to do everything necessary to protect, support, and sustain all sewers, culverts, water, or gas pipes, electric lights, power, telephone, or telegraph poles or conduits, and other fixtures laid across or along site of WORK, even to the extent of using hand labor in making trench openings under or over these. OWNER, as well as company or corporation owning said pipes, poles, or conduits must be notified in advance of same by DEVELOPER, before any such fixtures are removed or disturbed. In case any sewer, gas, or water pipes, service pipes, electric lights, power, telephone or telegraph poles or conduits, or other fixtures are damaged they shall be repaired by authorities having control of the same, and expense of repairs shall be paid by the DEVELOPER.
- C. No underground or overhead facilities encountered shall be disturbed without proper authority from OWNER, and then only in such manner as OWNER may prescribe and approve.
- D. Should it become necessary to change position, or permanently or temporarily remove any electric conduits, telephone conduits, water pipes, gas pipes, sewerage pipes, or other pipes, conduits, or wires in order to clear structure being built or to permit DEVELOPER to use a particular method of construction DEVELOPER shall cease work if necessary, until satisfactory arrangements shall have been made by owners of said pipes, wires, or conduit, to properly care for or relocate same as necessary to permit WORK to proceed as required for proper completion of Contract.

1.2 GENERAL CONDITIONS

- A. DEVELOPER shall locate all underground obstructions prior to excavation so as to prevent any damage to those services or other utilities.
- B. Any damages must be repaired without delay and cost of such repairs must be borne by DEVELOPER.

PART 2 PRODUCTS

2.1 NONE

PART 3 EXECUTION

3.1 RELOCATION OF WATER MAINS

- A. Only when approved by the CITY shall any water mains, service lines, or water meters be relocated.
- B. Material used for relocation of any water mains or appurtenances shall be of same size and strength as existing material.
- C. When existing water lines and appurtenances are removed for relocation and are not to be replaced by new material, they shall be suitably stored until they are relocated.
- D. When existing water lines and appurtenances are removed for relocation and are to be replaced by new material, remaining materials shall be disposed of by DEVELOPER at his expense.

3.2 RELOCATION OF SANITARY SEWERS

- A. Only when approved by the CITY shall any sanitary sewer lines or service laterals be relocated.
- B. Material used for relocation of any sanitary lines shall be of same size and strength as existing material. As a minimum, materials shall be as specified herein.
- C. Removed material during relocation of sanitary sewers shall be disposed of by DEVELOPER at his expense.
- D. Allowing raw wastewater to flow onto the ground or into a receiving stream is strictly prohibited

3.3 RELOCATION OF ELECTRIC POWER POLES AND CONDUITS

- A. Power pole relocation and electric service relocation shall be performed by Local Electrical Department.
- B. Temporary electrical service shall be provided when permanent electric service will be interrupted for more than one day.
- C. Cost of relocation of all electric utilities shall be responsibility of DEVELOPER.

3.4 RELOCATION OF GAS LINES

- A. Gas mains and gas services are to be relocated by the local gas company.
- B. Temporary gas service shall be provided when permanent gas service will be interrupted for more than one day.
- C. Cost of relocation for gas mains shall be responsibility of DEVELOPER.

3.5 RELOCATION OF TELEPHONE

- A. Telephone cable and conduit are to be relocated by the local telephone company.
- B. Cost of relocation of telephone cable and conduit shall be responsibility of DEVELOPER.

END OF SECTION

**SECTION 02 01 50
SITE RESTORATION**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Work included in this section consists of, but is not limited to: the restoration of pavement (asphalt, concrete and granular), driveway, concrete curbs and gutters, sidewalks, fences, walls, underground and above ground utilities, repair, replacement and/or relocation. Restoration of the landscaping, i.e., shrubs, trees and grassing, is also part of this work.

1.2 QUALITY ASSURANCE

- A. Any existing site improvements damaged during construction will be repaired at the DEVELOPER's expense, to its existing condition to the satisfaction of OWNER and CITY.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Existing materials may be reused when restoring the construction site to original condition unless those materials have been damaged or deteriorated in any way.
- B. If material cannot be reused as determined by the CITY, it shall be replaced with **new material** of like type.

PART 3 EXECUTION

3.1 GENERAL

- A. Particular care shall be taken to minimize disturbance to existing site improvements within the limits of construction. The DEVELOPER will take whatever measures are necessary to prevent damage which may include, but is not limited to, erection of barriers, tree protective fencing, shoring and bracing of excavations and staging of the construction.

3.2 CONSTRUCTION

- A. No excavations will be allowed to remain open overnight and they will either be properly backfilled or covered with steel plates to allow safe crossing of trenches by vehicles and/or pedestrians.
- B. All work must be approved by the owner and the CITY prior to acceptance.

3.3 MAINTENANCE

- A. The DEVELOPER will notify the CITY to inspect restored areas as soon as construction is complete and no further disturbances/damages would be likely to occur.
- B. For work performed on Georgia D.O.T., Jackson County, and the CITY property or Rights-of-Way, the DEVELOPER shall warrant the work free from defects of material and workmanship for a period of one year after acceptance.
- C. Clean up work areas by removing any scraps, rubbish or surplus material and dispose of them properly off the project site.
- D. Wash and hose down paved surfaces to remove all mud, debris, and other extraneous material prior to final inspection.

3.4 GRASSING

- A. DEVELOPER is to provide all information necessary for the establishment of a good growth of grass at the time of development review submittal.
- B. Information includes, but is not limited to, preparation of subsoil, placing topsoil, fertilizing, seed type and seeding, hydroseeding, seed protection, sod laying, and maintenance.
- C. Grassing and mulching shall take place as soon as practical, but no more than 14 days, after grading, backfilling of trench excavations, or other land disturbing activities have ceased. In cases where grassing and mulching cannot be initiated within 14 days due to snow cover or other adverse weather conditions, grassing and mulching shall be initiated as soon as practical. Grassing and mulching activities do not have to be initiated on portions of sites where land disturbing activities are temporarily stopped for less than 21 days.
- D. Coverage of grassed and sodded areas shall be considered to be acceptable when all soil disturbing activities at the site have been completed and at least 95% of the disturbed soil surface is uniformly covered with no bare spots exceeding one square foot and the ground surface is fully stabilized against erosion.

END OF SECTION

**SECTION 09 97 01.01
INTERIOR PIPE COATING**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. All ductile iron pipe and fittings conveying sanitary sewer or at sanitary sewer lift stations shall be coated on the interior with Protecto 401™ Ceramic Epoxy.

1.2 RELATED WORK

- A. Section 33 31 00 – Sanitary Sewer Force Mains
- B. Section 33 31 00 – Sanitary Sewer

1.3 CONDITION OF DUCTILE IRON PRIOR TO SURFACE PREPARATION

- A. All ductile pipe and fittings conveying sanitary sewer or at sanitary sewer lift stations shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining material and no coating shall have been applied to the first six inches of the exterior of the spigot ends.

PART 2 PRODUCTS

2.1 LINING MATERIAL

- A. The required coating is Protecto 401™ Ceramic Epoxy. The material shall be an amine cured novolac epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining pipe and fittings for sewer service, a test report verifying the following properties, and a certification of the test results.
- B. A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.
- C. The following test must be run on coupons from factory lined ductile iron pipe:
 - 1. ASTM B-117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two years.
 - 2. ASTM G-95 Cathodic Disbondment 1.5 volts @ 77°F. Results to equal no more than 0.5 mm undercutting after 30 days.

3. Immersion testing rated using ASTM D-714-87.
 - a. 20% Sulfuric acid - No effect after two years.
 - b. 140°F 25% Sodium Hydroxide - No effect after two years.
 - c. 160°F Distilled Water - No effect after two years.
 - d. 120°F Tap Water (scribed panel) - 0.0 undercutting after two years with no effect.
 4. ASTM G-22 90 Standard practice for determining resistance of Synthetic Polymeric materials to bacteria. The test should determine the resistance to growth of Acidithiobacillus Bacteria and should be conducted at 30 degrees centigrade for a period of 7 days on a minimum of 4 panels. The growth must be limited only to trace amounts of bacteria.
- D. An abrasion resistance of no more than 3 mils (.075 mm) loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.

PART 3 EXECUTION

3.1 APPLICATION

A. Applicator

1. The lining shall be applied by a certified firm with a successful history of applying linings to the interior of ductile iron pipe and fittings. All applicators must be independently inspected at least two times per year to insure compliance with the requirements of this specification. This inspection must be coordinated and reviewed by the manufacturer of the lining material and any deviation from the application and/or quality requirements shall be corrected by the applicator. All inspections shall be in writing and a permanent record maintained.

B. Surface Preparation

1. Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas with oil, grease, or any substance that can be removed by solvent, shall be solvent cleaned to remove those substances. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering oxide may be left on the surface. Any area where rust reappears before lining must be re-blasted.

C. Lining

1. After surface preparation and within 12 hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness. No lining shall take place when the substrate or ambient temperature is below 40°F. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

D. Coating of Bell Sockets and Spigot Ends

1. Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using Protecto 401™ Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.

E. Number of Coats

1. The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. To prevent delamination between coats, no material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

F. Touch-Up and Repair

1. Protecto 401™ Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

3.2 INSPECTION AND TESTING

A. Inspection

1. All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC PA-2 Film Thickness Rating.
2. The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500 volt test. Any defects found shall be repaired prior to shipment.
3. Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

B. Certification

1. The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.

3.3 HANDLING

- A. Lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying. The pipe shall not be dropped or unloaded by rolling.
- B. Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers.

END OF SECTION

**SECTION 09 97 01.02
EXTERIOR PIPE COATING**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. All ductile iron pipe and fittings inside the wetwell of a sanitary sewer lift station shall be coated on the exterior with Ceramawrap Epoxy by Induron.

1.2 RELATED WORK

- A. Section 33 31 00 – Sanitary Sewer Force Mains
- B. Section 33 31 00 – Sanitary Sewer

1.3 CONDITION OF DUCTILE IRON PRIOR TO SURFACE PREPARATION

- A. All pipe shall be delivered to the coating applicator bare. Because removal of old coatings may not be possible, the intent of this specification is that the entire exterior of the ductile iron pipe or fitting shall not have been coated with any substance prior to the application of the specified coating material.

PART 2 PRODUCTS

2.1 LINING MATERIAL

- A. The required coating is Ceramawrap Epoxy. Ceramawrap Epoxy is a very high solids, solvent free, fast curing two- component epoxy formulated especially to coat the exterior of ductile iron pipe for aggressive atmospheres or liquids. Ceramawrap is a chemical resistant product that will protect ductile iron pipe in salt Water, high pH, low pH, and aggressive liquids and atmospheres. Applied at 20-25 mils for maximum protection on ductile iron pipe, Ceramawrap Epoxy is produced using the technology developed for Protecto 401. This proven technology results in low permeability, high impact resistance, and superior adhesion properties. Ceramawrap was designed with the installation and protection of ductile iron pipe as the foremost consideration (including handling, repairs, and superior exterior corrosion resistance)

PART 3 EXECUTION

3.1 APPLICATION

- A. Surface Preparation
 - 1. The entire surface to be coated shall be abrasive blasted. The intent of this specification is that 100% of the surface be struck by the blast media so that all loose oxides and rust are removed.

B. Coating of Pipe

1. After surface preparation and within 8 hours of surface preparation the entire exterior surface up to the gasket groove with the exception of the spigot end, shall receive an average of 25 mils, 20 mils minimum, of Ceramawrap Epoxy. If any rusting is apparent prior to coating the surface, the entire area must be reblasted as specified.

C. Coating of the Spigot Ends

1. Due to the tolerances involved, the spigot end from the gasket area to the end of the spigot must be coated with 6 mils average, 10 mils maximum of Ceramawrap Epoxy. Care should be taken that the Ceramawrap Epoxy is smooth without excess buildup on the spigot end.

3.2 INSPECTION AND TESTING

- A. The film thickness of the coating shall be checked using a magnetic film thickness gauge. Measurements shall be taken per SSPC PA2 Section 5.1.
- B. The coated areas of the pipe from the socket edge area of the spigot back to the bell face shall be tested for pinholes using a 2000-volt pinhole detection test. Any pinholes found shall be repaired prior to shipment.

3.3 JOBSITE REPAIR

- A. Any areas where damage has occurred due to handling shall be repaired using Ceramawrap
- B. Epoxy prior to installation to equal the original coating.

3.4 HANDLING

- A. All pipes shall be handled with belt slings and padded forks to avoid damage. All shipping timbers and straps should be padded when shipping pipe.

END OF SECTION

SECTION 09 97 23
COATINGS FOR BELOW GRADE CONCRETE WASTEWATER STRUCTURES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. A manufacturer certified Applicator shall provide all labor, materials, equipment, incidentals, and quality requirements for concrete for surface preparation, repair or resurfacing, and ultra-high build, Structural Epoxy lining work to the entire interior surfaces of the structures as shown on drawings and specified herein.
- B. This Section's intent is to provide minimum requirements of an installation of an ultra-high build, high strength, structural epoxy system; and the lining of newly installed, existing, and/or defective specified concrete/masonry structures and surfaces exposed to municipal sanitary sewage by an applied and bonded application of high performance, 100% solids, ultra-high build, structural grade, applied fiber-reinforced-polymer (FRP) epoxy coating/lining system (Structural Epoxy).
- C. This Section's intent is for concrete and/or other masonry structures which are exposed to or in contact with municipal sanitary sewage; constituting municipal sanitary sewage from collection systems (sanitary sewer and/or stormwater), where sewage contact and exposure to hydrogen sulfide are present. Not intended for non-sewage applications or industrial waste.
- D. Basis of design are products of Epoxytect LLC (a Tnemec company, www.tnemec.com, +1-800-863-6321) www.epoxytect.com. Materials specified are those that have been evaluated for the specific service and are intended to provide the longest service life possible, lowest life cycle cost, and most sustainable solution.
- E. Other acceptable manufacturers are the Carbolite Company and Induron Coatings, Inc.
- F. Types of Structural Epoxy lining for concrete Work required include but are not necessarily limited to the following:
 - 1. Hydraulic water plug
 - 2. Chemical grout
 - 3. Cementitious repair mortar
 - 4. Epoxy cementitious resurfacer
 - 5. Structural epoxy lining
 - 6. Manhole chimney joint sealant
 - 7. Miscellaneous materials

1.2 CONTRACTOR PRE-QUALIFICATION

- A. CONTRACTOR shall be a certified Applicator by the Structural Epoxy manufacturer prior to bid date. Submit proof of Applicator certification by manufacturer to ENGINEER.
- B. Installation equipment shall be acceptable to the Structural Epoxy manufacturer. If spraying Structural Epoxy, Applicator must utilize equipment approved by Structural Epoxy manufacturer.
- C. Applicator shall establish quality control procedures and practices to monitor phases of surface preparation, storage, mixing, application, and inspection throughout the duration of the project. CONTRACTOR to provide a full-time, on-site person whose dedicated responsibilities will include quality control of the Structural Epoxy linings and completed manufacturing certification training.
- D. Applicator's quality control procedures and practices must include the following items:
 - 1. Training of personnel in the proper surface preparation requirements.
 - 2. Training of personnel in the proper storing, mixing, and application and quality control testing of the Structural Epoxy linings.
 - 3. If spraying, training of personnel with the spray equipment to ensure proper film build, film quality, and ratio control.

1.3 WARRANTY

Structural Epoxy lining Manufacturer shall warranty its products as free from material defects for a minimum period of ten (10) years. Provide associated Warranty Certificate.

CONTRACTOR shall warranty the installed Structural Epoxy lining system as free from workmanship defects for a minimum period of ten (10) years.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Hydraulic Water Plug: hydraulic cement water plug shall be used for low pressure active leak stopping.

Manufacturer	Tnemec	Carboline	Induron
Products	Epoxytec Mortartec Hydrxx-1	Plug Resins Prime Plug	Mortarchem
	Epoxytec Mortartec Hydrxx-3	Plug Resins Prime Plug	Mortarchem

1. Cure – Press firmly pre-mixed paste or dry material into place, maintaining pressure until the material begins to harden and the leak is stopped. Continue until all active leaks cease.
- B. Chemical Grout: Sanitary sewer grade chemical grouts shall be urethane-based, and formulated specifically for use in grouting pre-cast barrel joints, brick and CMU structures, and/or pipe penetrations and pinholes to stop aggressive flowing leaks.

Manufacturer	Aquifin
Products	Eco-CUT
	Eco-LV
	Eco-SLV

1. Cure – Mixing and handling of all the chemical grout materials shall be in accordance with chemical grout manufacturer's recommendations. Application of materials shall be by injection method according to chemical grout manufacturer recommendation and industry defined standard ASTM F 2414, using appropriate pressure to ensure no damage to the structure.
2. Re-Blast - All excess chemical grout must be removed from the surface by mechanical means.
- C. Cementitious Repair Mortar: cementitious repair mortar shall be used for structural repairs or surface repairs exceeding a depth 1/2 inch (12.7 mm) in accordance with Manufacturer's written instructions as outlined in the product data sheet and application guide.

Manufacturer	Tnemec	Carboline	Induron
Products	Tnemec Series 217 MortarCrete	Carbocrete 4000 4010 4020	Mortarchem

1. Thickness – Minimum ½ inch as required to re-establish original plane.
2. Cure – Ensure that the mortar while curing will remain moist, covered from direct sunlight, and if needed, covered by damp coverings to avoid mortar dry-out and to optimize curing.
3. Re-blast – Clean and profile the surface to remove the laitance layer and to uniformly profile the surface to produce a minimum ICRI CSP 6 surface profile amplitude.

- D. Epoxy Cementitious Resurfacer: epoxy cementitious resurfacer shall be used for filling voids, bugholes, static cracks and joints, and for general concrete patching, and to provide a uniform, void free surface for Epoxy Lining application.

Manufacturer	Tnemec	Carboline	Induron
Products	Tnemec Series N218 MortarClad	Carboguard 510	Mortarchem

1. Thickness – Epoxy lining shall be applied to a minimum thickness of 1/16 inch (1.6 mm) to the entire surface.
2. Cure - Ensure that the mortar while curing will remain moist, covered from direct sunlight, and if needed, covered by damp coverings to avoid mortar dry-out and to optimize curing.

- E. Structural Epoxy Lining: epoxy lining. Structural Epoxy coating shall be applied and applied in accordance with Manufacturer's written instructions as outlined in the product data sheet and application guide.

Manufacturer	Tnemec	Carboline	Induron
Products	Epoxytec CPP Sprayliner MH	Hydroplate 6500	Ceramasafe 90 or Permacleen 100
	Epoxytec CPP Trowel-Liner	Plasite 5371	Ceramasafe 90 or Permacleen 100

1. Thickness – Epoxy lining shall be applied to a minimum thickness of 125 mils (1/8" inch) dry film thickness.

- F. Manhole Chimney Joint Sealant: Applied polymer elastomer sealant, shall be applied and in accordance with Manufacturer's written instructions as outlined in the product data sheet and application guide. Applied polymer elastomer material is applied after Structural Epoxy lining material is installed and cured.

Manufacturer	Tnemec	Carboline	Induron
Products	Epoxytec Uro seal 45V	Dubick Membrane 310	Ceramasafe 90 or Permacleen 100

1. Thickness – Manhole chimney joint sealant shall be applied to a minimum thickness of 250 mils (1/4" inch) dry film thickness.
2. Re-blast – Lightly abrade and clean the surface of the Structural Epoxy liner when applying manhole chimney joint sealant beyond the recoat window of the Structural Epoxy.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

- A. All surface washing, abrasive blasting, water jetting, grinding, patching, filling and preparation shall be completed by the Applicator in accordance with the Structural Epoxy lining Manufacturer's recommendations.
- B. Allow new cast-in-place concrete to cure for a minimum of 28 days at 75°F and with adequate air movement before installing the corrosion protection lining system. Concrete surfaces to be coated shall be free of curing compounds and form release agents, laitance and foreign particles that may inhibit bonding. Prior to start of Structural Epoxy coating systems application, pre-clean as required, and inspect the substrate in accordance with SSPC-SP13/NACE No. 6, Severe Service. Surface preparation procedures shall be in accordance with NACE No. 6/SSPC-SP13 and ICRI Guideline No. 310.2. Surface preparation shall expose aggregate and obtain a uniform surface texture resembling the minimum recommended concrete surface ICRI-CSP profile. Surface preparation will be required on new or existing concrete.
- C. Stopping Active Leaks: After surface cleaning, any visible leaks or other water ingress shall be reported to the ENGINEER. Any water infiltration through minor leaks must be stopped using specified hydraulic cement water stop; should flows be aggressive, a chemical grout method shall be used. Surface and grouting material may require additional surface preparation prior to application of Structural Epoxy lining.

3.2 APPLICATION

- A. All work shall be in strict accordance with the specifications and recommendations including mixing, handling, storage, and application of all products as required and in accordance with manufacturer's published technical instructions, safety data sheets, including manufacturer's published PDS, design guidelines, and/or other written specifications.
- B. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, coating installation should be scheduled when the temperatures are falling versus rising.
- C. All specified products must be installed by qualified and trained applicators in accordance with this specification.

3.3 CLEAN-UP

- A. At the completion of the Work, CONTRACTOR shall remove all materials and debris associated with the Work of this Section.
- B. Clean all surfaces not designated to receive Structural Epoxy coating. Restore all other work in a manner acceptable to ENGINEER.
- C. All finished Structural Epoxy coating shall be protected from damage until Final Acceptance of the Work. Structural Epoxy coating damaged in any manner shall be repaired or replaced at the discretion of ENGINEER, at no additional cost to OWNER.

3.4 SETTING/CURING

- A. Setting and curing of specified products shall be in strict accordance with instructions detailed on manufacturer's product data sheets. Verify curing of the coating materials in accordance with the Manufacturer's instructions.

3.5 SHELF LIFE

- A. Consult manufacturer for specific details on shelf life and provide documentation that all products are within the shelf-life limitations specified by the manufacturer. Materials exceeding storage life as defined by the manufacturer shall be removed promptly from the site.

3.6 CAUTION

- A. Conform to all warnings on product Material Safety Data Sheets and consult container label caution statements for any hazards in handling these products.

END OF SECTION

SECTION 26 00 00
LIFT STATION ELECTRICAL WORK

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. WORK described in this section shall consist of furnishing, installing, and connecting all panels, motor control center, lighting fixtures, and all other equipment shown or otherwise indicated in the DEVELOPMENT DRAWINGS. This section shall provide minimum, general guidelines and requirements; all and any electrical plans shall be designed by a qualified, registered electrical engineer in the state of Georgia.

1.2 CODES AND STANDARDS

- A. WORK performed under this section shall conform to the latest edition of the National Electrical Code.
- B. Equipment and material furnished under this section shall be new, unused, and shall be manufactured to the following standards:
 - 1. I.E.E.E. - Institute of Electrical & Electronic Engineers.
 - 2. A.N.S.I. - American National Standards Institute.
 - 3. U.L. - Underwriters Laboratories, Inc.
 - 4. I.C.E.A. - Insulated Conductor Engineers Association.

1.3 POWER SERVICE

- A. In general the power service to the pump stations shall be three phase as listed below in the preferred order:
 - 1. 480/277V, 3 phase, 4 wire, Wye connected
 - 2. 120/208V, 3 phase, 4 wire, Wye connected
 - 3. 120/240V, 3 phase, 4 wire, Delta connected
 - 4. 480V, 3 phase, 3 wire open Delta connected (contact the power company for motor horsepower limitation)
 - 5. 120/240V; 3 phase, 4 wire, open Delta connected (contact the power company for motor horsepower limitation)

- B. For pump stations with motors 10Hp and smaller, single phase power service may be provided with written approval from the CITY.
 - 1. A letter from the power company states that three phase power is not available at the location must be submitted to the CITY with the request.
 - 2. If the CITY approves the request for single phase power service, variable frequency drives shall be used in the pump control panel for the pump motors. The variable frequency drives shall have single phase input and three phase output. The pump motors shall be three phase.
- C. Use of phase converters and single-phase pump motors will not be permitted.

PART 2 PRODUCTS

2.1 STATION APPURTENANCES

- A. A main circuit breaker shall be provided in the pump station and shall be located inside the fenced area of the station. The circuit breaker shall meet the following requirements:
 - 1. U.L. listed for service entrance.
 - 2. In NEMA-4X stainless steel enclosure.
 - 3. Capable of being padlocked in both “on” and “off” positions.
- B. Underground conduits shall be scheduled 40 PVC. All exposed conduits shall be rigid galvanized steel.
- C. No conduit runs or junction boxes shall be installed inside or on top of the wet well. Splicing of cables inside the wet well will not be permitted.
- D. The power, lighting and control cables shall be copper conductors with 600V type ‘XHHW’ insulation, #12 AWG minimum size. The signal cables shall be copper conductors, 600V rated, twisted and shielded type, #16 AWG minimum size.
- E. Each station shall be installed with a portable generator receptacle with a double throw switch ahead of the automatic transfer switch and permanent standby generator. Receptacle shall have reverse contacts. Receptacle shall be Arktite (Body Grounded) model AR20412-S22 or approved equal.
- F. A surge suppressor shall be provided at the power service entrance. The surge suppressor shall have voltage characteristics to match the power service.
 - 1. The surge suppressor shall be in NEMA-4X stainless steel enclosure and shall provide line to line, line to neutral, line to ground and neutral to ground protection modes as applicable for the power service.

2. The surge suppressor shall be provided with a disconnect. Minimum surge current rating shall be 100KA per mode, 200KA per phase per NEMA LS-1. The surge suppression system shall be duty cycle tested to survive 20KV, 10KA, IEEE C62.41 category surge current with less than 5% degradation of clamping voltage.
 3. The surge suppressor shall have minimum repetitive surge capacity of 4500 impulses per mode. Status indicating lights and form 'C' dry alarm contacts shall be provided.
 4. The surge suppressor shall be U.L. listed and labeled under UL1449 and UL1283. Acceptable manufactures are Liebert and Current Technology.
- G. A mini-power center shall be provided in the pump station when the power service is 480 volts. The mini-power center shall be in an outdoor weatherproof enclosure which shall consist of a transformer with primary and secondary circuit breakers and a 120/240V panel board. The panel board shall have at least two spare branch circuit breakers.
- H. The electrical equipment shall be mounted on an adequately sized galvanized steel or aluminum structure. Telemetry RTU shall also be installed on this structure. Large pump control panels shall be installed on concrete pad.
- I. A ground fault circuit interrupter type outlet in weatherproof enclosure shall be provided on the mounting structure for the CITY's use.
- J. A ground grid consisting of a minimum four ¾" diameter, 10' long copperweld rods at the corners of the fenced area connected with minimum #2 AWG bare stranded copper conductor run underground around the perimeter shall be provided. All the grounding connections shall be exothermic type. Mechanical connection are not permitted. The main circuit breaker, generator and the pump station fence shall be grounded to the ground grid.
- K. Each site shall have an exterior hinged light pole with 250-watt metal halide luminaire, 120-volt ballast, photoelectric control, with heat and impact resistant lens. Pole is to be architectural brown and is to be supplied with lowering winch.
1. BRACKET: G.E. PART # RBSU2H6PP
 2. POLE: G.E. PART # ASHTS202T-5.3-11PP

2.2 TELEMETRY SYSTEM

- A. The system shall be Model Mission M800 as manufactured by Mission Communications, LLC to match the CITY's existing installations. The DEVELOPER shall pay upfront for three (3) years of monitoring service and provide proof of payment to the CITY prior to acceptance of the system.

- B. The monitoring RTU shall be enclosed in a NEMA 4X enclosure equipped with sun shield. The RTU shall transmit all data and alarms via the Nextel or Sprint wireless data network. Such network(s) shall have 128-bit AES encryption. The RTU shall be powered by 120 volts AC and have a built-in battery backup capable of keeping the RTU powered for 24 hours in case of primary AC failure. All terminations inside the RTU enclosure shall be low voltage AC or DC (28 volts or less). The RTU shall be supplied with a U.L. recognized 120 VAC to 12 VAC step down transformer. The RTU shall have two (2) analog, 10-bit resolution, 4-20mA or 0-5 VDC inputs, with four (4) alarm thresholds per input. The analog input values shall be transmitted by the RTU to the central monitoring software at least every 2 minutes. The RTU shall have built in AC failure and low battery detection. The RTU shall have sixteen (16) digital inputs of which up to three (3) shall be capable of recording pump runtimes in one (1) minute resolution. Any change of the RTU digital inputs shall be transmitted to the central monitoring software within 10 seconds of occurrence. The RTU shall have at least three (3) remotely controllable relay outputs that may be controlled at will by the customer.
- C. The following remote input contacts shall be connected to the RTU:

DI = High-High Level (From Float)
DI = Pump #1 Run
DI = Pump #2 Run
DI = Pump #1 Fail
DI = Pump #2 Fail
DI = Phase Monitor Alarm (from Control Panel)
DI = Control Power On (from Control Panel)
DI = ATS Emergency Position
DI = ATS Normal Position
DI = Generator Run
DI = Generator Common Fault (low oil, fail to start, etc.)
DI = Generator Low Fuel
AI = Continuous Wetwell Level

- D. The RTU shall have up to two (2) optional pulse counting totalizers of which one can be programmed to report every two (2) minutes. The RTU shall have a built-in electronic key or card reader, which can be used to securely put the RTU in/out of alarm reporting mode and/or to accept in progress alarms.
1. The Telemetry RTU shall be a Mission Mydro 850 with expansion to 16 Discrete Inputs and shall include 3 years of Cellular Service.

- E. The RTU shall be capable of reporting alarms and all supervisory information to a password protected customer web site, an OPC compliant customer HMI software package or both. The web site or HMI software package shall be capable of displaying all RTU alarms and supervisory data. This shall include alarms, individuals accepting alarms, RTU electronic key/card reads with user names and time of read, pump running status, pump run times with historical graphs, individual pump flow estimates, automatic daily analysis of pump runtimes for abnormalities with automatic customer notification of such abnormalities, pump starts, hourly analysis of excess pump starts with automatic notifications of excess pump starts, minute-by-minute radio health checks with automatic notification of non-reporting or poorly reporting RTU's, scaled and labeled pulse totalizations and if rainfall gauges are used, inter-day rainfall graphs. The customer web site or HMI software package shall be capable of performing and displaying volumetric inflow calculations from RTU supplied data for each pump cycle as they occur. Such volumetric calculations will utilize real-time pump start/stop data with simultaneously gathered level transducer data to perform the inflow and pump GPM calculations. The customer web site or HMI software package shall be capable of reporting alarms via phone dialup, numeric pager dialup, alpha numeric pager, fax or email or any combination of the above. The customer web site or HMI software shall produce an audit report of every alarm or notification event with accurate results of all notification attempts. The customer web site or HMI software shall produce and deliver weekly reports which summarize alarms and responses, pump runtimes and flow estimates and all electronic key or card uses at the RTU sites.
- F. The RTU Supplier shall provide services of factory trained technician to check, start-up, instruct OWNER's personnel and put in operation the telemetry system. A certificate of successful commissioning of the system shall be provided to the CITY.

2.3 PUMP CONTROL PANEL

A. GENERAL

1. The power service will be 3 phase as specified on the electrical plans.
2. The control function shall provide for the operation of the pumps under normal conditions and shall alternate the pumps on each pump down cycle to equalize the run times. In the event the incoming flow exceeds the pumping capacity of the lead pump, subsequent pump shall automatically start to handle the increased flow. As the flow decreases, the pumps shall cut off at the elevations shown on the plans.
3. Motor starters shall be solid state reduced voltage type with isolation and bypass contactors. The solid state reduced voltage starters shall have soft start with current limiting features. The solid state starters shall be by Allen Bradley or Square-D.
4. Pump control panel shall contain AC for temperature control.

B. ENCLOSURE

1. The enclosure shall be a NEMA-4X stainless steel; free standing panel with 24” legs. Use shorter legs to prevent panel from exceeding 6.5-feet. The enclosure shall adequately house all of the components. The door gasket shall be rubber composition with a retainer to assure a positive weatherproof seal. The door shall open a minimum of 180 degrees. An air conditioner unit shall be provided for the enclosure to remove heat. The air conditioning unit shall be sized adequately for operation in the ambient temperature of 104 degrees F.
2. The pump control panel shall contain the following controls and indicators:
 - a. A “Hand – Off- Auto” switch for each pump.
 - b. The “Hand” position will force the pump to turn on unless operation is precluded due to a fault condition.
 - c. The “Off” position disables the pump. Power cannot be applied to the pump with the switch in this position.
 - d. The “Auto” position causes the pump to operate based on the wet well water level in conjunction with the pump control logic.

C. INNER DEAD FRONT DOOR

1. A polished aluminum dead front shall be mounted on a continuous aircraft type hinge, contain cutouts for mounted equipment, and provide protection of personnel from live internal wiring. Cutouts for breaker handles shall be provided to allow operation of breakers without entering the compartment. All control switches, indicator pilot lights, elapsed time meters, duplex receptacle and other operational devices shall be mounted on the external surface of the dead front. The dead front shall open a minimum of 150 degrees to allow access to equipment for maintenance. A 3/4" break shall be formed around the perimeter of the dead front to provide rigidity.

D. BACK PLATE

1. The back plate shall be manufactured of 12-gauge sheet steel and be finished with a primer coat and two (2) coats of baked on white enamel. All hardware mounted to the subpanel shall be accomplished with machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified.

E. POWER DISTRIBUTION

1. The panel power distribution shall include all necessary components and be wired with stranded copper conductors rated at a minimum of 90 degrees c. All conductor terminations shall be as recommended by the device manufacturer.

F. CIRCUIT BREAKERS

1. All circuit breakers shall be adequately sized by electrical engineer and be heavy duty thermal magnetic or motor circuit protectors with minimum interrupting rating of 22,000A R.M.S. symmetrical. Motor circuit protectors may be used only for motor starters. Each motor breaker shall be sized to meet the pump motor operating characteristics. The circuit breakers shall be U.L. listed. The control circuit and the duplex receptacle shall individually be controlled by heavy duty breakers.
2. Circuit breakers shall be indicating type, providing 'On-Off-Trip" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position indicating "Trip".
3. Thermal magnetic breakers shall be quick-make and quick-break on both manual and automatic operation and have inverse time characteristics secured through the use of bimetallic tripping elements supplemented by a magnetic trip.
4. Breakers shall be designed so that an overload on one pole automatically trips and opens all legs. Field installed handle ties shall not be acceptable.

G. TRANSFORMERS

1. Control transformers shall provide the 120 V AC and/or 24 V AC for control circuits. Transformers shall be fused on the primary and secondary circuits. One leg of the secondary shall be grounded.

H. PHASE MONITOR

1. A line voltage rated, adjustable phase monitor shall be installed to sense low voltage, loss of power, reversed phasing and loss of a phase. Control circuits shall de-energize upon sensing any of the faults and shall automatically restore upon return to normal power.

I. ALARM SYSTEM

1. The alarm light shall be a weatherproof, shatterproof, red light fixture with a 40 watt bulb to indicate alarm conditions. The alarm light shall be turned on by the alarm level.

J. PUMP CONTROL SYSTEM

1. The pump controller shall be Flygt Multismart MSM, or approved equal.
2. Provide a pressure transducer type level sensor Flygt cat. #LTU-701 or approved equal with adequate cable length to reach control panel without splicing.
3. Provide one high level alarm float in the wetwell as a back up to the level sensor probe.

4. Provide one low level float in the wetwell as a back up to the level sensor probe that will stop the pumps.
5. Provide 4-20ma signal proportional to level.
6. Provide one spare level sensor for the pump station.

K. ANCILLARY EQUIPMENT

1. The ancillary equipment listed below shall be included in/with the control panel.
 - a. Six digit pumps run time meters.
 - b. Watertight pump motor cables to reach the control panel without splicing.
 - c. 1 GFCI 20 A Duplex Receptacle
 - d. Provide the following alarm/status contacts for connection to the telemetry R.T.U:

DI = High-High Level (From Float)
DI = Pump #1 Run
DI = Pump #2 Run
DI = Pump #1 Fail
DI = Pump #2 Fail
DI = Phase Monitor Alarm (from Control Panel)
DI = Control Power On (from Control Panel)
DI = ATS Emergency Position
DI = ATS Normal Position
DI = Generator Run
DI = Generator Common Fault (low oil, fail to start, etc.)
DI = Generator Low Fuel
AI = Continuous Wetwell Level

L. MISCELLANEOUS

1. Drawings: a final as-built drawing encapsulated in mylar shall be attached to the inside of the front door. A list of all legends shall be included.
2. Panel markings: all component parts in the control panel shall be permanently marked and identified as they are indicated on the drawing. Marking shall be on the back plate adjacent to the component. All control conductors shall be identified with wire markers as close as practical to each end of conductors.
3. Testing: all panels shall be tested to the power requirements as shown on the plans to ensure proper operation of all the components. Each control function shall be activated to check for proper operation and indication.

4. Guarantee: all equipment shall be guaranteed for a period of one (1) year from date of acceptance. The guarantee shall be effective against all defects in workmanship or defective components.
 5. Manufacturer: the manufacturer shall be a UL listed shop for industrial control systems and shall provide evidence of such on request from the engineer or using authority.
- M. The Panel Vendor shall provide training and documentation on the operation, troubleshooting, and maintenance of the control panel. Documentation shall include:
1. Operator's manual(s) which contains the following information:
 - a. The function of each control and indicator.
 - b. A troubleshooting guide geared for the operator.
 - c. Description of fuses and circuit breakers and their locations within the panel.

PART 3 EXECUTION

3.1 GUARANTEES AND TESTS

- A. WORK shall be guaranteed for 12 months after date of acceptance. WORK shall be free from improper grounds and short circuits.
- B. DEVELOPER is required to test new pump stations with generator prior to acceptance of the facility with manufacturer's representatives.

END OF SECTION

SECTION 26 32 13
STANDBY POWER GENERATOR

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. WORK described in this section shall consist of furnishing a portable standby power generator.
- B. DEVELOPER shall furnish all material and labor to perform the work.

1.2 CODES AND STANDARDS

- A. WORK performed under this section shall conform to the latest edition of the National Electrical Code.
- B. Equipment and material furnished under this section shall be new, unused, and shall be manufactured to the following standards:
 - 1. I.E.E.E. - Institute of Electrical and Electronic Engineers
 - 2. A.N.S.I. - American National Standards Institute
 - 3. U.L. - Underwriters Laboratories, Inc.
 - 4. I.C.E.A. - Insulated Conductor Engineers Association

PART 2 PRODUCTS

2.1 STANDBY GENERATOR

- A. The standby generator shall be rated for continuous standby service for the full load demand of the station. This shall include running both pumps with staggered startups.
- B. The generator shall be housed in a weatherproof enclosure. Quiet site soundproofing shall be provided to reduce noise to the following levels at a distance of 7 meters:
 - 1. 60dB for Natural Gas Generators
 - 2. 68dB for Diesel Generators up to 80KW
 - 3. 74dB for Diesel Generators above 80KW
- C. The entire standby generator set shall have a manufacturer's warranty for a minimum period of five (5) years from the date of acceptance.

- D. Outdoor weather-protective housing with critical grade exhaust muffler shall be installed. The housing shall have hinged side access doors and a rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. Vibration isolators as recommended by the generator set manufacturer shall be provided. The generator must be mounted far enough away from obstructions to allow all doors to be opened 90°. All conduits and gas lines shall be installed underground.
- E. Generator shall be supplied with all auxiliary systems necessary for operation such as batteries, battery charger, block heater, etc.
- F. The standby power system shall include an automatic transfer switch. Transfer switch shall be rated for 100% of full load of the main disconnect switch. Switch shall be provided with indicators for all phases of operation and be equipped with a fully programmable timer for exercising the equipment. The switch must be selectable for load or no load.
- G. Three complete sets of O & M manuals and keys shall be provided for generator and automatic transfer switch.
- H. Generator control system must include a programmable control device to allow automatic start-up and test functions. Test functions can be programmed for daily, weekly or monthly testing. Connections for remote monitoring of function and failure must be provided.
- I. Pump stations are required to have continuous standby power. Generators rated 100 KW and below shall be installed to operate on natural gas. All gas piping and connecting equipment shall be installed in accordance with the Georgia State Amendments to the Standard Gas Code, latest edition. All gas supply lines must include a drip loop as well as all other equipment required for a safe and complete hook-up.
- J. If gas is unavailable, a letter of exception must be obtained from the CITY. Generators above 100 KW shall be diesel powered with 100 gallons minimum fuel storage capacity or 72-hour operating time, whichever is greater. Fuel storage shall be accomplished by the use of corrosion –resistant double wall sub-base fuel tank only, no underground storage will be allowed. A leak detection device shall be provided in the interstitial space for sensing fuel leakage. The device contact shall be connected to the generator control panel terminals for telemetry.
- K. Generators can be obtained from the following manufacturers/representatives:
 - 1. Caterpillar, Kohler, and Onan
- L. Transfer switches shall be in NEMA-4 enclosures obtained from the manufacturer of the generator.

PART 3 EXECUTION

3.1 TESTING

- A. Services of manufacturer's authorized representative shall be provided for supervision of the installation, check-out and start-up.
- B. Generator shall be load tested at 100% full load on site for a period of four hours using resistive load banks. Notify the City inspector prior to test, and provide certification letter from the manufacturer.
- C. Upon completion of the check-out and testing, the manufacturer's representative shall provide written certification that the system has been properly installed, tested and is functioning properly.

3.2 INSTRUCTIONS

- A. Provide after the successful testing one "Instructions and Training Session" with the OWNER's designated personnel. Give instructions on operation, function and maintenance.
- B. Provide three (3) sets of complete Operation and Maintenance Manuals and Keys.

3.3 SYSTEM SERVICE CONTRACT

- A. Provide for OWNER's consideration a copy of the manufacturer's standard service contract after the successful start-up.

END OF SECTION

**SECTION 31 11 00
SITE PREPARATION**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. WORK to be performed under this section shall consist of clearing and grubbing the site within the limits of the approved Development Drawings and disposal of all waste materials.
- B. WORK also included under this section shall include the removal and replacement of existing fences and the erection of temporary fences.
- C. Definitions
 - 1. Clearing: The removal and disposal of all exposed objectionable matter such as: trees, brush, logs, buildings, fences, poles, rubbish, loose boulders and other debris resting on or protruding through the ground surface.
 - 2. Grubbing: The removal and disposal of all objectionable matter such as: logs, poles, stumps, structures, boulders, rubbish, and other debris which is embedded in the soil.

1.2 REGULATORY REQUIREMENTS

- A. Conform to applicable code for disposal of debris.
- B. Conform to local Fire Department Codes for burning debris on site. DEVELOPER shall obtain all necessary permits prior to burning on site.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials used for tree and vegetation protection shall remain during clearing operations at DEVELOPER'S option. Materials chosen shall ensure maximum protection to vegetation and comply with the Georgia Manual for Erosion and Sediment Control.
- B. Materials used for the repair of trees and vegetation damaged outside clearing limits shown on approved construction drawings shall be at DEVELOPER'S option but must be approved by the CITY prior to use.
- C. Herbicides shall not be used unless written approval is given by the CITY.

- D. Explosives shall not be used unless necessary permits are obtained from all Authorities having jurisdiction.
- E. Materials used for the replacement or relocation of existing fences shall be of equal or superior quality to those fence materials existing prior to construction unless specified otherwise on the plans.

PART 3 EXECUTION

3.1 CLEARING

- A. No tree, shrub, or other landscaping plants shall be removed unless absolutely necessary for the construction of the proposed improvements. All shrubs or landscaping plants removed or damaged during construction shall be replaced by the DEVELOPER at his expense, with landscaping approved by the CITY.
- B. Limits of clearing shall be contained within the areas within Right-of-way, Easement and Construction limits as shown on the approved Development Drawings.
- C. Existing fences that, at the direction of the CITY, can be reused shall be carefully removed and stored at such a distance they shall not be damaged by construction activity.
- D. Fences that cannot be reused shall be removed to such a distance to allow construction activity and shall be replaced with new materials similar to existing fences upon completion of construction.

3.2 GRUBBING

- A. The limits of grubbing shall be contained within Right-of-way, Easement and Construction limits as shown on the approved Development Drawings.
- B. Stumps and roots shall be grubbed and removed to a depth not less than 2 feet below existing grade or bottom of foundation structure.
- C. All holes or cavities which extend below the subgrade elevation of proposed WORK shall be filled with crushed rock or other suitable material and compacted to the same density as the surrounding material.

3.3 PROTECTION

- A. Streets, roads, adjacent property, and other works to remain shall be protected throughout the work in accordance with local laws and ordinances.
- B. DEVELOPER shall make every effort to protect existing bench marks, R/W markers, monuments, iron pins, property corner markers, etc. If any are disturbed or destroyed, CONTRACTOR shall provide services of a registered land surveyor to replace the markers.

- C. No trees shall be cut outside of areas designated without specific approval of the CITY, and any trees designated shall be protected from damage by DEVELOPER's construction operations.
- D. Existing trees and other vegetation to remain shall be protected as directed by the CITY:
 - 1. Trees shall be protected by fencing, barricades, or wrapping. Trees which are trimmed are to be treated with a tree dressing.
 - 2. Shrub and bushes shall be protected by fencing, barricades, or wrapping. Wrapping of bushes and shrubs with plastic film will not be permitted.
 - 3. Shallow-rooted plants shall be protected at ground surface under and in some cases outside the spread of branches by fencing, barricades, or ground cover protection.
- E. If archaeological resources are uncovered, DEVELOPER shall notify the CITY prior to proceeding with any WORK.
- F. DEVELOPER is to erect temporary fences as necessary to preserve the privacy of all affected property owners whose existing fences are being removed or relocated. Temporary fences shall be of sufficient strength and quality to prevent escape of animals and livestock and to prevent the intrusion of animals and people.
- G. It is DEVELOPER's responsibility to coordinate the removal and erection of fences with each affected property owner and to maintain any temporary and relocated fences throughout the contract period.
- H. DEVELOPER shall assume all costs incurred by any property owner in the loss of animals or livestock due to an insufficiency of replaced or temporary fences during the contract period and maintenance period thereafter.
- I. It is the DEVELOPER's responsibility to secure any insurance necessary to protect himself in the event of loss or damage to any animals, livestock and property for the duration of the project and maintenance period.

3.4 DISPOSAL

- A. DEVELOPER shall remove and dispose of all excess material resulting from clearing or site preparation operations. DEVELOPER shall dispose of such materials in a manner acceptable to the CITY at an approved location where such materials can be lawfully disposed.
- B. DEVELOPER may, at no cost, retain any materials of value from clearing operations for his own use or disposal by sale unless otherwise stated in these Specifications. Such material shall be removed from construction area before completion of WORK. The CITY assumes no responsibility for protection or safekeeping of any materials so retained by DEVELOPER.

- C. Burning will be permitted if the required permits have been acquired from the local Fire Department. Burning will be permitted only at times when conditions are considered favorable for burning and at locations approved by proper State or local authorities. Materials to be burned shall be piled neatly and, when in a suitable condition, shall be burned completely. Piling for burning shall be done in such a manner and in such locations as to cause the least fire risk. All burning shall be so thorough that the materials are reduced to ashes. No logs, branches, or charred pieces shall be permitted to remain. DEVELOPER shall at all times take special precautions to prevent fire from spreading to areas beyond the limits of cleared areas and shall have available at all times, suitable equipment and supplies for use in preventing and suppressing fires. Unguarded fires will not be permitted.
- D. Material to be removed from site shall be removed as it accumulates to prevent any unsightly spoil areas.

END OF SECTION

SECTION 31 23 16
EARTHWORK FOR UTILITIES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Work under this section shall include all operations necessary for excavating, backfilling and compaction of material necessary for the construction of pipelines and all appurtenant facilities including sewage pump station, concrete saddles, pipe protection, etc., and for the disposal of waste and unsuitable materials.

1.2 RELATED WORK

- A. Section 33 14 13 – Water Distribution System
- B. Section 33 31 00 – Sanitary Sewer Force Main
- C. Section 33 31 00 – Sanitary Sewer

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), Annual Book of Standards
 - 1. ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - 2. ASTM D2167, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
 - 3. ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
 - 4. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - 5. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - 6. AWWA C150, American National Standard for the Thickness Design of Ductile-Iron Pipe
 - 7. ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes
- B. Occupational Safety and Health Administration (OSHA), Code of Federal Regulations CFR Part 1926, Subpart P – Excavation, latest revision.

PART 2 PRODUCTS

2.1 BEDDING AND HAUNCHING STONE

- A. Class IA or IB aggregate materials in accordance with ASTM D 2321 for gravity sewer, wet trench conditions, under roads, structures and driveways.

2.2 BACKFILL

- A. Reused or imported earth free of stone, clods, broken rock, or concrete larger than 3 inches in largest dimension, or organic matter, rubbish, or other unsuitable material.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify bedding and backfill material to be used are acceptable. Do not use frozen material.
- B. Verify areas to be backfilled are free of debris, snow, ice, or water, and surfaces are not frozen.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. When necessary, compact subgrade surfaces to density requirements for backfill material.

3.3 SHEETING, SHORING AND BRACING

- A. CONTRACTOR shall be responsible for supporting and maintaining all excavations required even to the extent of sheeting and shoring the sides and ends of excavations with timber or other supports. All sheeting, shoring and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and to conform with OSHA 29 CFR 1926, Subpart P – Excavations, latest revision.
- B. Excavations adjacent to existing or proposed utilities, buildings and structures, or in paved streets or alleys shall be sheeted, shored and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent utilities and structures shall be done when necessary to maintain utilities and structures in safe condition. The CONTRACTOR shall be held liable for any damage resulting to such utilities, structures or pavements as a result of his operations.
- C. The need and adequacy of sheeting, shoring, bracing, or other provisions to protect men and equipment in a trench or other excavation shall be the sole and exclusive responsibility of CONTRACTOR.

- D. Moving trench boxes or sheeting: When using moveable trench support, care should be taken so not to disturb the pipe location, joints, or embedment. Removal of any trench protection below the top of the pipe and within the dimensions of the trench shown on the construction details (for Class 2, 4, and 5 Bedding) shall be prohibited after pipe embedment is compacted. Therefore, moveable trench supports shall only be used in wide trench construction where supports extend below the top of the pipe, or on a shelf above the pipe installed in a narrow trench in accordance with construction details. Any voids left in the embedment material by support removal shall be carefully filled with Class IA or IB aggregate materials and compacted.

3.4 EXCAVATION

A. Trench Excavation

1. Trench excavation shall consist of the removal of materials necessary for the construction of pipelines and all appurtenant facilities including collars, concrete saddles, and pipe protection called for on Drawings.
2. Excavation for pipelines shall be made in open cut unless otherwise shown on Drawings. Trenches shall be cut true to lines and grades shown on Drawings. Minimum pipe cover shall be 48" measured from the top of pipe to the ground surface.
3. Use of motor-powered trenching machine will be permitted but full responsibility for the preservation, replacement, and/or repair of damage to any existing utility services and private property shall rest with CONTRACTOR.
4. Bell holes for bell and spigot pipe and/or mechanical joint pipe shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench or bedding material.
5. Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic. Final grading and cleanup shall be continuous throughout the project. CONTRACTOR shall backfill all trenches at the end of each day.
6. Unless otherwise specified herein or shown on Drawings, wherever pipe trenches are excavated below elevation shown on Drawings, CONTRACTOR, at his own expense, shall fill the void thus made to proper grade with bedding and haunching material in accordance with Part 2.01A.

7. In all cases where materials are deposited along open trenches they shall be placed so that no damage will result to the WORK and/or adjacent property in case of rain or other surface wash.
 8. Remove soft, spongy, or otherwise unstable materials encountered at elevation of pipe which will not provide a firm foundation for the pipe. Extend bedding depth as necessary to reach firm materials.
- B. Any unauthorized excavation shall be corrected at the CONTRACTOR/DEVELOPER's expense.
 - C. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
 - D. Grade top perimeter of excavation to prevent surface water run-off into excavation.
 - E. Notify CITY and ENGINEER of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
 - F. Trench widths shall be in accordance with construction details for Class 2, 4, and 5 Bedding.

3.5 DEWATERING

- A. CONTRACTOR shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the WORK. Dewatering shall be accomplished by methods which will ensure a dry excavation and preservation of final lines and grades of bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches provided such ditches are kept open and free-draining at all times. Dewatering methods used shall be acceptable to ENGINEER. Footing pits or trenches shall be protected by small earth dikes and plastic covers when they are left open in rainy weather.
- B. When significant (more than 30 L.F. continuously in a trench) ground water is encountered in soils containing fines, the CONTRACTOR shall notify the CITY. In these areas, the trench shall be lined with an approved filter fabric between the bedding and haunching material and the trench walls to reduce the effects of migration of fines which can diminish pipe support.

- C. Unless specifically authorized by CITY, groundwater encountered within the limits of excavation shall be depressed to an elevation not less than twelve (12) inches below the bottom of such excavation before pipe laying or concreting is started and shall be so maintained. No concrete structures shall be exposed to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Water shall not be allowed to rise above bedding during pipe laying operations. CONTRACTOR shall exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Dewatering operations shall commence when ground or surface water is first encountered and shall be continued until such times as water can safely be allowed to rise in accordance with provisions of this section.
- D. Standby pumping equipment shall be kept on the job site. A minimum of one standby unit (one for each ten in the event well points are used) shall be available for immediate installation should any pumping unit fail. Installation of well points or deep wells shall be adequately sized to accomplish the WORK.
- E. CONTRACTOR shall not operate dewatering devices (i.e., pumps, etc.) before the hour of 8:00 AM and after the hours of 8:00 PM in a residential area unless otherwise approved by CITY.
- F. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with foundation backfill. Foundation backfill shall be placed in bottom of trench to within 6" of the bottom of pipe. Six (6) inches of bedding stone shall be placed over the top of the foundation backfill.
- G. CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. Conveyance of water shall be such as to not interfere with construction operations or surrounding property owners. No water shall be drained into WORK built or under construction. CONTRACTOR will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
- H. Storm water runoff shall be controlled by means of temporary erosion control methods.
- I. Water shall be disposed of in such a manner as not to be a menace to public health and in accordance with applicable Environmental Protection Agency, Corps of Engineers, and State Environmental Protection Division standards and permits.

3.6 BEDDING/BACKFILLING

- A. The backfilling of trenches shall be started immediately after construction. Bedding shall be aggregate and backfill material shall be earth or aggregate in accordance with Part 2 and the Details. Material shall be deposited in the initial horizontal layer to the spring line of the pipe (before compaction) on each side of the pipe. The initial layer shall be thoroughly tamped or rammed around the pipe until the initial layer's density is equal to the density of the adjacent undisturbed soils. The second bedding material layer shall be deposited horizontally to a depth to provide a cover of not less than 12 inches over top of pipe. The remainder of the backfill shall be placed in horizontal layers 18 inches (maximum) in depth. The second and subsequent bedding/backfill layers shall be compacted by compaction tools to a density equal to the density of the adjacent undisturbed soils, except under roads, structures, and driveways.
- B. Compact aggregate and soil backfill under roads, parking lots, structures, and driveways to a minimum of 95% of maximum dry density at not less than 2% below nor more than 2% above the optimum moisture content as determined by ASTM D 698. The top 12 inches shall be compacted to 100 percent of maximum dry density. Consolidation by saturation or ponding will not be permitted.
- C. All backfilling shall be done in such a manner that the pipe or structure over or against which it is being placed will not be disturbed or injured. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be removed and repaired to the satisfaction of OWNER and then re-backfilled.
- D. Backfilling shall not be done in freezing weather except by permission of the CITY, and shall not be done with frozen material or upon frozen materials.
- E. All backfilling shall be left with smooth, even surfaces, properly graded and shall be maintained in this condition until final completion and acceptance of the work. Where directed by the CITY, the backfill shall be mounded slightly above the adjacent ground.
- F. Leave stockpile areas completely free of excess fill materials. After construction and cleanup, stockpile areas shall be seeded.
- G. Use "Class 5" bedding in all wet trenches and under roads/driveways, regardless of pipe material.
- H. Use "Class 5" bedding for all PVC gravity sewer.
- I. Use "Class 5" bedding for all HDPE force mains.
- J. Use "Class 2" bedding for DIP water line.

3.7 SUBSURFACE OBSTRUCTIONS

- A. In excavating, backfilling, and laying pipe, care must be taken not to remove, disturb, or injure any existing water, telephone, gas pipes, storm drainage pipe, headwalls or catch basins, or other conduits or structures, without the approval of the CITY. If necessary, the CONTRACTOR at his own expense, shall sling, shore up, and maintain such structures in operation, and shall repair any damage to them. Before final acceptance of the work, he shall return all such structures to as good condition as before the work started.
- B. The CONTRACTOR shall give sufficient notice to the interested utility of his intention to remove or disturb any pipe, conduit, etc., and shall abide by their regulations governing such work. In the event that any subsurface structure becomes broken or damaged in the execution of the work, the CONTRACTOR shall immediately notify the proper authorities, and shall be responsible for all damage to persons or property caused by such breaks. Failure of the CONTRACTOR to promptly notify the affected authorities shall make him liable for any needless loss so far as interference with the normal operation of the utility.
- C. When pipes or conduits providing service to adjoining buildings are broken during progress of the work, the CONTRACTOR shall repair them at once.
- D. Delays such as would result in buildings or residences being without services overnight or for a needlessly long period during the day will not be tolerated. Should it become necessary to move the position of a pipe, conduit or structure, it shall be done by the CONTRACTOR in strict accordance with the instructions given by the CITY or the utility involved.

3.8 BORROW EXCAVATION

- A. Wherever the backfill of excavated areas or the placement of embankments or other fills require material not available at the site, suitable material shall be obtained from other sources. This may require the opening of borrow pits at points not immediately accessible to the WORK. Before a borrow pit is opened, the quality and suitability of the material to be obtained shall be approved by the CITY. Any soil tests required for approval of the borrowed material shall be at the DEVELOPER's expense.

3.9 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

- A. Materials removed by excavation, which are suitable for the purpose, shall be used to extent possible for backfilling pipe trenches and for making embankment fills, subgrades or for such other purposes as may be shown on Drawings. Materials not used for such purposes shall be considered waste material and shall be disposed of at the CONTRACTOR's expense.

- B. Waste materials shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with sufficient and adequate openings to permit surface drainage of adjacent lands.
- C. Unsuitable materials, consisting of rock, wood, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material so designated by the CITY, shall be removed from the work site and disposed of by CONTRACTOR at his expense.
- D. No waste material shall be dumped on private property unless written permission is furnished by owner of property and unless a dumping permit is issued from local jurisdiction.

3.10 TESTING

- A. Compaction of fill and backfill to the specified moisture-density relationship of soils shall be verified by in-place density tests using ASTM D 2167, D1556 or other ASTM in-place density tests approved by the CITY. Maximum density determination and in-place density tests shall be performed by a registered geotechnical engineering representative employed by the DEVELOPER. Frequency and location of tests shall be adequate to ensure proper compaction has been achieved.
- B. The CITY shall reserve the right to employ and assign its own a registered geotechnical engineering representative to verify and conduct compaction testing if so inclined.
- C. Evidence/documentation of the DEVELOPER's testing shall be submitted to the CITY at the CITY's request.
- D. Areas not meeting the required compaction shall be recompacted until the desired degree of compaction is achieved. All costs associated with **re-testing** failed areas of compaction shall be paid for by the DEVELOPER.

3.11 PROTECTION

- A. Protect excavation by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in of loose soil into excavation. Protection shall be in accordance with OSHA 29 CFR 1926, Subpart P-Excavations, latest revision.

3.12 FINAL GRADING

- A. After other earthwork operations have been completed, sites of all structures and embankments shall be graded to finished grade as shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond required limits. Finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from use of hand tools. If CONTRACTOR is able to obtain required degree of evenness by means of mechanical equipment, he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished.

- B. Unless otherwise specified or shown on the Drawings, all finished ground surfaces shall be graded and dressed to present a surface varying not more than plus or minus 0.10 foot. Any finished surfaces resulting in inadequate drainage or washouts shall be corrected by the CONTRACTOR at his expense.

3.13 SETTLEMENT

- A. CONTRACTOR shall be responsible for all settlement of backfill, fills, and embankments which may occur during warranty period.
- B. CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from CITY.

END OF SECTION

SECTION 31 23 17 ROCK REMOVAL

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. All rock materials discovered during excavation for the purpose of construction shall be removed. Removal shall include drilling and/or blasting incidental thereto and disposal of excavated materials.
- B. When necessary for prosecution of the WORK, the use of explosives to assist rock removal may be executed by DEVELOPER provided this use is in compliance with all local, State, Federal and other Governmental regulations applying to transportation, storage, use and control of explosives.

1.2 RELATED WORK

- A. Section 31 23 16 - Earthwork for Utilities

1.3 REFERENCES

- A. NFPA 495 - Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials.
- B. OSHA 2207 - Construction Industry Standards, Subpart T - Demolition.
- C. Rules and Regulations of Safety Fire Commissioner, Chapter 120-3-10.

1.4 QUALITY ASSURANCE

- A. Explosives Firm: Company specializing in explosives for disintegration of subsurface rock with documented experience.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code, including Rules and Regulations of Safety Fire Commissioner, Chapter 120-3-10, for explosive disintegration of rock.
- B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.
- C. All explosives shall be stored securely in compliance with all laws and ordinances, and all such storage places shall be clearly marked DANGEROUS EXPLOSIVES. Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents. Locked storage shall be provided satisfactory to the CITY, never closer than allowed by the Safety Fire Commissioner.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Rock (Definition): Solid mineral material with a volume in excess of 1/2 cu yd that cannot be broken down and removed by use of heavy construction equipment, such as a Caterpillar 225 or equivalent, having a bucket curling force rated at not less than 25,700 pounds, bulldozer such as a Caterpillar D8K equipped with single tooth hydraulic ripper, 3/4 cu yd capacity power shovel, rooters, etc., and without drilling or blasting. Materials which can be loosened with a pick, hard pan, boulders less than 1/2 cu yd in volume, chert, clay, soft shale, soft and disintegrated rock and any similar material shall not be considered as rock. (All materials to be considered unclassified or common excavation)
- B. Explosives: Shall be suitable for intended purposes at the DEVELOPER's option subject to review by the CITY.
- C. Delay Devices: Type recommended by explosives firm to be used as accessory to explosives. Subject to review by the CITY.
- D. Blasting Mat: When the use of explosives is necessitated during prosecution of the WORK, DEVELOPER shall incorporate the use of blasting mats of type recommended by explosives firm to lessen the danger of projectiles occasionally resultant from blasting of rock.

PART 3 EXECUTION

3.1 NOTICE

- A. CONTRACTOR shall notify CITY staff 24 hours (Monday-Friday) prior to any blasting work.

3.2 INSPECTION

- A. Rock in utility trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipeline (Inches)	Depth of Excavation Below Bottom of Pipe (Inches)
Less than 4	6
4 to 6	8
8 and over	12

- B. Space below grade for pipe shall then be backfilled with 3/4-inch crushed rock or gravel or other approved materials and tamped to proper grade.

3.3 ROCK REMOVAL - MECHANICAL METHOD

- A. Excavate and remove rock by mechanical method.
- B. Where pipes are constructed on concrete cradles, rock shall be excavated to bottom of cradle as shown on approved construction plans.
- C. Where rock foundation is obtained at grade for over 50 percent of area of any one structure, the portion of foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class C concrete.
- D. Where rock foundation is obtained at grade for less than fifty (50%) of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of twelve (12) inches below grade and the space below grade shall be backfilled with crushed stone as specified for pipelines.
- E. Rock excavation near existing pipelines or other structures shall be conducted with utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired to the satisfaction of the CITY and by DEVELOPER at his own expense.
- F. Remove excavated material from site.
- G. DEVELOPER shall correct excess rock removal by backfill to grade with Class C (3000 psi) concrete in accordance with backfilling and compaction requirements of Section 31 23 16 (Earthwork for Utilities), at his own expense.

3.4 ROCK REMOVAL - EXPLOSIVES METHODS

- A. The DEVELOPER shall notify any owners of adjacent buildings or structures, and any public utility owners having structures or other installations above or below ground, in writing prior to use of explosives. Such notice shall be given sufficiently in advance so that they may take such steps as they may deem necessary to protect their property from injury and/or damage.
- B. Rock excavation by use of explosives shall be conducted with due regard for safety of persons and property in the vicinity and in strict conformance with requirements of local, State and Federal ordinance, laws and regulations of the Safety Fire Commissioner.
- C. Blasting shall be conducted so as not to endanger persons or property, and whenever required, the blast shall be covered with mats or otherwise satisfactorily confined. The DEVELOPER shall be held responsible for and shall make good any damage caused by blasting or accidental explosions.
- D. The DEVELOPER shall permit only authorized and qualified persons to handle and use explosives.

- E. Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported or used.
- F. No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.
- G. All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The DEVELOPER shall be held responsible for maintaining an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.
- H. No explosives or blasting agents shall be abandoned.
- I. DEVELOPER's employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to, visual and audible warning signals, flags, or barricades, to ensure safety.
- J. A seismograph shall be used at the nearest structure during blasting events that are within 750 feet of the nearest house, public building, school, church, commercial or institutional building and roadway. The velocity/shock wave shall not exceed the established limits of U.S. Bureau of Mines RI 8507; appendix (b).
 - 1. Exception: Where all pedestrian and vehicular traffic on a roadway can be restricted to a distance of 750 feet or greater from the blast site at the time of the firing of the blast or where a variance is issued by the State Fire Marshal's Office.
- K. Disintegrate rock and remove from excavation.
- L. Cut away rock at excavation bottom to form level bearing.
- M. Remove shale layers to provide sound and unshattered base for pipe foundations.
- N. Remove excavated material from site.
- O. Correct unauthorized rock removal or overbreak in accordance with backfilling and compaction requirements at his own expense.

3.5 FIELD QUALITY CONTROL

- A. Provide for visual inspection of bearing surfaces and cavities formed by removed rock for inspection by the CITY.

END OF SECTION

**SECTION 32 01 16
RESTORING PAVEMENTS**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Work included in this Section consists of repair and replacement of pavements including: concrete, asphalt, surface treatment, and crushed storm or gravel roadways; sidewalks, curbs and gutters; stabilized shoulders; and driveways.

1.2 RELATED WORK

- A. Section 31 23 16 – Earthwork for Utilities

1.3 QUALITY ASSURANCE

- A. Coring and testing of pavement shall be performed at DEVELOPER’S’s expense.

1.4 REFERENCES

- A. Standard Specifications, Construction of Roads and Bridges, Latest Edition – Department of Transportation, State of Georgia.

PART 2 PRODUCTS

2.1 GRADED AGGREGATE

- A. Shall be sound, durable, graded aggregate base, all of which passes the following, free of organic matter and debris.

Sieve Size	Percent Passing By Weight
Group 1 Aggregates	
2 in (50 mm)	100
1 – ½ in (37.5 mm)	97-100
¾ in (19.0 mm)	60-95
No. 10 (2 mm)	25-50
No. 60 (250 □m)	10-35
No. 200 (75 □m)	7-15

From DOT Spec – 815 – 9.A.B.

2.2 CONCRETE

- A. Shall be ready-mixed concrete, 3,000 psi.

2.3 BITUMINOUS PRIME

- A. Shall conform to GDOT Standard Specifications Section 821.01, latest edition.

2.4 ASPHALTIC CONCRETE

- A. Shall be Hot Mix Asphaltic Concrete conforming to Section 400 of GDOT Standard Specifications (latest edition), from a source approved, in advance, by the CITY.

PART 3 EXECUTION

3.1 GENERAL

- A. Restore all pavement, base, sidewalks, curbs and gutters, shoulders, and driveways equal to or better than the original, but not less thickness than specified herein or shown on the Drawings.
- B. Carefully backfill any excavated area on which pavement, sidewalks, or curbs and gutters are to be placed as specified in Section 31 23 16 of these Specifications.
- C. All pavement restoration shall be done in accordance with the requirements of the authorities within whose jurisdiction such pavement is located. All highway utilities are to be maintained, and work shall conform to the rules and regulations of the authority, including the use of traffic control signage. The DEVELOPER shall provide all such bonds or checks which may be required by the highway authorities to insure proper restoration of paved areas, at no cost to the OWNER.
- D. It is the DEVELOPER's responsibility to coordinate, communicate and comply with local authority that has jurisdiction. All work shall comply with the requirements of this local authority.
- E. If, prior to the expiration of the period of maintenance, any pavement or gravel roadways, curbs, or storm drainage structures which have been damaged, due to undermining, or for any other cause which may be attributed to the work of the DEVELOPER, the DEVELOPER shall remove such damaged or injured surfaces, foundations of same, and all loose earth. DEVELOPER shall then backfill with graded aggregate base, properly compacted; and furnish, place and maintain the pavement, gravel roadway, curbs, or storm drainage structure as required.
- F. Work which the DEVELOPER may perform in connection with the replacement and repair of damaged roadways or storm drainage structures during the period of maintenance, shall be done at his expense, in accordance with the rules and requirements of the authority within whose jurisdiction such pavement is located, and in accordance with the additional requirements of the specifications, and the DEVELOPER shall furnish evidence to the CITY that the work has been completed to the satisfaction of such authority.

- G. Before placing any base, pavement, sidewalk or curb and gutter, cut the existing pavement along the trench line back from the top edges of the ditch line for a distance of at least twelve inches (12") on each side of the ditch to allow solid bearing edges for base and pavement.
- H. All cuts shall be made by channeling machine, pneumatic tools, or such other methods that will furnish a clean cut in the pavement and pavement base without undue shattering.
 - 1. For pipeline trenches, the repaired area should adhere to the following procedures:
 - a. Pavement and trench to be opened as shown in standard details. After the utility line and any required bedding have been placed, the backfill and overfill material shall be placed as described in the project specifications, up to the subbase. At this point, the pavement shall be cut back at least 12-inches on each side of the trench or to visible overbreaks, whichever is greater, to a depth of 2-inches with a concrete saw. Remove pavement as necessary. The subbase material shall be carefully placed and shaped. Water shall be added as necessary to provide a damp, but not wet, subbase before the concrete base is placed. The vertical face of the existing pavement shall be sprayed with a fine mist of water to moisten the surface. The new concrete base shall then be poured before this surface dries out. The base shall be placed with care, making sure it is worked back into all corners and into the rough surface of the existing pavement.
 - b. After the concrete base has cured, the surface of the concrete base and vertical edges of the existing paving must be clean and dry before the tack coat is applied. The tack coat shall be applied to the surface of the new concrete base and brushed into the corners and onto the vertical edges of the old pavement to provide a bond and to seal out water. The hot asphaltic plant mix surface material shall be immediately placed after the surface of the tack coat has dried to the point that it is sticky to the touch.
- I. The DEVELOPER shall provide graded aggregate base over trenches in public streets promptly after completion of backfill to provide full use of the street with a minimum of delay. Steel plates shall be placed over the trenches until placement of concrete or asphalt, as directed on the Contract Drawings is complete.
- J. Should settlement, cracks or other indications of failure appear in pavements, the paving shall be removed to the extent necessary to secure firm, undisturbed bearing and shall be relaid in a satisfactory manner.
- K. Bituminous Paving
 - 1. Transport bituminous concrete paving mixes from an approved mixing plant to the work site in tight vehicles with metal bottoms previously cleaned of all foreign materials. All such vehicles shall be suitably insulated to avoid heat loss. Each load shall be covered or otherwise protected to prevent cooling and loss of ingredients.

2. Prime base course and place surface course in accordance with Section 400 of the GDOT Standard Specifications. Surface course in place, compacted thickness shall be 1½" minimum unless otherwise shown on the Drawings.
3. Dump and spread mixture on primed base with a spreading and finishing machine so that after compaction, surface will be smooth, of uniform density, and meet requirements for typical cross-sections shown on the Drawings. Other placing means may be proposed.
4. Unless otherwise indicated or approved, place all bituminous concrete and complete initial rolling during daylight hours. Mixtures shall be at a temperature of between 225 degrees F. and 325 degrees F. when placed.
5. During application take care to prevent the splattering of adjacent curbs, gutter, concrete paving, and structures. Hand spreading may be employed where machine is impractical.
6. Bituminous concrete paving finish grades shall be approximately 6" below adjacent concrete sidewalks, and/or curbs, except as specifically straight within ½" in 10' when checked with a straight edge. No "bird baths" will be allowed.
7. Provide sufficient rollers to obtain the required pavement density. Continue rolling until no further compression can be obtained and all roller marks are eliminated.
8. Rollers shall not be permitted to stand on pavement which has not been fully compacted and which has not cooled to atmospheric temperature. To prevent adhesion of surface mixture to roller, keep wheels thoroughly moistened with water; however, an excessive use of water will not be permitted.
9. Maintain slow enough movement of roller at all times to avoid displacement of mixture. If any displacement occurs, correct at once by use of rakes and addition of fresh mixture.
10. Take precautions to prevent dropping of oil, gasoline, or grease on pavement.
11. Along edges of pavement along curbs, headers, aprons, manholes, valve boxes and similar places not accessible to roller, thoroughly compact asphalt with lightly oiled hand-operated vibrating rollers or mechanical tampers.
12. After final rolling, do not permit vehicular traffic on asphalt pavement until it has cooled and hardened, and in no case sooner than 6 hours.

L. Surface Treatment

1. Shall conform to triple surface treatment as defined in the GDOT Standard Specifications, Section 424.

2. DEVELOPER shall select the aggregates and bituminous material to be used subject to approval of CITY.
3. Aggregates and bituminous material shall conform to, and be applied in conformance with, Section 424 of GDOT Standard Specifications (latest edition).
4. Spread materials at a uniform rate; use hand work where necessary to insure uniform, adequate cover.
5. Provide sufficient rolling to key the aggregate into bituminous material.
6. Broom surface as necessary.
7. Do not permit traffic on any course until the bituminous material has cooled and set.

M. Portland Cement Concrete Pavement

1. Shall conform to requirements of Section 430 of GDOT Standard Specifications (latest edition). Concrete shall be 4,000 psi.
2. Place concrete in such a manner as to require as little rehandling as possible.
3. Provide reinforcement equal the original pavement with sufficient ties to insure an integral slab.
4. Vibrate concrete over its full width and depth.
5. Finish by float or finishing machine, continuously following placement.

3.2 CLEAN UP

- A. Before work is accepted by the CITY, remove excess material not used from job site.
- B. Any subsequent settlement of pavement or backfill, or erosion over or in the trenches shall be replaced or repaired and the surface shall be brought to grade.
- C. Any and all items disturbed by the construction shall be restored to original condition as soon as possible after completion of the work.

END OF SECTION

SECTION 32 31 13
CHAIN LINK FENCE AND GATES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The work covered in this section shall include all materials, labor, and equipment necessary for a complete installation of the chain link fencing.

1.2 REFERENCES

- A. ASTM A 392 Zinc-Coated Steel Chain Link Fence Fabric.
- B. ASTM A 824 Metallic-Coated Marcellled Tension Wire for use with Chain Link Fence Fabric.
- C. ASTM A-121 Standard Specification for Zinc Coated (Galvanized) Steel Barbed Wire.
- D. ASTM F 552 Definitions of Terms Relating to Chain Link Fencing.
- E. ASTM F 567 Standard Practices for Installation of Chain-Link Fence.
- F. ASTM F 626 Standard Specifications for Fence Fittings.
- G. ASTM F 669 Standard Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence.
- H. ASTM F 1083 Pipe, Steel, Hot-dipped, Zinc-Coated (Galvanized) Welded, for Fence Structures.
- I. ASTM C 94 Ready Mix Concrete.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Allied Tube and Conduit Corporation.
- B. American Security Fence Corporation.
- C. Southeastern Wire, P.O. Box 1968, Tampa, Florida 33601.
- D. Cyclone Fence (United States Steel Corporation).
- E. Manufacturer and distributor of complete fencing systems, or approved equivalent.

2.2 FENCE MATERIAL

A. Posts and Fabric

1. Posts and fabric shall be as specified in the following table:

	Fence Height 8 Feet
Fabric	2" Mesh / 9 Ga.
Corner Post	4"
Line Post	2"
Gate Post	4"
Top Rail and Brace	1 □ "

2. Post sizes should conform to Table 1, ASTM F-1083 (schedule 40 steel pipe). All post and rails shall be hot dipped galvanized per ASTM F-1083.

B. Top Rail shall be continuous with coupling spaced at intervals not to exceed 20 feet.

C. All posts shall be provided with post tops which will fit over the outside of posts to exclude moisture and shall be combination tops with barbed wire supporting arms. Post tops shall be provided with a hole suitable for the through passage of the top rail. Posts without barb arms shall be fitted with a cap.

D. Barbed wire supporting arms shall be at an angle of 45°, and shall be fitted with clips or other means for securing three lines of barbed wire, the top line approximately 12" horizontally from the fence line and 12" above the top of the fabric and the other lines spaced uniformly between the top line and the top of the fabric.

E. Post Brace

1. A horizontal, galvanized post brace shall extend to each adjacent line post at mid-height of the fabric for each gate, corner, pull and end post. A diagonal 3/8" diameter truss rod shall also be provided from the line post to the gate, corner, pull, or end post, with a turnbuckle or other equivalent device for tension adjustment. Two diagonal tension truss rods shall be provided for each fence panel adjacent to a gate, end, corner or pull post.

F. Stretcher Bar

1. Stretcher bars 1/4" x 3/4" inch in size, with length 1" less than fabric height, shall be provided for stretching and securing the fabric at each gate, end, corner and pull post, one for each gate and end post and two for each corner and pull post.

G. Wire

1. Wire shall be provided along the top and bottom edges. It shall be not less than No. 7 gauge coiled spring wire. Galvanized ties or clips shall be provided for attaching tension wires to fabric.
2. Wire Ties shall be 9 gauge.
3. Barbed wire shall consist of (3) strands of 12 gauge with 4 points at 5" o.c. per ASTM A-121.

H. Gate Frame

1. Fabricate gate frames from steel pipe to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, that provides security against removal or breakage connections.
2. Extend end members of gate frames 1'-0" above to member and prepare to receive 3 strands of wire. Provide clips for securing wire to extensions.
3. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.
4. Fabricate frames of minimum 12" (NPS).

I. Fabric - Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c.

J. Gate Hardware: Provide hardware and accessories for each gate, in accordance with the following:

1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1-1/2 pair of hinges for each leaf.
2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch. Center drop to be provided on double gates.
3. Padlock: Bronze cylinder type lock with three (3) keys is to be provided for each set of gates. Locks are to be keyed per OWNER's direction.
4. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.

2.3 FINISHES

A. Galvanized: ANSI/ASTM A 123; 2.0 oz/sq. ft.

- B. Aluminum coating: ASTM A 428; 0.40 oz/sq. ft.
- C. Thermally fused vinyl coating: Black color.
- D. Vertical vinyl privacy slats: Black color.
- E. Vinyl Components: Black color.
- F. Accessories: Same finish as fabric.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Do not begin installation and erection before final grading is completed.
- B. Work shall be performed in a safe and orderly fashion in accordance with Occupational Safety and Health Administration (OSHA) regulations.

3.2 POST INSTALLATION

- A. Excavation: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. Excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
 - 2. Excavate hole depths 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.
- B. Fence Post Setting
 - 1. Line posts shall be placed equidistant at intervals not to exceed 10 ft. o.c. The intervals to be measured parallel to the grade of proposed fence and in the line of the fence.
 - 2. Line, end, corner and pull posts shall be of sufficient length to allow for installation to a depth as shown on PS-3.
 - 3. Posts shall be set vertically and plumb and encased in cylindrical concrete footings at least four times the post diameter, with at least a 2" cover on the bottom of the post. Extend the concrete at least 2" above grade and crown to shed water.

3.3 RAIL INSTALLATION

- A. Top Rail: Connect securely to the posts using boulevard clamps or other suitable means, so that a continuous brace is formed.

3.4 CHAIN LINK FABRIC

- A. Chain link fence fabric shall be installed over the outside face of the fence framework. Fabric shall be tied to line posts and middle rails with 9 gage galvanized wire spaced 12" maximum.

3.5 TENSION WIRES

- A. Install tension wires along bottom of fence before stretching fabric and tie to each post. Fasten fabric to tension wire using 9-gauge, wire ties or galvanized wire hog rings spaced 24-inches on center.

3.6 BARBED WIRE

- A. Pull wire taut and install to extension arms and secure to end post or terminal arms in accordance with manufacturer's instructions.

3.7 GATES

- A. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate.

3.8 STRETCHER BARS

- A. Thread through or clamp to fabric 4" o.c. and secure to posts with metal bands spaced 15" o.c.

3.9 BRACE ASSEMBLIES

- A. Install braces so posts are plumb when diagonal rod is under proper tension.

END OF SECTION

SECTION 33 05 07
HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This section describes materials and equipment required to install potable water main, reclaimed water main, gravity sewer, and force main pipe using horizontal directional drilling (HDD) method of installation. The pipe size, type and length shall be as specified herein and as shown on the approved construction drawings. Work shall include, but not be limited to, proper installation, testing, and environmental protection and restoration.
- B. Protect all known underground utilities, structures, and drains using industry standard techniques.
- C. Directional drilling shall be accomplished by first drilling a pilot hole to design standards and then enlarging the pilot hole no larger than 1.2 times the outside diameter of the pipe or pipe bell, if applicable, to accommodate pull back.
- D. Work shall be constructed using all local, GDOT, and OSHA rules and guidelines for traffic control and safety.

1.2 REFERENCES

- A. American Water Works Association (AWWA)
 - 1. AWWA C104: Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water
 - 2. AWWA C111, Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
 - 3. AWWA C151, Standard for Ductile Iron Pipe, Centrifugally Cast for Water or Other Liquids
 - 4. AWWA C600, Standard for Installation of Ductile Iron Water Mains and Their Appurtenances
 - 5. AWWA C651, Standard for Disinfecting Water Mains
 - 6. AWWA C150, Standard for Thickness, Design of Ductile Iron Pressure Pipe
- B. NSF International (NSF)
 - 1. NSF61 Drinking Water System Components

1.3 QUALITY ASSURANCE

- A. The CONTRACTOR shall provide the City with 72 hours' notice (Monday – Friday) prior to any underground drilling operations.
- B. At the request of the CITY, the CONTRACTOR shall provide an overview of the drilling and locating equipment to be used, as well as the methods and practices of monitoring the accuracy of the bore.
- C. The CONTRACTOR shall exercise all due diligence in attempting to maintain accurate line and grade with minimum deviation to the submitted Pilot Bore Profile. The CITY shall be notified immediately of any unforeseen site conditions which, the CONTRACTOR feels, will render the bore unusable or beyond the agreed limits of accuracy.

PART 2 PRODUCTS

2.1 HIGH DENSITY POLYETHYLENE PIPE FOR HORIZONTAL DIRECTIONAL DRILLING

- A. See Specification 33 31 00.

2.2 TRACER WIRE

- A. WIRE
 - 1. Tracer wire for pipe HDD applications shall be 3/16" diameter 7x7 stranded copper clad steel extreme strength wire with 4,700 lb break strength with a minimum 50 mil HDPE insulation thickness made for direct bury.
 - 2. Acceptable manufacturers are as follows:
 - a. Soloshot Extreme by Copperhead Industries, LLC
 - b. Or approved Equal
- B. CONNECTORS
 - 1. All mainline tracers wires shall be interconnected at tees, crosses, etc. using lockable connectors specifically manufactured for direct bury installation.
 - 2. Connectors shall be dielectric silicon filled to seal out moisture and corrosion.
 - 3. Twisted connections, wire nuts, etc. sealed with electrical tape are prohibited.

4. Acceptable manufacturers are as follows:
 - a. Copperhead Industries, LLC
 - b. Or approved equal

2.3 DRILL RIG

- A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a magnetic guidance system or walk-over system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, and trained and competent personnel to operate the system. All equipment shall be in good, safe 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. The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling 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 installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.
- C. The drill head shall be steerable by changing its rotation, and shall provide necessary cutting surfaces and drilling fluid jets.
- D. Mud Motors (if required): Mud motors shall be of adequate power to turn the required drilling tools.

2.4 GUIDANCE SYSTEM

- A. An electronic walkover tracking system or a Magnetic Guidance System (MGS) probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to fifty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate and calibrated to manufacturer's specifications of the vertical depth of the borehole at sensing position at depths up to forty feet and accurate to 1-foot horizontally.

- B. The CONTRACTOR shall supply all components and materials to install, operate, and maintain the guidance system.
- C. The guidance system shall be of a proven type, and shall be set up and operated by personnel trained and experienced with the system. The operator shall be aware of any geo- magnetic anomalies and shall consider such influences in the operation of the guidance system.

2.5 DRILLING FLUID (MUD) SYSTEM

- A. 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. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be minimum of 1,000 gallons. Mixing system shall continually agitate the drilling fluid during drilling operations.
- B. Drilling fluid shall be composed of clean water and bentonite clay. Water shall be from an authorized source with a pH of 8.5 to 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. No additional material may be used in drilling fluid without prior approval from ENGINEER. The bentonite mixture used shall have the minimum viscosities as measured by a March funnel:

Rocky Clay	60 seconds
Hard Clay	40 seconds
Soft Clay	45 seconds
Sandy Clay	90 seconds
Stable Sand	80 seconds
Loose Sand	110 seconds
Wet Sand	110 seconds

- 1. These viscosities may be varied to best fit the soil conditions encountered, or as determined by the operator.

- C. The mud pumping system shall have a minimum capacity of 35-500 GPM and the capability of delivering the drilling fluid at a constant minimum pressure of 1200 psi. The delivery system shall have filters in-line to prevent solids from being pumped into drill pipe. Used drilling fluid and drilling fluid spilled during operations shall be contained and conveyed to the drilling fluid recycling system or shall be removed by vacuum trucks or other methods acceptable to ENGINEER. A berm, minimum of 12 inches high, shall be maintained around drill rigs drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey drilling fluid from containment areas to storage and recycling facilities for disposal.
- D. The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid and render the drilling fluid reusable. Spoil separated from the drilling fluid will be stockpiled for later use or disposal.

2.6 OTHER EQUIPMENT

- A. Pipe Rollers: Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydrotested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe.
- B. Pipe Rammers: Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of ENGINEER.
- C. Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the ENGINEER prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system shall maintain line and grade within the tolerances prescribed by the particular conditions of the project.

2.7 PERSONNEL REQUIREMENTS

- A. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have at least two years directional drilling experience.
- B. All welders used for splicing and connecting steel and HDPE pipe shall be certified welders. No welds will be allowed by a welder that does not have their certification card on site.

- C. A competent and experienced supervisor representing the CONTRACTOR and Drilling SUBCONTRACTOR shall be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge of, and control, the operation at all times. In all cases, the supervisor must be continually present at the job site during the actual Directional Bore operation. The CONTRACTOR and SUBCONTRACTOR shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner.
- D. Personnel who are unqualified, incompetent or otherwise not suitable for the performance of this project shall be removed from the job site and replaced with a suitable person.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. The CITY must be notified 72 hours in advance (Monday – Friday) of starting work. It shall be the responsibility of ENGINEER to provide inspection personnel at such time as appropriate without causing undue hardship by reason of delay to the CONTRACTOR.
- B. All work under this specification affecting the Georgia Department of Transportation (GDOT) property, right-of-way or facilities shall be carried out to the full satisfaction of the GDOT authorized representative. The CONTRACTOR shall fully inform himself of all requirements of the GDOT as pertains to specific project and shall conduct all his work accordingly.

3.2 DIRECTIONAL DRILLING OPERATION

- A. The CONTRACTOR shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the bore hole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits.
- B. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If CONTRACTOR is using a magnetic guidance system, drill path will be surveyed for any surface geo-magnetic variations or anomalies.
- C. Readings shall be recorded after advancement of each successive drill pipe (no more than 20 lf.) and the readings plotted on a scaled drawing. Access to all recorded readings and plan and profile information shall be made available to the CITY at all times. At no time shall the deflection radius of the drill pipe exceed the deflection limits of the carrier pipe as specified herein.
- D. A complete list of all drilling fluid additives and mixtures to be used in the directional operation will be available to the CITY.

- E. The pilot hole shall be drilled on bore path with minimal deviation proportionate to the grade being maintained. In the event that pilot does deviate from the bore path, CONTRACTOR will notify CITY and CITY may require CONTRACTOR to pull-back and re-drill from the location along bore path before the deviation. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, CONTRACTOR shall contain the fractured area with necessary erosion control devices to prevent damage to property or the environment.
- F. Upon completion of pilot hole phase of the operation, a complete set of “as-built” records shall be submitted in duplicate to the CITY. These records shall include copies of the plan and profile drawing, as well as directional survey reports as recorded during the drilling operation.
- G. Upon approval of the pilot hole location, the hole opening or enlarging phase of the installation shall begin. The bore hole diameter shall be increased to accommodate the pullback operation of the required size and type of pipe. The type of hole opener or back reamer to be utilized in this phase shall be determined by the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation. The reamer type shall be at the CONTRACTOR’s discretion with the final hole opening to be determined by the subsurface conditions, except when installing gravity sewer.
- H. The open bore hole may be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry must be in a homogenous / flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pullback shall be calculated based on soil conditions, largest diameter of the pipe couplings, capacity of the bentonite mud pump, and the speed of pullback as recommended by the bentonite drilling fluid manufacture. The bentonite slurry is to be contained at the exit or entry side of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening operation, or shall be hauled by the CONTRACTOR to an approved dumpsite for proper disposal.
- I. The pipe shall be joined together according to manufacturer’s specifications. The gaskets and the ends of pipe must be inspected and cleaned with a wet cloth prior to each joint assembly so they are free of any dirt or sand. The ends of pipe must be free of any chips, scratches, or scrapes before pipe is assembled. A pulling eye will be attached to the pulling head on the lead stick of pipe which in turn will be attached to a swivel on the end of the drill pipe. This will allow for a straight, smooth pull of the product pipe as it enters and passes through the borehole toward the drill rig and original entrance hole of the directional bore. The product pipe will be elevated to the approximate angle of entry and supported by means of a sideboom with roller arm, or similar equipment, to allow for the “free stress” situation as the pipe is pulled into the exit hole toward the drill rig. The product pullback phase of the directional operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore. When pulling back pipe, rollers shall be used at all times to prevent damage to the pipe or wrap.

3.3 PIPE HANDLING

- A. Care shall be taken during transportation of the pipe such that it will not be cut, kinked or otherwise damaged.
- B. Ropes, calipers, fabrics, or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped into rocky or unprepared ground.
- C. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.
- D. The handling of the joint pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Slings for handling the pipeline shall not be positioned at pipe joints. Sections of the pipes with deep cuts and gouges shall be removed and the ends of the pipeline rejoined.

3.4 TRACER WIRE INSTALLATION

- A. Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
- B. Trace wire systems shall be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.
- C. Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
- D. Trace wire shall be installed at the bottom half of the pipe and secured (taped/tied) at 5' intervals.
- E. All service lateral trace wires shall be a single wire, connected to the mainline trace wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline trace wire.

- F. In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors, and shall be properly grounded at the splice location as specified.

3.5 TESTING PIPE

- A. Cleaning and flushing are to be done by the CONTRACTOR in accordance with the requirements of the contract.
- B. Directional drilling pipe shall be tested by CONTRACTOR after pullback in accordance with Section 33 14 13 or 33 31 00.
- C. The manufacturer's recommendations on bend radius and tensile strength shall be observed.

3.6 SITE RESTORATION

- A. Following drilling operations, CONTRACTOR shall de-mobilize equipment and restore the work site to the original conditions or better. All excavations will be backfilled and compacted according to Section 31 23 16.
- B. Surface restoration shall be completed in accordance with the requirements of the Project plans, to a condition as good as or better than existed prior construction.
- C. No ground, trees, shrubs, signage, or any other existing items are to be disturbed as a result of the proposed horizontal directional drilling. In the event that any ground, trees, shrubs, signage, or any other existing items are disturbed, the CONTRACTOR shall replace and otherwise restore the area to its original condition to the satisfaction of the affected property owner.

3.7 RECORD KEEPING AND AS-BUILTS

- A. CONTRACTOR shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the CITY at completion of project.
- B. The MGS data shall be recorded every 25 feet during the actual crossing operation. The CONTRACTOR shall furnish "as-built" plan and profile drawing based on these recordings showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation. The MGS data shall be certified accurate by the CONTRACTOR to the capability of the MGS System.

END OF SECTION

**SECTION 33 05 08
BORING AND JACKING**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. WORK covered in this section includes furnishing all labor, materials, accessories, equipment and service required to properly complete pipeline construction using tunneling or boring and jacking under railroads and state, county, or city highways and streets, as described herein and/or shown on CITY's Standard Details and Construction Drawings.

1.2 RELATED WORK

- A. Section 31 23 16 - Earthwork for Utilities
- B. Section 33 14 13 - Water Distribution Systems
- C. Section 33 31 00 - Sanitary Sewer Force Mains
- D. Section 33 31 00 - Sanitary Sewer

PART 2 PRODUCTS

2.1 MATERIALS

- A. Boring and Jacking
1. Steel casing pipe, sizes 12 inches through 24 inches shall be spiral or straight seam welded steel pipe conforming to ASTM A 139, Grade A. Minimum wall thickness of steel pipe for railroad crossings shall be 0.375 inches. Minimum wall thickness for roadway crossings shall be 0.250 inches.
 2. Steel casing shall be bituminous coated on the outside.
 3. Minimum Steel Casing Diameters:

Pipe Diameter	Minimum Steel Casing Diameter
6-inch	12-inch
8-inch	16-inch
10-inch	20-inch
12-inch	20-inch

- B. All carrier piping shall be installed through casing with restrained joints for water and gravity sewer in accordance with Section 33 14 13 (Fast-Grip Gasket” or “Field-Lok Gasket) or welded for HDPE force mains.
- C. Concrete encasement shall be Class "D" (2500 psi).

PART 3 EXECUTION

3.1 GENERAL

- A. Any solidification of embankments, boring heading, or sides shall be the DEVELOPER's responsibility and shall be done at his own expense.
- B. Trench excavation; all classes and types of excavation; the removal of rock, muck, debris; the excavation of all working pits; and backfill requirements of Section 02220 are included under this section.
- C. Adequate sheeting, shoring, and/or bracing for embankment operating pits and other appurtenances shall be placed and maintained to ensure that WORK proceeds safely and expeditiously. Upon completion of required WORK, the sheeting, shoring, and bracing shall be left in place, cut off, or removed, as designated by the CITY.
- D. DEVELOPER shall maintain and operate pumps, well points, and drainage system equipment to keep work dewatered at all times.
- E. Bored installations shall be a bored-hole diameter essentially the same as the outside diameter of casing pipe to be installed.
- F. Casing pipe shall be jacked into boring as soon as possible after boring is made. Lengths of casing pipe as long as practical shall be used. Joints between sections shall be completely welded as recommended for joining the particular type of pipe.
- G. Once jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of DEVELOPER.
- H. Care shall be taken to ensure that casing pipe installed by boring and jacking or open cut method will be at the proper alignment and grade.
- I. Open cut installations, where permitted, shall be in accordance with details and procedures shown on Drawings.
- J. Ends of casing shall be sealed with brick bulkheads using brick and mortar.
- K. After casing pipe is installed, the carrier pipe shall be installed exercising care to protect its coating and lining and maintain its joint integrity. Carrier pipe shall be concentric and be placed in proper horizontal and vertical alignment using wooden blocking/wedges or prefabricated pipe collars spaced radially around pipe and secured to remain firmly in place. Spacing of such blocking or collars shall be no greater than ten (10') feet on center longitudinally in casing pipe.

3.2 HIGHWAY/ROADWAY CROSSINGS

- A. DEVELOPER is responsible for the coordinating and scheduling of all construction work within State, County, or City highways, or railroad rights-of-way prior to, during, and after utility installation.
- B. DEVELOPER shall review and coordinate construction methods, materials, and safety measures with the affected OWNER.
- C. For open trench cut installations, DEVELOPER shall be responsible for scheduling and coordinating all construction work. WORK at one particular crossing shall be completed with the trench backfilled, compacted, and a temporary crushed stone surface provided for traffic before any work is started on another such crossing.
- D. Installations shall be done to leave free flows in drainage ditches, pipes, culverts, or other surface drainage facilities of the highway, street, or its connections.
- E. Where sodding is disturbed by excavation or backfilling operation, such areas shall be replaced by mulch sodding on slopes 5 percent or less. Slopes over 5 percent shall be replaced with block sodding. No separate payment shall be made for sodding which shall be included in the bid prices for installation of pipe.
- F. Trench excavation within the right-of-way, but not under pavement, shall be backfilled as described in Section 31 23 16 (Earthwork for Utilities).
- G. Surplus material shall be removed from the right-of-way and the excavation finished flush with surrounding ground.
- H. Grout backfill shall be used for unused bores or abandoned pipes.
- I. Boring, jacking, or driving of casing pipes shall be accomplished without jetting, sluicing, or wetboring.
- J. No excavated materials or equipment shall be placed on the pavement or shoulders of roadways.
- K. In no instance will DEVELOPER be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadways.

END OF SECTION

SECTION 33 05 61 MANHOLES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. WORK required under this section consists of all materials, accessories, equipment, tools, and labor required to install precast concrete standard manholes.
- B. Construction of cast-in-place or precast manholes shall conform to ASTM C-478 (latest edition).

1.2 RELATED WORK

- A. Section 31 23 16 - Earthwork for Utilities
- B. Section 09 97 23 – Coatings for Manholes and Wastewater Structures

1.3 REFERENCES

- A. ASTM A 48, Standard Specification for Gray Iron Castings.
- B. ASTM C 32, Standard Specification for Sewer and Manhole Brick (made from clay or shale).
- C. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C 443, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- E. ASTM C 478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
- F. ASTM C 1244, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) test.
- G. ASTM C 923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
- H. ASTM C 990, Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

1.4 QUALITY ASSURANCE

- A. After delivery to site, materials which have been damaged in transit or are otherwise unsuitable for use in the WORK, shall be rejected and removed from the site.

1.5 DEPTH

- A. The maximum manhole depth shall be 20 vertical feet from the ground to the lowest invert.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete

- 1. Concrete, cement, sand and water used in manhole construction shall conform to the applicable requirements stated in ASTM C-478.
- 2. Steel reinforcement shall conform to the applicable requirements of ASTM C-478.

B. Precast Concrete Manholes

- 1. Precast concrete manholes shall consist of precast reinforced concrete sections, a conical or flat slab top section, and a base section conforming with the typical manhole details as shown on Drawings, concrete to be Type II, 4,000 psi concrete.
- 2. All Precast manhole sections shall be wetcast and shall be manufactured, tested, and marked in accordance with latest provisions of ASTM C-478.
- 3. Ends of each reinforced concrete manhole riser section and bottom end of manhole top section shall be so formed that when manhole risers and top are assembled, they will make a continuous and uniform manhole.
- 4. Joints of manhole sections shall be of tongue and groove, or male and female type. There are two acceptable types of joints allowed as follows:
 - a. The joints shall be manufactured and sealed in accordance with ASTM C990 (latest edition) and sealed with BN-109 Butyl-Nek Sealant by Henry Company or approved equal.
 - b. The joints shall be manufactured and sealed in accordance with ASTM C443 (latest edition) and sealed with a rubber gasket.
 - c. All exterior joints regardless of type shall be sealed with RU 116 Rubr-Nek External Joint Wrap, 6-inches wide by Henry Company or approved equal.
- 5. Holes in manhole bases to receive sewer pipes shall be precast at the factory at required locations and heights. Knocking out of holes in the field will not be permitted. Coring will only be permitted with approval of CITY when unknown field conditions arise.

6. Holes in precast bases to receive sewer pipes shall be provided with flexible manhole connectors of high quality synthetic or natural rubber and conform to ASTM C923. Approved products are ALOK-EX-CEI by ALOK Products, Inc. or KOR-N-SEAL by NPC, Inc. or approved equal.
7. Manhole inverts shall be constructed of 4,000 psi concrete in accordance with details on Drawings and shall have the same cross section as the invert of the sewer with which they connect. Invert shall be carefully formed to required size and grade by gradual and even changes in sections. Changes in direction of flow through sewer shall be made to a curve with as large a radius as size of manhole will permit.
8. Lift inserts must be integrally cast into the structures. Holes will not be permitted to penetrate the entire wall thickness.
9. Manholes Connecting to Existing System
 - a. When connecting a proposed sewer line to an existing sewer line, the existing line shall be cut and a new manhole with solid base shall be installed and reconnected to the existing sewer pipe upstream and downstream in accordance with this specification.
 - b. Invert of the new line must be higher than springline of existing pipe if possible.
 - c. A CITY inspector must be present when cutting the existing pipe.
 - d. Doghouse manholes are not permitted.
10. Manhole Corings
 - a. The DEVELOPER shall be responsible for performing manhole corings.
 - b. The coring must not be backfilled until approved by the CITY inspector.
 - c. Failure, for any reason, to have the CITY inspector approve the coring will cause all work to be halted until the cored manhole is excavated and the rubber boot exposed.
 - d. Cores for “future development” or “future tie-ons” are only allowed when installed with a rubber boot, 10 feet of ductile iron pipe, and a mechanical joint plug.

C. Frames, Covers and Steps

1. Manhole frames, stepsets and covers shall be cast iron conforming to minimum requirements of latest ASTM A-48, for Class 35B Gray Iron Castings. Castings shall be made accurately to required dimensions, fully interchangeable, sound, smooth, clean and free from blisters or other defects. Defective castings which have been plugged or otherwise treated shall not be used. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.
2. Manhole frames and covers shall be of size and location as shown on Drawings. Where manholes are to be located under roads or driveways, whether paved or unpaved, frames and covers shall be equivalent to Neenah Foundry Co., No. R-1642. Where called for on drawings, frames and covers shall be equivalent to Neenah Foundry Co., No. R-1916-F (bolt down).
3. Covers:
 - a. Watertight manhole covers, where indicated on Drawings, shall be equivalent to Neenah Foundry Co., No. R-1916-F (bolt down). All bolts or screws must be stainless steel.
 - b. All manholes located outside of the street or the street right-of-way shall have bolt down covers.
 - c. Contact surfaces of all manhole covers and corresponding supporting rings in rims shall be machined to provide full perimeter contact.
 - d. Sanitary sewer manhole covers shall have cast on the top in letters 2 inches high, "Sanitary Sewer". Cover shall be Neenah Type "A".
4. Steps: Manhole steps conforming to applicable provision of ASTM C-478 such as "Wedg-Lok" as manufactured by Delta Pipe Products, or plastic steps as manufactured by M. A. Industries, Inc., or approved equivalent, shall be used.

- D. Brick used in manhole construction shall be either solid or cored, medium hard or better, Grade SM brick conforming to requirements of ASTM C-32 for sewer and manhole brick.
- E. Mortar for brick manhole construction shall be sand-cement mortar composed of one part portland cement to two parts clean sand conforming to ASTM C-144. Twenty pounds of hydrated lime per sack of cement may be added. No retempered mortar shall be used.
- F. All manholes with drops of 24 inches or more shall be outside drop manholes. Inside drop manholes are not acceptable. All drop manholes shall include all exterior drop pipe additions to standard manholes complete with drop pipe encasement, excavation, and foundation cushion. All outside drop pipe materials to be ductile iron, including one (1) joint of ductile iron pipe entering the manhole.

- G. Manhole coating shall comply with Section 09 97 23.
- H. All exterior joints regardless of type shall be sealed with RU 116 RubR-Nek External Joint Wrap, 6-inches wide by Henry Company or approved equal.

PART 3 EXECUTION

3.1 MANHOLES

- A. Manhole bases shall be placed on 6-inch bed of foundation stone to required elevation.
- B. Joints of precast sections shall be sealed with approved sealant. After joint has been made, joint opening shall be sealed with grout. Grout shall be applied from both sides of joint and shall be struck smooth and flush on the inside.
- C. After installation of pipe to proper grade and alignment, make required seal of pipe and manhole base and formed inverts in accordance with Specifications and as shown on Drawings.
- D. Manhole shall have a minimum of 0.2' (2/10') fall, measured from inlet to outlet.
- E. Install manhole frames and covers in accordance with Specifications and as shown on Drawings.
- F. Backfilling of manhole in accordance with Section 31 23 16 (Earthwork for Utilities).
- G. Manholes are required to be installed at the following locations:
 - 1. At the end of each line.
 - 2. At all changes in grade, line size, or alignment.
 - 3. At distances not greater than 400 feet.
 - 4. At any location to assure the change in horizontal alignment is never less than 90°
- H. Layout of manholes that connect to the existing system shall comply with items 3.01 A-G above as well as Details. Sewer lines must be properly plugged before being cut and a pump shall be provided to divert sewage from the manhole directly upstream of the cut line to a downstream manhole. **BYPASSED SEWAGE SHALL NOT BE DIRECTED ONTO THE GROUND OR INTO ANY RECEIVING STREAMS.**
- I. All new manholes and wetwells shall be coated as per specification section 02603. When connecting to an existing manhole via force main said existing manhole shall be coated as per specification section 09 97 23.

3.2 INSPECTION

- A. After completion of sanitary sewer systems, all manholes shall be visually inspected to insure all joints are slated, all lift holes are grouted, and all inverts are properly constructed. Insure all joints are properly seated, inverts are properly constructed, and pipe to manhole connections are installed per manufacturer's recommendations.
- B. Vacuum Testing
 - 1. Each manhole shall be tested immediately after assembly and prior to backfilling as defined by ASTM C1244 *Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test*.
 - 2. All lift holes shall be plugged with an approved non-shrink grout.
 - 3. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.
 - 4. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations.
 - 5. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inch diameter, 75 seconds for 60-inches, and 90 seconds for 72-inch diameter manholes.
 - 6. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.
- C. The system will not be accepted by the CITY until all manholes pass a vacuum test.

END OF SECTION

SECTION 33 14 13
WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. WORK covered by this Section consists of furnishing and installing water distribution pipes and appurtenances, including, but not limited to, reaction blocking, testing, and disinfection.

1.2 RELATED WORK

- A. Section 31 23 16 - Earthwork for Utilities
- B. Section 33 14 13.01 - Water Service Connections

1.3 REFERENCES

- A. American Water Works Association (AWWA) Standards.
 - 1. AWWA C104, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C110, Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.
 - 3. AWWA C111, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. AWWA C151, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or other Liquids.
 - 5. AWWA C153, Standard for Ductile-Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in., for Water Service.
 - 6. AWWA C509, Standard for Resilient – Seated Gate Valves for Water Supply Service.
 - 7. AWWA C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
 - 8. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - 9. AWWA C651, Standard for Disinfecting Water Mains.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. DEVELOPER/CONTRACTOR shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into work.
- B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.
 - 1. Pipe shall not be unloaded by rolling or dropping off trucks.
 - 2. Pipe handled on skidways shall not be skidded or rolled against pipe already on ground.
- C. Unload material at site of work, near place where it will be placed in trench.
 - 1. Materials shall be placed so as to least interfere with traffic.
 - 2. Provide signs, lights, and barricades as necessary to protect public.
- D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.
 - 1. Keep interior of pipe, fittings, and valves, free of dirt or foreign matter at all times.
 - 2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.1 GENERAL

- A. All water distribution piping mains shall be ductile iron only. All materials shall be new and unused. All materials used and come into contact with drinking water during its distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61).

2.2 DUCTILE IRON PIPE

- A. Shall conform to latest requirements of AWWA C151.
- B. Shall be cement mortar lined in accordance with AWWA C104 standard thickness.
 - 1. Unless otherwise specified, pipe shall have push-on compression type joints conforming to AWWA C111 or AWWA C153 (Latest Editions).
 - 2. Minimum pressure class shall be 350 psi.
- C. Ductile iron pipe for minor creek crossings shall be connected with restrained joints.

D. Ball-Joint Pipe- Major Creek and River Crossings

1. Shall be manufactured for river crossing applications.
2. Joints shall be boltless.
3. Joints shall be restrained.
4. Joint shall provide up to 15-degrees of deflection.

E. Restrained Joints – DIP

1. Restrained joints shall be “Fast-Grip Gasket” by ACIPCO or “Field-Lok Gasket” by U. S. Pipe.
2. Joint preparation and installation shall be in accordance with manufacturer’s recommendations.

F. Retainer Glands for Restraint - DIP

1. Retainer gland restraints shall be “Mega-Lug 1100 Series” by EBBA Iron Sales, or approved equal.

2.3 DUCTILE IRON FITTINGS

- A. Fittings for ductile iron pipe shall be cast or ductile iron and shall conform to requirements of AWWA C110 or AWWA C153 and shall be cement mortar lined in accordance with AWWA C104 standard thickness.
- B. Joints shall conform to AWWA C111.
- C. Restrained joint for mechanical joints shall be accomplished with MJ Field Lok Gasket by U. S. Pipe or “Mega-Lug 1100 Series” by EBBA Iron Sales, or approved equal.
- D. Fittings shall be mechanical joint unless otherwise specified on Drawings.

2.4 GATE VALVES

- A. Shall conform to requirements of AWWA C509 or C515 for resilient seated gate valves, iron body, with bonded epoxy coating conforming to AWWA C550.
- B. Shall be designed for 250 psi working pressure and 500 psi hydrostatic test pressure.
- C. Shall be of iron body, bonded epoxy, and shall have non-rising bronze stem, and shall be wrench operated.
- D. Valves shall open by turning counter-clockwise.
- E. Operating nuts shall be standard two inches square.

- F. Suitable stem guides shall be provided, where required.
- G. Shall be furnished with mechanical joint suitable for connection to pipe into which it will be installed for buried service.
- H. Small Gate Valves: Valves smaller than 3 inches shall conform to level of quality and manufacturing standards established for valves 3 inches and larger by respective AWWA Standards.
- I. Gate valves to be spaced every 1000 feet and in every direction at intersections (i.e. three valves at 3-way intersections and four valves at 4-way intersection.)
- J. Acceptable manufacturers are Mueller or M & H.

2.5 PRESSURE REDUCING VALVES

- A. Pressure Reducing Valves and vaults shall be designed and sized by the DEVELOPER's engineer, and reviewed by the CITY. Pressure Reducing Valves shall be as manufactured by Cla-Val. Some installation may require high and low flow set-ups.
- B. Precast vaults for each pressure reducing valve must be supplied and installed. The vault must be sized for each application so as to allow ample working room in the vault. CONTRACTOR is to provide shop drawings of the proposed units for approval by CITY and ENGINEER at the Preconstruction Conference.

2.6 AIR RELEASE VALVES

- A. Shall be cast iron body with stainless steel (ASTM A240) float and synthetic seat equal to Crispin PL 10, Type N.
- B. Orifice size shall be as follows:

MAXIMUM OPERATING PRESSURE (PSI)						
PSI	50	100	150	200	250	300
ORIFICE	$\frac{5''}{16}$	$\frac{5''}{16}$	$\frac{1''}{4}$	$\frac{3''}{16}$	$\frac{5''}{32}$	$\frac{1''}{8}$

- C. In most cases a 3/16" orifice will be adequate. However, DEVELOPER is to verify actual size with City prior to installation.

2.7 AIR/VACUUM VALVES

- A. Shall be cast iron body with stainless steel (ASTM A240) trim and float equal to Crispin AL20 or approved equivalent.
- B. Orifice size shall be 2" diameter.
- C. Internal parts shall be stainless steel (ASTM A240) or bronze.

2.8 VALVE MARKERS

- A. Valve markers shall be furnished with each valve and air valves installed as indicated on the drawings, with exception of fire hydrant valves.
- B. Flexible valve markers shall be used when located in the clear zone as dictated by the GDOT.
 - 1. Marker shall be reboundable, flexible post as per *USA Blue Book* the RHINO 3-RAIL marking post, color blue, 66", catalogue no. 70456.
 - 2. Label Decal shall be white with blue text, 2-7/8" X 14", reading WARNING WATER VALVE. Decal shall also bear the name, CITY.

2.9 VALVE BOXES AND COVERS

- A. Shall be provided with valves.
- B. Shall be of adjustable screw type, of length required with a minimum 6" of adjustment allowed, and installed as shown on standard details.
- C. Base size and extension piece shall be as required for each individual size of valve and depth.

2.10 TAPPING VALVES

- A. DEVELOPER/CONTRACTOR is to submit the manufacturer, size, and type of mechanical joint tapping sleeve and valve to the City for review and approval prior to installation.
- B. Tapping machines and competent supervision shall be provided in presence of CITY personnel.
- C. Tapping sleeves shall be properly sized to fit existing pipe and shall be of split sleeve type with ends suitable for connection into pipeline into which it will be installed.
- D. Largest tap allowed shall be equal size of the existing main. The new water main may be increased in size beyond the installed tapping sleeve and valve.

- E. Valves furnished with sleeves shall conform to requirements herein above for gate valves, except for modifications required to permit use of full-size cutter through valves.
- F. Outlet of valves shall be mechanical joint for joining with water mains.

2.11 SAMPLING STATION

- A. If required by the CITY and depending on location, a water sampling station may be required on the proposed water lines. The sampling station shall be manufactured by Water Plus Corporation Model #301D-36-NL. The station shall be above-grade 36-inch dry barrel and lead-free. DEVELOPER shall submit shop drawings to the CITY for review and approval.

PART 3 EXECUTION

3.1 GENERAL

- A. No water main may be installed on or in close proximity of an abandoned landfill site or any site used for waste disposal.

3.2 ALIGNMENT AND GRADES

- A. Depth of Pipes
 - 1. All water line shall be installed at a minimum depth of 48-inches of cover from the top of the pipe to finished grade or at a cover depth of 48-inches below the adjacent, parallel edge of roadway, whichever depth is greater shall govern.
 - 2. Where obstructions are encountered, depth may be greater than 48-inches.
- B. Valves
 - 1. Shall be installed with stems vertical.
- C. Pipe Curvatures
 - 1. Pipe shall be installed within horizontal or vertical permissible deflection at joint, as specified by manufacturer or AWWA Specification C600 (Latest Edition).

3.3 INSTALLING PIPE

- A. General
 - 1. Pipe and appurtenances shall be installed only when trench conditions are suitable.
 - 2. Trenches must be dry.
 - 3. Proper implements, tools, and facilities shall be provided by DEVELOPER for safe and convenient performance of the work.

B. Installation

1. Lower pipe, fittings, valves, and hydrants carefully into trench piece by piece by means of derrick, ropes, or other suitable tools or equipment.
2. Prevent damage to water main materials and protective coatings and linings.
3. Do not drop or dump water line materials into trench.
4. Carefully examine pipe and fittings for cracks and other defects while suspended above trench immediately before installation in final position.
 - a. Defective pipe or fittings shall be clearly marked and shall be removed from site.
5. Clean bell and spigot ends of each piece of pipe thoroughly before pipe is laid.
6. Prevent foreign material from entering pipe while it is being placed in line.
 - a. Provide protective covering for ends of pipe until connection is made to adjacent pipe, if necessary.
 - b. No debris, tools, clothing, or other materials shall be placed in pipe during laying operations.
7. As each length of pipe is placed in trench, spigot end shall be centered in bell and pipe forced home and brought to correct line and grade.
 - a. Pipe shall be secured in place with approved backfill material tamped around it.
 - b. Precautions shall be taken to prevent dirt from entering joint space.
8. Open ends of pipe shall be closed by watertight plug, or other means approved by the City, at times when pipe laying is not in progress.
 - a. If water is in trench, plug shall remain in place until trench is pumped completely dry. Water shall not be allowed to run into pipe at any time during construction.
9. Lay pipe with bell ends facing in direction of laying.
 - a. Where pipe is laid on grade of 10 percent or greater, laying shall start at bottom and shall proceed upward with bell ends of pipe upgrade.

3.4 CUTTING PIPE

- A. Cut pipe for inserting valves, fittings, or closure pieces in neat manner without damage to pipe or lining and so as to leave smooth end at right angles to axis of pipe.

3.5 DETECTION OF ALL PIPE

- A. 12-gauge, solid strand detection wire shall be installed 18-inches above all waterlines, not connected to the pipe, with waterproof connectors and connection at every valve and hydrant.
- B. Marking tape showing "caution buried waterline" shall be installed 24-inches above all waterlines.

3.6 JOINTING

- A. Pipe, fittings, and valve joints shall be in strict compliance with manufacturer's printed instructions.
- B. Mechanical Joints
 - 1. Thoroughly clean outside of spigot and inside of bell.
 - 2. Clean gasket.
 - 3. Tighten nuts with torque limiting wrench.
 - 4. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure.
- C. Push-On Joints
 - 1. Furnish and install adaptors if required to join bells and spigots of different sizes.
 - 2. Thoroughly clean inside of bell and outside of spigot end.
 - 3. Insert and lubricate gasket using lubricant furnished or recommended by pipe manufacturer.
 - 4. Spigot end of pipe shall be entered into socket with care used to keep joint from contacting ground.
 - 5. Complete joint by forcing plain end to bottom of socket with forked tool or jack-type tool.

3.7 SETTING VALVES AND FITTINGS

- A. Valves, fittings, plugs, and caps shall be set and joined to pipe in manner specified above for cleaning, laying and joining pipe.

- B. Valves shall be set plumb and a valve box shall be provided for every valve.
 - 1. Valve box shall not transmit shock or stress to valves and shall be centered and plumb over wrench nut of valve, with box cover flush with surface of finished pavement or such other level as may be directed.
 - 2. For installation where there are roadside ditches, valves and valve boxes shall be placed on the back side of the ditch at least five (5) feet from the centerline of the ditch.
- C. Backfill around valves shall be carefully tamped in 6-inch layers for full depth of trench with valve box in place.
- D. Provide concrete pad at surface as indicated in the Standard Detail drawing.

3.8 THRUST BLOCKING

- A. Plugs, caps, tees, bends, and valves, unless otherwise specified, shall be provided with reaction blocking and joint restraint. Concrete reaction blocking shall conform with these specifications and the applicable standard details. Joint restraint shall be as specified in Part 2.
- B. Concrete reaction blocking shall conform with these specifications and the applicable standard details.
- C. Reaction blocking shall be concrete, having a compressive strength of not less than 3,000 psi after 28 days. "Sackcrete" shall not be used.
- D. Blocking shall be placed between solid, unexcavated earth and fitting to be anchored; area of bearing on pipe and on ground in each instance shall be that shown on approved construction drawings.
- E. Blocking shall, unless otherwise shown or directed, be so placed that pipe and fitting joints will be accessible for repair.
- F. All fittings shall be restrained and blocked.

3.9 CONNECTION TO EXISTING MAINS

- A. Connections to existing water mains shall be made under the supervision of CITY personnel.
- B. DEVELOPER shall coordinate with the CITY regarding connections to existing mains.
- C. Connection to existing mains shall be made at such time as to minimize disruption of water service to public.

- D. Connections to existing mains shall be made using proper fittings and materials to suit actual conditions.
- E. Existing pipes which are cut or damaged by CONTRACTOR shall be repaired, reconnected, and returned to service in equal or better condition.

3.10 SEPARATION OF WATER MAINS AND SEWERS

A. Parallel Separation

- 1. Water mains shall be laid at least ten (10) feet horizontally, measured edge-to-edge, from any existing or proposed sanitary sewer, storm sewer, or sewer manhole.
- 2. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at an elevation such that the bottom of the water main is at least 18 inches above the top of the sewer.

B. Crossings

- 1. Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At any crossing, one full joint of water pipe shall be centered over sewer line.
- 2. When local conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.
- 3. When water mains cross under sewers, additional measures shall be taken by providing:
 - a. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;
 - b. Adequate structural support for the sewers to prevent excessive deflection of joints and settling and breaking of the water mains;
 - c. That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer;
 - d. Both the sewer and the water main shall be constructed of water pipe and subjected to hydrostatic tests, as prescribed in paragraph 3.12 of this Section.

3.11 STREAM AND UTILITY CROSSINGS

- A. Pipe shall be placed beneath stream beds or ditches, around, over, or under sewers, culverts, gas mains, telephone ducts, water mains, or other structures.
 - 1. Do not pass pipe through any drainage pipe, culvert, sewer, or manhole.
 - 2. Provide minimum of 48-inches under stream beds or ditches, unless approved by ENGINEER in writing.
 - 3. Provide a minimum of 18-inch earth or sand cushion between proposed water line and any other utility or structure, or as indicated on drawings.
- B. Where water lines are installed below free flowing streams, the DEVELOPER is responsible for adequate pipeline design of each crossing on a case-by-case basis subject to the CITY'S' review. The DEVELOPER's ENGINEER shall consider the soils, creek flow, pressure, topography, thrust restraint, construction techniques allowed, etc. to design and specify appropriate layout and pipe joints.
- C. The DEVELOPER shall be responsible for all and any necessary permitting by all authorities having jurisdiction for stream crossings or crossing of state waters including but not limited to EPD, Jackson County, and the Army Corps of Engineers.
- D. Gate valves shall be provided at both ends of a stream crossing to allow the section to be isolated for testing or repair.

3.12 HYDROSTATIC TESTS

- A. Pressure and leakage tests will be required on each section of line between valves and shall be conducted in accordance with AWWA C600.
- B. General Procedure
 - 1. Furnish and install corporation stops at high points on line to release air as line is filled with water.
 - 2. Furnish suitable pump, connections, and necessary apparatus including means for accurately measuring water introduced into line during testing.
 - 3. Test pressure shall not be less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section. Test pressure shall not be less than 200 psi or 1.5 times the stated working pressure at the lowest elevation (whichever is greater) of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less as specified by the manufacturer.
 - a. Test pressures shall be as directed by the CITY.

- b. Test shall be conducted for a minimum of 2 hours.
 - c. Pressure shall not vary by more than 5 psi during test.
- 4. Testing Allowance.
 - a. The testing allowance is the maximum amount of water that may be added into the pipeline section during hydrostatic testing in order to maintain ± 5 psi of the test pressure.
 - b. The maximum allowable makeup water shall be based on the following formula Where L is the testing allowance of makeup water in gallons per hour; S is the test length in feet, D is the pipe diameter in inches and P is the average test pressure in pounds per square inch.
$$L = \frac{S \times D \times (P^{0.5})}{148,000}$$
 - c. No pipe installation shall be accepted if the amount of make-up water required exceeds the amount determined in the formula above.
- 5. Locate, remove, and replace any defective pipe, valves, fittings, or hydrants.
- 6. Repeat tests until results are satisfactory to the CITY.

3.13 DISINFECTION

- A. Pipe, fittings, valves, and appurtenances which have been exposed to contamination by construction shall be thoroughly cleaned, chlorinated, drained, and flushed in accordance with AWWA Specification C651, and EPD Minimum Standards for Public Water Systems.
- B. Procedure
 - 1. Flush line prior to disinfection. Flushing shall produce minimum velocity of 2.5 feet per second in pipe.
 - 2. The “tablet method” of disinfection consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is complete. In accordance with EPD Minimum Standards for Public Water Systems, the tablet method is not allowed.
 - 3. The chlorine solution used for disinfection of water mains shall have a free chlorine residual concentration not less than 25 mg/L. This heavily chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances. At the end of the 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine. Re-chlorination if required results are not obtained on all samples.

4. After 24 hour retention period, flush chlorinated water from line until chlorine concentration of water leaving main is no higher than that generally prevailing in existing system, or less than 1.0 mg/l.
 5. Disposal of the heavily chlorinated water shall be in accordance with AWWA Standard C651. The environment to which this water will be discharged shall be inspected. If water discharges to a State Water, a reducing agent shall be used to neutralize the chlorine residual thoroughly.
 6. In accordance with AWWA C651, cross connection / backflow prevention measures shall be taken before and during disinfection of constructed water mains to prevent backflow into active portions of the distribution system or into sections that have already been disinfected but not yet placed into service.
 7. All samples shall be collected in the presence of CITY personnel. DEVELOPER shall have sample analyzed by a certified laboratory.
- C. Repeat disinfection procedures until bacteriological analysis results are acceptable to the CITY.

END OF SECTION

SECTION 33 14 13.01
WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. WORK covered by this Section consists of furnishing all materials and installation of all service connections to the water system.
- B. All new service connections shall be metered.

1.2 RELATED WORK

- A. Section 33 14 13 – Water Distribution System

1.3 REFERENCES

- A. Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch, for Water Service (AWWA C901). "K" Soft Temper Copper Tubing (ASTM B88)
- B. Copper Tubing (AWWA 78-CR Type "K")
- C. Cold Water Meters – Displacement Type, Bronze Main Case (AWWA C700).
- D. Cold Water Meters – Compound Type (AWWA C702)
- E. Cold Water Meters – Electromagnetic and Ultrasonic Type
- F. Specifications for Gray-Iron Castings (ASTM A-48).
- G. Underground Service Line Valves and Fittings (AWWA C800)

PART 2 PRODUCTS

2.1 SERVICE TUBING

- A. Up to 2-inch diameter shall be copper tubing conforming to ASTM designation B88 for Type "K". Soft temper or AWWA 78-CR Type "K". Tubing may be in 20-foot straight lengths or 60 to 100-foot coils.
- B. Services 3-inches or greater diameter shall be ductile iron, as specified in Section A above, conforming to AWWA C110.
- C. Tubing O.D. shall be compatible with accessories specified herein below.

2.2 WATER METERS 1-INCH OR LESS

- A. Residential meters up to 1-inch shall be R-900 radio-read by Neptune, Model T-10® positive displacement type conforming to AWWA C700 latest edition or Model MACH 10® Ultrasonic Meter conforming to AWWA C715. The CITY shall determine which meter is applicable for each application or development.
- B. All meters shall comply with NSF and the Safe Drinking Water Act. Meters shall read in gallons. Meters shall be compatible with meter yokes specified herein below.

2.3 COPPER SETTERS

- A. Copper Setters shall be Ford 70 Series or AY McDonald sized for the appropriate meter with dual check valve on outlet, and locking by-pass for meters up to and including 2" in size.
 - 1. Setters ¾-inches and 1-inch shall be Ford 70 Series or AY 724-207WDTD 33.
 - 2. Setters 2-inches shall be Ford 70 Series or AY 724-212WDTD 33, each with telescoping flanges.

2.4 METER BOXES

- A. Residential and small commercial meter boxes shall be Carson Industries plastic box, size 18-inches long x 9-1/2-inches wide x 11-inches deep.
- B. Meter Box Cover shall be Carson Industries cast iron cover, size 16-3/4-inches long x 11-inches wide with circular cut-out for electronic reading pad. Where a water meter box is subject to vehicular traffic a Quazite meter box or approved equivalent and lid shall be used.

2.5 ACCESSORIES

- A. Services shall be compatible with pipe and service tubing furnished.
- B. Service saddles shall be Smith-Blair or Romac for all pipe, 3/4" tap size.
- C. Corporation stop shall be Ford Catalog Number F1000, 3/4-inch size.
- D. Cut-off valve shall be a Watts Series WBV brass ball valve.
- E. Valve box for cut-off valve shall be a Carson Industries, 6-inch circular box – plastic.

2.6 TWO-INCH AND LARGER METERS

- A. There are two meters approved for meters two-inches and larger, Compound or Ultrasonic. The City will determine which type is applicable for each site or development.

B. Compound Meters

1. Compound Meters shall be R-900 Neptune electronic/ radio read Compound Meter Model Tru/Flo®. Compound meters shall consist of a combination of an AWWA Class II turbine meter for measuring high rates of flow and a nutating disc type positive displacement meter for measuring low rates of flow enclosed in a single maincase. An automatic valve shall direct flows through the disc meter at low flow rates and through the turbine meter at high flow rates. At high flow rates, the automatic valve shall also serve to restrict the flow through the disc meter to minimize wear.
2. All meters shall comply with AWWA C702, NSF and the Safe Drinking Water Act. Meters shall read in gallons.

C. Ultrasonic Meters

1. Ultrasonic Meters shall be R-900 Neptune electronic/ radio read Model Mach 10®. The measurement technology shall be based on ultrasonic sensing featuring no moving parts.
2. All meters shall comply with AWWA C715, NSF and the Safe Drinking Water Act. Meters shall read in gallons.

D. The meter serial number shall be imprinted on the meter flange.

E. Higher risk connections must specify an RPZ type backflow preventor (i.e. medical, process manufacture, etc.)

2.7 FIRE METERS

A. There are two meters approved for fire meters, Compound and Ultrasonic. The City will determine which type is applicable for each site or development.

B. Compound Meter

1. Compound Fire Meters shall be R-900 Neptune electronic/ radio read HP PROTECTUS III® FIRE METER, (touch read), pro-read auto detect reading in gallons. Meters shall consist of a combination of an AWWA Class II inline horizontal axis turbine for measuring high rates of flow and a positive displacement bypass meter conforming to AWWA C700 for measuring low rates of flow. An automatic valve shall direct the flow from the bypass meter to the mainline meter as flow rates increase and back to the bypass meter as flow rates decrease. All components of the meter assembly shall be both UL (Underwriter's Laboratory) Listed and FM (Factory Mutual) approved for fire service use. Meters shall be certified to NSF/ANSI 61 and NSF/ANSI 372 requirements.
2. All meters shall comply with AWWA C703, NSF and the Safe Drinking Water Act. Meters shall read in gallons.

C. Ultrasonic Meters

1. Ultrasonic Meters shall be R-900 Neptune electronic/ radio read Model Mach 10®. The measurement technology shall be based on ultrasonic sensing featuring no moving parts.
2. Meter shall be UL listed and FM approved.
3. All meters shall comply with AWWA C715, NSF and the Safe Drinking Water Act. Meters shall read in gallons.

D. The meter serial number shall be imprinted on the meter flange.

E. Clearly show all of the proposed metering locations and arrangements on the plans for the fire meter and back flow preventor.

F. The DEVELOPER shall furnish all required materials and labor and install said meters, BFP and vaults. Submit shop drawings of the meter, BFP and vault to the CITY for review and approval.

1. DEVELOPER shall pay CITY for all required connection fees.
2. Detailed design drawings and dimension of meter and meter vault, BFP and vault shall be submitted to the CITY for review and approval prior to installation.

PART 3 EXECUTION

3.1 GENERAL

- A. Service connections shall be installed in the same manner as water distribution mains, and in accordance with Section 33 14 13 of these Specifications, except for depth which shall be 24 inches at the meter box.
- B. Meter boxes shall be placed as shown on the construction drawings or as directed by CITY.
- C. Service connections shall be made where directed by the CITY.
- D. Jack and bore service tubing under pavement. Service tubing shall be from one (1) continuous tube. No pavement cutting will be permitted.
- E. Water meters are to be set in Ford 70 series copper setters or approved equivalent. The backflow preventor is to be located on the customer side of the meter. Copper setters are to be plumb.

- F. Any pipe, solder, or flux used in the installation or repair of water lines must be lead free. Pipes and fittings must not contain more than 8.0% lead, and solders and flux must not contain more than 0.2% lead.
- G. All meters, fittings, piping and accessories shall be approved by the National Sanitation Foundation (NSF) with the seal of approval for potable water.

END OF SECTION

**SECTION 33 14 19
FIRE HYDRANTS**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The work to be done under this Section of the Specifications consists of furnishing all materials and performing all labor necessary for the complete construction of fire hydrants, as indicated on the Contract Drawings and/or specified.

1.2 REFERENCES

- A. AWWA, Section C502 - Dry-Barrel Fire Hydrants (Latest Edition)

PART 2 PRODUCTS

2.1 MATERIALS

- A. Hydrants shall be manufactured in full compliance with American Water Works Association Standard for Dry-Barrel Fire Hydrants, 250 psi. working pressure, C502, and as herein amended.
- B. Hydrants shall be Mueller Super Centurion 250/HS or M & H Model 129.
- C. Hydrants shall be three-way, post type, dry top traffic model with compression main valve opening against and closing in the direction of normal water flow.
- D. Internal main valve diameter shall be minimum of 5-1/4-inches.
- E. Hydrants shall have name of manufacturer, year manufactured, and nominal valve size in legible, raised letters cast on barrel of bonnet.
- F. Hydrant Security Check Valve
 - 1. For Mueller Super Centurion 250/HS High Security Fire Hydrant, the hydrant shoe shall incorporate a fabric and steel reinforced elastomeric flapper check valve located inside the fire hydrant inlet, allowing normal operation and access to the hydrant main valve through bonnet or ground flange.
 - 2. For M & H Model 129 Fire Hydrant, a Kennedy Valve Patriot Hydrant Check Valve shall be connected to the fire hydrant boot. The hydrant check valve shall incorporate an alum-bronze clapper with resilient seat and stainless steel spring.
- G. Dry Top Bonnet
 - 1. Shall be constructed with moisture-proof lubrication chamber which provides automatic lubrication of threads and bearing surfaces each time hydrant is operated.

2. Assembly shall be comprised of top "O" ring serving as dirt and moisture barrier and a lower "O" ring which shall serve as a pressure seal.

H. Operating Nut

1. Shall be of regular pentagon shape measuring 1" point to flat; i.e. National Standard, and shall open by turning counter-clockwise (left).
2. Nozzle caps shall have same cross-section as operating nut and shall come with heavy duty, non-kinking chains.
3. Chains shall be securely affixed to hydrant upper barrel and permit free turning of caps.

I. Traffic Design

1. Hydrant barrel sections shall be connected at groundline in a manner that will prevent damage to hydrant when struck by vehicle.
2. Main valve rod sections shall be connected at groundline by frangible coupling.
3. Standpipe and groundline safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing top operating components and top section of hydrant standpipe.

J. Main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.

K. Main Valve Seat

1. Shall be of bronze and assembly into hydrant shall involve bronze to bronze thread engagement.
2. Two (2) "O" ring seals shall be provided as positive pressure seal between the bronze seat ring and shoe.
3. Valve assembly pressure seals shall be obtained without employment of torque compressed gaskets.
4. Hydrants shall be designed to allow removal of all operating parts through hydrant barrel by means of single, light weight disassembly wrench without excavation.

L. Drain

1. Mechanism shall be designed to operate automatically with the operation of main valve and shall allow a momentary flushing of drain ports.
2. Minimum of two (2) internal and two (2) external bronze lined drain ports shall be required in main valve assembly to drain hydrant barrel.

3. Inlet connection shall be cast iron inlet elbow and shall have 6" mechanical joint connection.
 4. Barrel extension sections shall be available in 6" increments complete with rod, extension coupling and necessary flanges, gaskets and bolts so that extending hydrant can be accomplished without excavating.
 5. No lead will be allowed in nozzle installation.
 6. Hydrants shall be tested in strict accordance with AWWA C502 at supplier's expense. Certificate of compliance shall be furnished to OWNER upon request.
- M. Fire hydrants shall have two 2-1/2-inch diameter hose connections and one 4-1/2-inch diameter pumper connection. Standard hose threads shall be provided.

2.2 SPARE PARTS

- A. DEVELOPER shall provide the CITY with two (2) sets of maintenance wrenches and five (5) breakaway repair kits for each type of hydrant provided.

PART 3 EXECUTION

3.1 SETTING HYDRANTS

- A. Hydrants to be installed so the finish grade is at the hydrant bury line.
- B. Spacing between hydrants shall not exceed 500 feet minimum with 300-foot hose lays to all buildings.
- C. Hydrants shall be oriented towards the curb or away from the curb depending on other proposed utilities within the development. The City shall determine this on a case-by-case basis.
- D. Extension required to bring hydrant to proper grade shall be furnished and installed by DEVELOPER at his expense.
- E. Fire hydrant assembly shall consist of the ductile iron tee, gate valve, ductile iron lead pipe, and hydrant. Hydrant anchor couplings shall be used. PVC IS NOT ALLOWED FOR HYDRANT ASSEMBLY.

3.2 PAINTING, COATING AND LUBRICATING

- A. Iron parts of hydrant shall be thoroughly cleaned inside and outside.
- B. All fire hydrants shall be painted "Safety Yellow" coated at factory.

- C. Unless otherwise stipulated or directed, surface shall be coated or painted with, or dipped in, an asphalt or bituminous base paint or coating, except for the exterior portion above the groundline.
- D. Hydrants shall be covered with two (2) coats of paint, the first being allowed to dry thoroughly before applying second coat.
- E. Exterior of hydrant valve above finished groundline shall be thoroughly cleaned and painted in shop with two (2) coats of Koppers Primer 621, or approved equivalent.
- F. Following installation, hydrants shall be painted with two (2) field coats of enamel paint to CITY specifications.
- G. Bronze, threaded and contact moving parts shall, during shop assembly, be lubricated and protected by coating of rust proof compound to prevent damage in shipment.

END OF SECTION

**SECTION 33 31 00
SANITARY SEWER**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The work to be done under this of the Specifications consists of furnishing all materials and equipment and performing all labor necessary for the complete construction of the gravity sewer system including all sewer pipe, house service lines and other appurtenances as indicated on the Contract Drawings and/or specified.

1.2 RELATED WORK

- A. Section 31 23 16 - Earthwork for Utilities

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. American Water Works Association (AWWA).
- C. American National Standards Institute (ANSI).
- D. Uni-B-6-98 - Recommended Practice For Low Pressure Air Testing of Installed Sewer Pipe, Uni-Bell PVC Pipe Association.

1.4 QUALITY ASSURANCE

- A. Each pipe shall be clearly marked as required by governing ASTM standard specifications to show its class, date of manufacture, and name or trademark of manufacturer.
- B. Any pipe or specials that have been broken, cracked, or otherwise damaged before or after delivery, or which have failed to meet required tests, shall be removed from site of work and shall not be used.

1.5 DELIVERY, STORAGE AND HANDLING

- A. DEVELOPER shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into the WORK.
- B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.
 - 1. Pipe shall not be unloaded by rolling or dropping off trucks.
 - 2. Pipe handled on skidways shall not be skidded or rolled against pipe already on ground. Unload material at site of work, near place where it will be placed in trench.

- C. Unload material at site of work, near place where it will be placed in trench.
 - 1. Materials shall be placed so as to least interfere with traffic.
 - 2. Provide signs, lights, and barricades as necessary to protect public.
- D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.
 - 1. Keep interior of pipe, fittings and valves, free of dirt or foreign matter at all times.
 - 2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.1 GENERAL

- A. Pipe and fittings shall be new materials which have not been previously used.
- B. Minimum depth for sanitary sewer shall be four (4) feet except under pavement; then, the minimum depth shall be seven (7) feet.
- C. No changes in pipe material shall be allowed between manholes.

2.2 BEDDING AND BACKFILL

- A. Bedding material shall be as specified in Section 31 23 16 Earthwork for Utilities.
- B. Backfill material shall be as specified in Section 02200 Earthwork.

2.3 PVC GRAVITY SEWER PIPE

A. MATERIALS

- 1. PVC sewer pipe and fittings shall be plastic gravity sewer pipe with integral wall bell and spigot joints for the conveyance of domestic sewage. Pipe and fittings shall meet the strength minimum of DR 18 and AWWA C900.
- 2. Pipe and fitting markings shall include the appropriate ASTM and Cell Classification Numbers (12454-B or 12454-C or other ASTM approved classifications) and be any color. Unmarked pipe and fittings will be rejected.
- 3. Each length of pipe shall be marked with the manufacturer's name, trade name, nominal size, class, hydrostatic test pressure, manufacturer's standard symbol to signify it was tested, and date of manufacture. Each rubber ring shall be marked with the manufacturer's identification, the size, the year of manufacture and the classes of pipe with which it can be used.

4. PVC pipe shall be joined with a rubber gasket or PVC ring which is designed to prevent inflow and ex-flow. Mechanical compression joints shall be molded plastic or similar material (with or without the use of rubber or elastic plastic compression rings) as described in ASTM C425 for polyvinyl chloride (slip joint). Precast joints or rubber push-type gaskets for compression joint sealing (ASTM D3312 or F477) are all acceptable. (PVC pipe shall not be joined by a solvent cement joint in which the pipe spigot wedges into the tapered socket and the surfaces fuse together.)
5. In cases where pipe joints are required to be restrained the pipe shall utilize an internal restraint system suitable for C900/905 PVC pipe such as the CertainTeed Certa-Lok C900/RJ Restrained Joint System, Diamond Plastics Diamond Lok-21, JM Eagle Eagle Loc900, RieberLOK or approved equal.

B. CLEANOUTS

1. Pipe cleanouts shall be the same size as the pipe. A cleanout installation shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. A countersunk PVC screw plug shall be caulked in female adapter. An 18" diameter or square by 4" thick concrete cleanout marker shall be provided for each cleanout.

2.4 FLEXIBLE COUPLINGS

- A. Flexible Coupling shall be made of polyvinyl chloride with stainless steel sheer ring, manufactured by FERNCO, Davison, Michigan or approved equivalent.
- B. Sizes of flexible couplings shall be selected according to the types of pipe material being used.

2.5 GREASE TRAPS

- A. Grease Traps are required to be designed and installed at any commercial, municipal, industrial, and/or business services where fats, oil, and grease are discharged. These include but are not limited to restaurants, businesses of food ingredient processing, and cafeterias. Grease traps shall be sized and installed as per the City's Standard Details.
- B. All grease traps shall be installed with a test manhole immediately downstream to allow for testing of the discharge by the CITY.

- C. In cases where a new establishment will generate fats, oil, and grease is being proposed to occupy an existing building and site with existing sewer service which does not have a grease trap on the sewer service discharge; and the DEVELOPER of said establishment can demonstrate that there is inadequate space, property, and grade to allow for a conventional grease trap as per City details; and the proposed discharge flow is not significant, the City may allow a that a grease trap be installed inside the establishment as a retrofit to the plumbing in lieu of the City's standard. This decision shall be at the sole discretion of the City Public Works Department. Any grease traps inside the buildings on the DEVELOPER's plumbing shall be permitted through the local Health Department.

PART 3 EXECUTION

3.1 PIPE LAYING

- A. Sewer pipe shall be bedded and backfilled in accordance with Section 31 23 16 (Earthwork For Utilities).
- B. CONTRACTOR shall verify that no sewer is being installed within 10 lateral feet or 18 vertical inches of an existing waterline. Where crossings do occur, the sewer pipe is to be located so that both joints are as far from the water main as possible.
- C. Excavation and pipe bedding shall be performed in accordance with (Section 31 23 16 (Earthwork For Utilities)).
- D. Each piece of pipe and each fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in trench. Pipe laying shall proceed upgrade, starting at lower end of grade and with the bells uphill.
- E. Bell holes shall be sufficient size to allow ample room for making pipe joints properly. Bell holes shall not be cut out more than ten joints ahead of pipe laying. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe in order to avoid sudden offsets or inequalities in flow line.
- F. Water shall not be allowed to run or stand in trench while pipe laying is in progress or before the joints are completely set or before trench has been backfilled.
- G. No joints shall be made where pipe or joint materials have been soiled by earth in handling until such soiled surfaces are thoroughly cleaned by wire brushing and wiping until all traces of earth are removed.
- H. As work progresses, interior of all pipe shall be kept thoroughly clean. After each line of pipe has been laid, all earth, trash, rags and other foreign matter shall be removed from interior.

I. Backfilling of trenches shall not begin until pipe inspector has observed and approved the pipe in the trench. Backfilling of trenches shall start immediately after the pipe installation has been approved by the pipe inspector. Backfill shall be deposited and compacted as provided under Section 31 23 16 (Earthwork for Utilities).

J. Piping shall have a minimum slope as shown below.

Nominal Sewer Size	Minimum Slope in ft/100f
8-inch	0.50
10-inch	0.28
12 inch (300mm)	0.22
14 inch (350mm)	0.17
15 inch (375mm)	0.15
16 inch (400mm)	0.14
18 inch (450mm)	0.12
21 inch (525mm)	0.10
24 inch (600mm)	0.08
27 inch (675mm)	0.067
30 inch (750mm)	0.058
33 inch (825mm)	0.052
36 inch (900mm)	0.046
39 inch (975mm)	0.041
42 inch (1050 mm)	0.037

1. Maximum slopes and velocities shall be in accordance with the Ten States Standards as follows:
2. Where design velocities exceed 15 feet per second, special provisions incorporated to protect against displacement by erosion and impact.
3. Sewers on 20 percent slopes or greater shall be anchored securely with concrete, or equal, anchors spaced as follows:
 - a. Not over 36 feet center to center on grades 20 percent and up to 35 percent
 - b. Not over 24 feet center to center on grades 35 percent and up to 50 percent
 - c. Not over 16 feet center to center on grades 50 percent and higher.

3.2 DETECTION TAPE

- A. Detector marking tape shall be non-metallic and shall be installed minimum 18-inches above the pipe. Tape shall be high visibility green and minimum 2 inches wide. Lettering shall read "Caution: Buried Sewer Line".
- B. Detection wire shall be size #12 AWG, installed the entire length of the sewer main and the sewer laterals. Wire shall be installed 24" above pipe.

3.3 REPAIR CONNECTIONS

- A. When repair connections are to be made, the City has the ultimate discretion to approve or disapprove of the proposed repair method by the DEVELOPER. Existing pipe wastewater flow is to be stopped. If necessary, temporary measures are to be taken to ensure continuous sewer service.
- B. Saw cut the existing pipe five feet (5') minimum each side of the break.
- C. Prepare pipe bedding in accordance with the Standard Drawings.
- D. Replace the pipe with a section of pipe the same diameter and length as that removed. Material is to be PVC, SDR 35 min, or Ductile Iron, AWWA C150 or C151.
- E. Insert the flexible couplings and tighten in accordance with the manufacturer's specifications.
- F. Insert the stainless steel sheer ring in accordance with the manufacturer's specifications.
- G. Prior to backfilling the open trench, allow flow to the return to the pipe and check for leaks.
- H. Backfill the trench in accordance with Section 31 23 16 - Earthwork for Utilities.
- I. Video and perform pressure tests in accordance with Section 33 31 00 - Sanitary Sewer.

3.4 SERVICE CONNECTIONS

- A. Service connections to the main sewer shall be provided by inserting a 4" or 6" tee-wye at the correct location. The tee-wye shall be tilted upward on an angle of not less than 11-degrees (See Standard Detail Nos. S-17 and S-18 installation details). Each service line is to have a cleanout at the property line and cleanouts located along the service line between the property line and the building. The spacing of the cleanouts shall not exceed 80-feet. Cleanouts will also be provided at all 90° and 45° horizontal bends. Services lines will be run at a minimum grade of 1%. If there is more than one discharge point from the building to be served, (i.e. bathroom discharge separate from laundry discharge) then they shall be combined to enter the trunk sewer as one.

- B. The ends of all service laterals and service stubs not hooked to an existing structure will be plugged and marked with a pressure treated 2 x 4 painted red. The marker shall be at least 6 feet long with 2 feet protruding from the ground.
- C. If the existing structure does not have toilet facilities, then the service piping shall be run to within two feet (2') of the lowest point on the perimeter of the structure and marked as described above.
- D. Saddle taps are not to be used on new sewer mains. Tee/wyes of the appropriate size are to be used.
- E. Where connection to an existing sewer is necessary, it shall be performed with a saddle tap cove. "Knock-outs" will NOT be allowed. All cores are to be performed in the presence of a representative of the City.

3.5 JOINT CONSTRUCTION

- A. All joints for the various types of pipes shall be installed in accordance with pertinent AWWA, ASTM, and manufacturer's specifications. Any defective work will be removed and replaced if it cannot be corrected in accordance with the above-mentioned specifications.

3.6 INSPECTION

- A. The CITY inspector shall be notified no less than 48 hours (Monday through Friday) before installed pipe is scheduled to be buried, tested, or inspected.
- B. Prior to scheduling any testing of the sewer infrastructure, all final grading and stabilization including cuts and fills must be complete in the vicinity of the sewer piping.
- C. No official testing of manholes and piping (air test, mandrel, video, vacuum test, etc.) shall begin until final grade, sub- base, and curb has been completely installed on site.
- D. Once final grade has been established, the DEVELOPER may request and schedule inspection and testing with the CITY. Testing shall not commence until the CITY is satisfied that the above criteria and the intentions of said criteria have been met.
- E. No testing shall occur until all visible leaks are repaired.
- F. After completion of any section of pipe, the grades, joints and alignment shall be true to line and grade.
 - 1. Joint surfaces shall be smooth.
 - 2. There shall be no visible leakage and sewer shall be completely free from any cracks, protruding joint materials, deposits of sand, mortar or other materials on the inside of the pipe.

G. Low Pressure Air Leakage Testing

1. A low-pressure air test shall be conducted on each section of sewer line in accordance with ASTM F-1417 once backfilling to final grade has been completed.
2. Testing shall include the following equipment:
 - a. Plugs – mechanical or pneumatic
 - b. Above Ground Control Panel – to include shut-off valve, pressure regulating valve, pressure relief valve, input pressure gauge, and continuous monitoring gauge.
 - c. Separate Hoses – one connected to the control panel for input to sealed line and one connected to sealed line for constant monitoring of air pressure build-up. If pneumatic plugs are used, a third hose shall be supplied to inflate the plug from the above ground control panel.
3. All service laterals, stubs, and fittings in the test section shall be properly capped or plugged. Pipe connections at manholes shall be visually inspected to determine if pipe shear has occurred due to differential settlement of pipe and manhole.
4. Low pressure air shall be slowly introduced into the sealed line until internal air pressure reaches 4.0 psig greater than the average back pressure of any ground water that may submerge the pipe. Groundwater back pressure shall be determined per item 7 below.
5. At least two (2) minutes shall be allowed for temperature stabilization before proceeding further.
6. At a reading between 3.5 and 4.0 psig above the average groundwater back pressure, a stopwatch shall be used to measure the time it takes for the pressure in the line to drop 0.5 psig. If this time equals or exceeds the minimum test time as given in Table 1 below, the pipe line is considered acceptable. If there is no pressure loss after one hour of testing, the pipe line is considered acceptable.
7. If groundwater is present, the starting air pressure should be adjusted as follows:
 - a. A one-half inch threaded pipe nipple shall be installed through the manhole wall directly above one of the pipes entering the manhole. The pipe shall extend no more than 2 inches on the inside of the manhole and be at least 4 inches longer than the thickness of the manhole wall. The pipe shall be non-corrosive and be sealed watertight. The pipe end shall be sealed with a threaded one-half inch cap.

- b. Immediately before testing, the groundwater level shall be measured by attaching a clear plastic tube to the end of the pipe nipple. Once the water in the tube has stopped rising, the height, in feet, of water over the sewer pipe invert shall be measured.
 - c. The starting pressure shall be calculated by dividing the height of water over the sewer pipe invert by 2.31 and adding to the normal starting pressure of 3.5 psig. The starting pressure shall not exceed 9 psig. This adjusted starting pressure shall be used as the starting point for the test detailed in item 6 above.
8. If pipe installation fails to meet these requirements, DEVELOPER shall determine source or sources of leakage and shall repair or replace all defective materials or workmanship.
9. Final acceptance of each section or run of sewer tested will not be issued until leakage has been reduced to rates not exceeding the maximum values specified herein.

H. Mandrel Testing

1. A mandrel test of the sewer shall be made at least 30 days after backfilling as follows:
 - a. Mandrel shall be pulled through all gravity sewer pipe while CITY's representative is present.
 - b. Mandrel shall be sized to allow 7-1/2% maximum deflection in pipe dimension for all materials other than PVC. Maximum 5% deflection shall be allowed for PVC pipe.
 - c. Minimum specified test time required for a 0.5 psig pressure drop is shown in the table below.

Pipe Diameter (in.)	Minimum Time (min:sec)	Length for Minimum Time (ft.)	Time for Longer Length (sec.)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38

15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46
42	39:48	57	41.883 L	69:48	104:42	139:37	174:30	209:24	244:19	279:13	314:07
48	45:34	50	54.705 L	91:10	136:45	182:21	227:55	273:31	319:06	364:42	410:17
54	51:02	44	69.236 L	115:24	173:05	230:47	288:29	346:11	403:53	461:34	519:16
60	56:40	40	85.476 L	213:41	213:41	284:55	356:09	427:23	498:37	569:50	641:04

I. Video Recording

1. DEVELOPER is to provide the City with a color DVD system video of the inside of every reach of sanitary sewer installed.
2. DVD shall record the following information:
 - a. Manhole number to manhole number
 - b. Date of recording
 - c. Distance record from start of run
3. DVD shall include a distance and location description of every service line connection installed.
4. The manhole numbering system shall be the same as shown on the approved Development Drawings.

J. Miscellaneous Items

1. Safety Precautions: Low pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, a line is over pressurized or plugs are installed improperly. It is extremely important that various plugs be installed so as to prevent sudden expulsion of a poorly installed or partially inflated plug (i.e., a force of 250 lbs (112N) is exerted on an 8-inch (200 mm) plug by an internal pressure of 5 psi (34 kPa)). Observe the following precautions:
 - a. No one shall be allowed in manholes during testing because of hazards.
 - b. Install all plugs securely.
 - c. When lines are to be tested, it may be necessary that plugs be braced as an added safety factor.
 - d. Low pressure testing pressures shall not exceed 9 psi.
2. Special Equipment
 - a. Air compressor with capacity of 85 cubic feet to 125 cubic feet.
 - b. Pressure bags (plugs) for each size of pipe installed.
 - c. Material for bracing is required when necessary that plugs be braced as an added safety factor.
 - d. NOTE: List presented above is a partial list and other equipment may be required. DEVELOPER shall furnish all equipment and personnel required for performing low pressure air test.

END OF SECTION

SECTION 33 32 00
SUBMERSIBLE SEWAGE PUMP STATION

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The lift station shall be designed at a minimum in accordance with standards and references set forth by the Georgia Department of Natural Resources-Environmental Protection Division (EPD), and in accordance with the CITY's minimum requirements as well.
- B. For subdivisions, apartment complexes, shopping centers, and similar developments, the CITY requires the use of submersible-type lift stations. All wastewater lift stations shall be reviewed by the CITY and/or the Georgia Department of Natural Resources on a case-by-case basis.
- C. For the CITY's review, the DEVELOPER shall submit Detail Sheet PS-1 completed with all pertinent data, and documentation showing all necessary calculations for appropriate lift station and wetwell design. The CITY may require any additional information at its discretions in order to complete its review.
- D. Each lift station design and site are unique and shall be reviewed by the CITY as such. This includes site layout, access, electrical requirements, appearance, controls, etc. These standards are presented as a minimum requirement and guideline only; changes or additional requirements to each station may be required by the CITY at their discretion as a result of review during plan submittals and/or construction.

1.2 PUMPS

- A. The CITY accepts only submersible sewage pumps: heavy duty, vertical shaft, non-clog type passing 3-inch sphere, submersible centrifugal pumps manufactured by FLYGT. All Flygt pumps shall be of the N-series.
- B. The pumps furnished under this Section shall be the product of the same supplier to ensure maximum compatibility and interchangeability of parts. The DEVELOPER-CONTRACTOR shall assign unit responsibility to the pump supplier or manufacturer for the equipment specified in this section in order to enhance compatibility, ease of construction, and efficient maintenance of the components of each pumping system. The pump manufacturer shall coordinate pump controls so that a complete and operable system is achieved.
- C. Refer to Section 26 00 00, Electrical Plans for electrical equipment requirements.

1.3 MINIMUM GENERAL REQUIREMENTS

- A. All stations shall be a duplex at minimum.
- B. All stations shall be designed as submersible non-clog lift station complete with access drive, maintenance friendly layout and grading, motors, permanent discharge elbows, mix flush valves, guide bars, intermediate, upper and lower guide bar brackets, power cables, lifting chains, pump controls, level sensor, generator, lighting and pole, yard hydrant, anchor bolts, valve vault, wetwell, aluminum access hatches, fence, site work, spare parts and other accessories including all necessary labor, supervision, materials, tools, and appurtenances.
- C. Minimum wetwell diameter shall be 8-feet.
- D. Wetwell shall be coated as per specification section 09 97 23.
- E. Each station shall be furnished and installed with a permanent standby generator in accordance with specification section 26 32 13.
- F. Each lift station shall be furnished and installed with the CITY's most current SCADA. See electrical specifications.
- G. Check valves shall be swing type with cushion chamber and counterweight for closing speed adjustment.
- H. See lift station details for reference.
- I. All phases of construction shall be inspected as per the CITY's requirements.
- J. Entire Lift Station site (50'x50') shall be paved with concrete, access road shall be paved concrete.
- K. All Ductile Iron Pipe at conveying sewage shall have an interior coating, as specified in Specification 09 97 23.
- L. All Ductile Iron Pipe inside the wetwell conveying sewage shall have an exterior coating, as specified in Specification 09 97 01.02.

1.4 WORK INCLUDED

- A. The DEVELOPER shall furnish and install at the locations shown on the Approved Drawings, as specified or as directed, electrical submersible pump(s) required to complete the project.

- B. The DEVELOPER shall be responsible for any and all details and special construction required whether or not shown in the City's Standards or on the Approved Drawings or called for in these specifications. The DEVELOPER shall be responsible for the complete installation and responsibility for the proper operation of the various components of this section. It shall also include painting, field testing and additional services of the equipment supplier.

1.5 WORKMANSHIP AND MATERIALS

- A. All equipment and materials furnished under this Contract shall be new, suitable for the conditions of service to which they will be subject and equal to the best of their respective classes. Grade and quality shall meet the applicable cited specifications and standards.
- B. Workmanship shall be of the highest quality and shall be carried out by competent and experienced workmen.

1.6 SUBMITTALS

- A. Shop drawings, minimum 3 copies each, for the pumping station, associated equipment, and generator shall be submitted to the CITY for review and comment prior to installation by the DEVELOPER. The shop drawings must bear the stamp and approval of the design engineer prior to submitting to the CITY. The DEVELOPER shall provide to the CITY as a minimum the submittals listed below. Submittals shall be submitted to the CITY and approved prior to fabrication, shipment or work specified under this section begins. Submittals shall be in PDF format.
 - 1. Manufacturer's data including materials of construction and equipment weight.
 - 2. Predicted performance curves developed for the specific application. Performance curves shall plot speed, capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation.
 - 3. Motor submittal data.
 - 4. Shop drawings including dimensions and cross-sectional views of all equipment showing details of construction.
 - 5. Shop drawings including plan and sectional views of the pumps in the sump.
 - 6. A written report on the factory test results as specified in Section 1.7 of this Specification.
 - 7. Extended warranty as specified in Section 3.8 of this Specification.

- B. The DEVELOPER shall also include complete working details, dimension, assembly, and installation drawings, catalog and other data, and manufacturer's specifications and data indicating all parts, accessories and appliances, all piping, valves, motors, conduit, wiring and equipment, methods and material of construction, location, and installation, support, anchorage and connections and wiring diagrams, surface finishes and other information as may be required, complete in every detail, to define the articles to be furnished and indicate whether or not they comply with the Specifications.
- C. A tabulated list of all motors and electrical devices shall also be furnished. Include ampere and voltage operating characteristics for all devices. For motors, include full load amperes, power factor, efficiencies, slop and temperature rise. Process the tabulated list, plus all special wiring diagrams as shop drawings and as soon as possible in order to expedite the electrical work on electrical drawings.
- D. The DEVELOPER shall also furnish under this section two (2) bound copies and a PDF file of complete and detailed instructions for the operation, lubrication, and maintenance of all equipment furnished and installed hereunder. The manuals shall be furnished after final approval of all shop and working drawings but prior to shipment of equipment. Manuals shall be complete with wiring diagrams, lubrication schedules and recommended lubricants, drawings, cuts, parts lists, and other necessary data. All parts shall be numbered or otherwise clearly identified to facilitate ordering or replacements. Descriptions of all operations control devices and their specific functions shall also be included.

1.7 FACTORY TESTS

- A. Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and at the appropriate voltage and frequency.
- B. Testing shall also include, but not be limited to, the following:
 - 1. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.
 - 2. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.
 - 3. Impeller, motor rating and electrical connections shall first be checked for compliance to the specifications.
 - 4. A motor and cable insulation test for moisture content or insulation defects shall be made.

5. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
 6. The pump shall be run for 30 minutes submerged, a minimum of 6 feet under water.
 7. After the operational test described in line No. 6, the insulation test described in line No. 4 shall be performed again.
 8. After testing, the pump shall be inspected to insure that the pump maintains full watertight integrity.
- C. A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump as part of the shop drawing submittal process.

PART 2 PRODUCTS

2.1 PUMP REQUIREMENTS

- A. The pump(s) shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. The pumps provided shall be capable of operating in an ambient liquid temperature of **104 DEGREES F**. Since the high temperature of **104 DEGREES F** is specified by the National Electrical Manufacturers Association (NEMA) and Factory Mutual (FM), motors with a maximum ambient temperature rating below **104 DEGREES F** shall not be acceptable.
- B. The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable.
- C. The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

2.2 PUMP CONSTRUCTION

- A. 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 of stainless-steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

- B. 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. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- C. 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.

2.3 EQUIPMENT FEATURES

A. COOLING SYSTEM

- 1. If required by FLYGT, each unit shall be provided with an integral stainless steel motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F. (40°C.). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

B. CABLE ENTRY SEAL

- 1. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

C. MOTOR

1. 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. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.
2. 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. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.
3. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C. ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no- load characteristics.
4. The power cable shall be sized according to the NEC and ICEA standards 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 chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.
5. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

D. BEARINGS

1. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two-row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

E. MECHANICAL SEALS

1. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.
2. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.
3. The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.
4. A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

5. Seal lubricant shall be non-hazardous.

F. PUMP SHAFT

1. For the NP-model pumps:
 - a. The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

G. IMPELLERS

1. For the NP-model pumps:
 - a. The impeller shall be of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyl resin primer.

H. VOLUTE/SUCTION COVER

1. For the NP-model pumps:
 - a. The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non- concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

I. PROTECTION

1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.
2. A leakage sensor shall detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both locally and/or remote. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**
3. The thermal switches and FLS shall be connected to a Mini CAS (Control And Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

J. EXPLOSION-PROOF PUMPS:

1. The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to **104 DEGREES F**. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be available, as an option, in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM experienced personnel. **The pump manufacturer must provide training schools to qualify personnel in the proper service and repair of explosion proof pumps.**

K. MIX FLUSH SYSTEM:

1. Each pump shall be furnished and installed with the ITT Flygt mix flush valve.

L. GUIDE SYSTEM

1. The pumps shall be provided with a guide system to allow easy removal of the pumps without entering the wet well. Two guide bars shall be provided extending from the top slab of the pump station to the discharge connection of each pump and shall assist in raising and lowering the pump unit. The discharge connection shall be bolted to the floor and shall serve as a lower attachment for the guide bars. The working load of the lifting system shall be 50% greater than the pump unit weight.

2. The pump unit shall be guided on the bars by a guide bracket which shall be an integral part of the pump. Each pump shall be fitted with sufficient length of stainless-steel chain capable of lifting the pump and motor. The necessary fittings and eye bolts shall be provided.
3. The materials shall be stainless steel, type 316L and/or ASTM A276 Type 304

PART 3 EXECUTION

3.1 INSTALLATION

- A. The CONTRACTOR shall furnish and install the pumps at the locations shown on the Contract Drawings and in accordance with the pump manufacturer's specification and recommendations. All discharge elbows shall be mounted on concrete pedestals prepared for them and over anchor bolts set in the concrete. Pump pedestals shall be carefully set at proper elevation, location and alignment, and leveled after which they shall be properly grouted in with grout filling the entire underside of the base. Grouting shall be as recommended by the manufacturer. All piping shall be brought to the pump connection in such manner as to prevent the possibility of applying any loads or stresses to pump connections.

3.2 ANCHOR BOLTS AND FASTENERS

- A. Anchor bolts, nuts, washers, and fasteners shall be furnished with the equipment herein specified and set in conformance with templates or drawings also supplied by the manufacturer. All anchor bolts, studs, fasteners, washers, and nut shall be Type 316 stainless steel. The CONTRACTOR shall install all anchor bolts, studs, washers, nuts and fasteners required to complete the work of this Contract.

3.3 SAFETY GUARDS

- A. All exposed shafts, couplings, belts, etc., shall be provided with removable, rigidly constructed and mounted protective safety guards, meeting in full the requirements of the OSHA standards, State safety standards and all local codes or ordinances that may apply. Guards shall be designed to facilitate access for lubrication, maintenance, and/or belt replacement.

3.4 PAINTING

- A. Unless otherwise specified, all mild steel parts not buried in concrete, cadmium plated, galvanized or plastic covered, shall be shop primed with one coat of paint recommended as compatible with finish coats by the manufacturer whose paint is to be used for field painting. Stainless steel, aluminum, brass, bronze, galvanized or cadmium plated steel, and plastic covered parts will not be painted. Machined and finished surfaces shall be protected with a suitable lubricant to prevent rusting.

- B. The CONTRACTOR shall, under this Section, remedy all damage to shop coatings after installation of equipment, and to the satisfaction of the ENGINEER.

3.5 TOOLS AND LUBRICANTS

- A. The CONTRACTOR shall furnish a complete set of any special tools required for the maintenance and operation of this equipment, as designated by the equipment manufacturer.

3.6 FIELD TEST AND START-UP SERVICE

- A. The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for 8-hour working day(s) at the site to inspect the installation and instruct the owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the following:
1. Megger stator and power cables.
 2. Check seal lubrication.
 3. Check for proper rotation.
 4. Check power supply voltage.
 5. Measure motor operating load and no-load current.
 6. Check level control operation and sequence.
 7. Insurance that the connection between the pump and discharge connection does not leak. If the connection leaks, the discharge elbow shall be replaced by the pump manufacturer at no cost to the supplying CONTRACTOR or OWNER
 8. Compliance with operating conditions specified for flow rate and TDH: At least 2 draw down tests will be conducted for each pump, and parallel pumping at each wetwell to determine average discharge pumping rate. CONTRACTOR shall provide necessary personnel and equipment to assist ENGINEER in measuring wetwell depths during testing. CONTRACTOR shall be solely responsible for making all arrangements for scheduling tests, and having adequate personnel and potable water for testing and start up.

3.7 ADJUSTING, TESTING, TRAINING AND ADDITIONAL SERVICES

- A. In addition to the tests listed under this Section, each pump together actual motors shall be fully tested in water at the pump manufacturers' works to establish that all rating conditions have been met. The CONTRACTOR shall make all remedial work necessary on any or all pumps should they fail to meet the conditions specified at no extra compensation. Pumps shall then be retested and failure to meet the specified conditions after remedial work has been performed may be cause for rejection of the pumps.
- B. On completion of the work, the entire pumping equipment shall be lined up, operated and adjusted by qualified representatives of the several pump and control manufacturers, and under the intended operating conditions, and shall be left in first class, satisfactory, operating conditions, ready for continuous and satisfactory operation. The CONTRACTOR shall furnish all power, oil, fuses and other supplies for the field testing of the pumps, equipment, controls, and appurtenances, together with the services of the manufacturer's representatives.

3.8 PUMP WARRANTY

- A. The pump manufacturer shall submit the proper documentation demonstrating that the pump manufacturer warrants the pumps being supplied to the OWNER against defects in materials and workmanship for a period of five (5) years or 10,000 hours under a Municipal Wastewater Permanent Installation Warranty.

END OF SECTION

**SECTION 33 34 00
SANITARY SEWER FORCE MAINS**

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The work to be done under this Section of the Specifications consists of furnishing all materials and performing all labor necessary for the complete construction of the force mains, including all piping and fittings, as indicated on the Drawings and/or specified.

1.2 RELATED WORK

- A. Section 31 23 16 – Earthwork for Utilities
- B. Section 33 05 07 – Horizontal Directional Drilling
- C. Section 02 01 00 – Protection, Relocation and Restoration of Existing Utilities
- D. Section 33 31 00 – High Density Polyethylene Pipe

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. American National Standards Institute (ANSI).

1.4 QUALITY ASSURANCE

- A. Each pipe shall be clearly marked as required by governing ASTM standard specifications to show its class, date of manufacture, and name or trademark of manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. DEVELOPER shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into the WORK.
- B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.
 - 1. Pipe shall not be unloaded by rolling or dropping off trucks.
 - 2. Pipe handled on skidways shall not be skidded or rolled against pipe already on ground.

- C. Unload material at site of work, near place where it will be placed in trench.
 - 1. Materials shall be placed so as to least interfere with traffic.
 - 2. Provide signs, lights, and barricades as necessary to protect public.
- D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.
 - 1. Keep interior of pipe, fittings and valves, free of dirt or foreign matter at all times.
 - 2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.1 GENERAL

- A. Pipe and special fittings shall be furnished in sizes, types and classes at locations shown on the Development Drawings, and/or specified herein.
- B. Pipe and fittings shall be new materials that have not been previously used.
- C. All force mains shall be high-density polyethylene pipe (HDPE) ductile-iron pipe size (DIPS) DR 11.

2.2 HIGH DENSITY POLYETHYLENE MATERIALS

- A. Resin and Material Requirements – All material shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D 3350 with a minimum cell classification of 445474C. HDPE pipe and fittings shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. HDPE products shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
- B. HDPE Pipe
 - 1. Pipe shall be made of HDPE material with a minimum material designation code of PE4710 and with a minimum Cell Classification as noted in 2.01.A. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black of not less than 2 percent. The manufacture of the HDPE resin shall certify the cell classification indicated.
 - 2. Pipe sizes 3" and large shall have a manufacturing standard of ASTM F 714, while pipe smaller than 3" shall be manufactured to the dimensional requirements listed in ASTM D 3035.

3. Dimension Ratio (DR) shall be DR 11.
4. Pipe shall be Ductile Iron Pipe Size (DIPS)
5. Pipe shall meet AWWA C901 (3/4" to 3") or AWWA C906 (4" to 63").
6. When required by the owner, pipe shall be color coded for the intended service. The color coding shall be permanently co-extruded stripes on the pipe outside surface as part of the pipe's manufacturing process. Color coding shall be green for sanitary sewer.

C. HDPE Fittings

1. Butt Fusion Fittings: Fittings shall be PE3608 HDPE, minimum cell classification of 345464C as determined by ASTM D 3350 and approved for AWWA use. Butt Fusion Fittings shall have a manufacturing standard of ASTM D 3261. Molded & fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records. All fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.
2. Electrofusion Fittings: Fittings shall be PE 3608 HDPE, minimum cell classification of 345464C as determined by ASTM D 3350. Electrofusion Fittings shall have a manufacturing standard of ASTM F 1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All electrofusion fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.
3. Flanged and Mechanical Joint Adapters: Flanged and Mechanical Joint Adapters shall be PE 3608 HDPE, minimum cell classification of 345464C as determined by ASTM D 3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D 3261. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans
4. Fittings shall have the same pressure rating as HDPE Pipe.

2.3 PLUG VALVES

- A. All plug valves shall conform to AWWA C517 and shall be of the tight closing, resilient faced plug type and shall be of the bi-directional shut off for 175 psi. The plug valve shall provide 100% full port area.

- B. Valve bodies shall be constructed of cast iron ASTM A-126 Class B with chloroprene plug face, and shall have integrally cast mechanical joint ends or flanged ends as per the application shown on the construction drawings. End connections shall meet the following specifications: 125# ANSI B16.1 flange drilling, mechanical joint per AWWA C-111.
- C. Actuators for above ground service shall be Dezurik G-series or approved equal, manual hand wheel. Actuators for buried application shall be G-series with 2-inch nut, and valve box, with valve cap labeled, “sewer”.
- D. Plug valves shall be installed every 2,500 LF along force mains from lift station site to the discharge.
- E. Model shall be Dezurik PEF 100% Port, or approved equal.

2.4 AIR RELEASE VALVES

- A. Air Release valves for sewage applications shall be Golden Anderson Industries, Fig. 925 Standard Sewage Air Release Valve, or equivalent.
- B. The valve shall be supplied with flushing attachments consisting of: bronze shut off and flushing valves, quick-connect couplings, and 5 feet of rubber hose, for backwashing with clean water.
- C. The valve shall be float operated and shall employ a compound lever mechanism to enable the valve to automatically release air and gases from a sewage pipeline while the system is pressurized and operating.
- D. The valve shall close drip-tight, incorporating an adjustable Buna-N orifice button. All internal metal parts shall be stainless steel. The linkage/lever mechanism shall be able to be removed from the valve without disassembly of the mechanism. The float shall be stainless steel and capable of withstanding a 1,000 psi test pressure.
- E. Body and cover shall be of cast iron conforming to ASTM A126 Class B. Inlet connection shall be 2" or 3" NPT, or 4" flanged as required. Outlet connection shall be 1/2" NPT.

2.5 COMBINATION AIR RELEASE AND AIR/VACUUM VALVES

- A. Combination Air Release and Air/Vacuum valve shall be Cla-Val Model 36WW, 2" (inlet) x 1" (outlet), with backwashing kit, or approved equivalent.
- B. Combination Air Release and Air/Vacuum valve shall be able to function fully in normal operating pressures less than 10 psi.
- C. Body and cover shall be of cast iron conforming to ASTM A126 Class B. Float and internal parts shall be stainless steel. Seal shall be Buna-N®Rubber.

2.6 DETECTION WIRE AND WARNING TAPE

- A. Detector marking tape shall be non-metallic and shall be installed minimum 2 feet above the pipe. Tape shall be highly visible and minimum 2 inches wide. Lettering shall read "Caution: Buried Force main".
- B. Detection wire shall be size #12 AWG solid strand, installed the entire length of the piping.
- C. Wire shall be installed minimum 18-inches above the pipe, not connected to the pipe, and with waterproof connectors and connections at every valve so line can be relocated with a pipe finder after burial.

PART 3 EXECUTION

3.1 ALIGNMENT AND GRADES

- A. Depth of Pipes
 - 1. All force mains shall be installed at a minimum depth with 48-inches of cover from the top of the pipe to finished grade or at a cover depth of 48-inches below the adjacent, parallel edge of roadway, whichever depth is greater shall govern.
 - 2. Where obstructions are encountered, depth may be greater than 48 inches.
- B. Valves
 - 1. Shall be installed with stems vertical.
- C. Pipe Curvatures
 - 1. Shall be within horizontal or vertical permissible deflection at joint, as specified by manufacturer or AWWA Specification C600 (Latest Edition).

3.2 INSTALLING PIPE

- A. General
 - 1. Pipe and appurtenances shall be installed only when trench conditions are suitable.
 - 2. Trenches must be dry.

3. Proper implements, tools, and facilities shall be provided by DEVELOPER for safe and convenient performance of the work.
4. Where force mains encounter water lines, a minimum horizontal separation of ten (10') feet and minimum vertical separations of 18" must be provided. At crossings, one full length of force main pipe must be located so that both joints are as far from the water as possible. Force main shall be installed below water line.

B. Installation

1. Lower pipe, fittings, valves, and carefully into trench piece by piece by means of derrick, ropes, or other suitable tools or equipment.
2. Prevent damage to pipe line materials and protective coatings and linings.
3. Do not drop or dump pipe line materials into trench.
4. Carefully examine pipe and fittings for cracks and other defects while suspended above trench immediately before installation in final position.
 - a. Defective pipe or fittings shall be clearly marked and shall be removed from site.
5. Prevent foreign material from entering pipe while it is being placed in line.
 - a. Provide protective covering for ends of pipe until connection is made to adjacent pipe, if necessary.
 - b. No debris, tools, clothing, or other materials shall be placed in pipe during laying operations.
6. As each length of pipe is placed in trench, spigot end shall be centered in bell and pipe forced home and brought to correct line and grade.
 - a. Pipe shall be secured in place with approved backfill material tamped around it.
 - b. Precautions shall be taken to prevent dirt from entering joint space.

7. Open ends of pipe shall be closed by watertight plug, or other means approved by the City, at times when pipe laying is not in progress.
 - a. If water is in trench, plug shall remain in place until trench is pumped completely dry. Water shall not be allowed to run into pipe at any time during construction.
8. Force mains shall be installed so that a minimum grade of 1.0% is always maintained downhill away from a sewage air release valve so that entrapped air will always accumulate at the air release valve and air locking of the force main will be avoided.

3.3 CUTTING PIPE

- A. Cut pipe for inserting valves, fittings, or closure pieces in neat manner without damage to pipe or lining and so as to leave smooth end at right angles to axis of pipe.

3.4 SETTING VALVES AND FITTINGS

- A. Valves, fittings, plugs, and caps shall be set and joined to pipe in manner specified above for cleaning, laying and joining pipe.
- B. Valves shall be set plumb and a valve box shall be provided for every buried valve. Valve box shall not transmit shock or stress to valves and shall be centered and plumb over wrench nut of valve, with box cover flush with surface of finished pavement or such other level as may be directed.
- C. Backfill around valve shall be carefully tamped in 6 inch layers for full depth of trench with valve box in place.
- D. Provide concrete pad at surface.

3.5 JOINTING

- A. Jointing of pipe, fittings, and valves shall be made in strict compliance with manufacturer's printed instructions.
- B. Mechanical Joints
 1. Thoroughly clean outside of spigot and inside of bell.
 2. Clean gasket.
 3. Tighten nuts with torque limiting wrench.
 4. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure.

C. Push-On Joints

1. Furnish and install adaptors if required to join bells and spigots of different sizes.
2. Thoroughly clean inside of bell and outside of spigot end.
3. Insert and lubricate gasket using lubricant furnished or recommended by pipe manufacturer.
4. Spigot end of pipe shall be entered into socket with care used to keep joint from contacting ground.
5. Complete joint by forcing plain end to bottom of socket with forked tool or jack-type tool.

3.6 THRUST

- A. Plugs, caps, tees, bends, and valves, unless otherwise specified, shall be provided with reaction blocking and joint restraint. Concrete reaction blocking shall conform with these specifications and the applicable standard details. Joint restraint shall be as specified in Part 2.
- B. Concrete reaction blocking shall conform with these specifications and the applicable standard details.
- C. Reaction blocking shall be concrete, having a compressive strength of not less than 3,000 psi after 28 days. "Sackcrete" shall not be used.
- D. Blocking shall be placed between solid, unexcavated earth and fitting to be anchored; area of bearing on pipe and on ground in each instance shall be that shown on approved construction drawings.
- E. Blocking shall, unless otherwise shown or directed, be so placed that pipe and fitting joints will be accessible for repair.
- F. All fittings shall be restrained and blocked.

3.7 STREAM AND UTILITY CROSSINGS

- A. Pipe shall be placed beneath stream beds or ditches, around, over, or under sewers, culverts, gas mains, telephone ducts, water mains, or other structures.
 1. Do not pass pipe through any drainage pipe, culvert, sewer, or manhole.

2. Provide minimum of 48 inches under stream beds or ditches, unless approved by ENGINEER in writing.
 3. Provide a minimum of 18-inch earth or sand cushion between proposed water line and any other utility or structure, or as indicated on drawings.
- B. Where pipelines are installed below free flowing streams, the DEVELOPER is responsible for adequate pipeline design of each crossing subject to the CITY review and approval. The DEVELOPER's ENGINEER shall consider the soils, creek flow, pressure, topography, thrust restraint, construction techniques allowed, etc. to design and specify appropriate layout and pipe joints.
- C. The DEVELOPER shall be responsible for any and all necessary permitting by authorities having jurisdiction for stream crossings or crossing of state waters including but not limited to EPD, Jackson County, and the Army Corps of Engineers.
- D. Plug valves shall be provided at both ends of a stream crossing to allow the section to be isolated for testing or repair.

3.8 HYDROSTATIC TESTS

- A. Pressure and leakage tests will be required on each section of line between valves and shall be conducted in accordance with AWWA C600.
- B. General Procedure
1. Furnish and install corporation stops at force main high points to release air as line is filled with water.
 2. Furnish suitable pump, connections, and necessary apparatus including means for accurately measuring water introduced into line during testing.
 3. Test pressure shall not be less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section. Test pressure shall not less than 200 psi or 1.5 times the stated working pressure at the lowest elevation (whichever is greater) of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less as specified by the manufacturer.
 - a. Test pressures shall be as directed by the CITY.
 - b. Test shall be conducted for a minimum of 2 hours.
 - c. Pressure shall not vary by more than 5 psi during test.
 4. Testing Allowance.

- a. The testing allowance is the maximum amount of water that may be added into the pipeline section during hydrostatic testing in order to maintain ± 5 psi of the test pressure.
- b. The maximum allowable makeup water shall be based on the following formula where L is the testing allowance of makeup water in gallons per hour; S is the test length in feet, D is the pipe diameter in inches and P is the average test pressure in pounds per square inch.

$$L = \frac{S \times D \times (P^{0.5})}{148,000}$$

- c. No pipe installation shall be accepted if the amount of make up water required exceeds the amount determined in the formula above.
5. Locate, remove, and replace any defective pipe, valves, fittings, or hydrants.
6. Repeat tests until results are satisfactory to the CITY.

END OF SECTION