ITB NO. 23-021
INVITATION TO
BID
PUMP STATION 4044 REHAILITATION
JWSC PROJECT NO. 2105

For

BRUNSWICK-GLYNN COUNTY JOINT WATER AND SEWER COMMISSION
BRUNSWICK, GA

Issued Thursday, May 11, 2023

MANDATORY Pre-bid teleconference and OPTIONAL site visit
Tuesday, June 6, 2023, 10:00 a.m. EST

Call-in: 888.204.5987
Access Code: 5863965
Please pre-register via email to pcrosby@bgjwsc.org
no later than Monday, June 5, 2023, at 5:00 p.m.

Deadline for questions is Friday, June 9, 2023, at 5:00 p.m. EST
Please submit questions via e-mail to pcrosby@bgjwsc.org

Bids Due by 12:00 NOON EST Tuesday, July 11, 2023, to:

Purchasing Division
Pam Crosby, Director of Purchasing
Brunswick-Glynn County Joint Water and Sewer Commission1703
Gloucester Street
Brunswick, Georgia 31520
(912) 261-7100

Bids should be clearly labeled as follows:
"ITB No. 23-021 Pump Station 4044 Rehabilitation Project"

Submit responses in hard copy only; electronic or fax responses will not be accepted.
Responses received after the deadline or at any other location will not be accepted.

FOR COMPLETE DETAILS OF THIS SOLICITATION, please visit the BGJWSC website, utilizing the

following link: http://www.bgjwsc.org/departments/procurement/

SECTION 00020

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BIDDING REQUIREMENTS

INVITATION FOR BIDS – 23-021

Sealed bids for **ITB No. 23-021 PUMP STATION 4044 REHAB PROJECT, 128 ALTAMA CONNECTOR #17000, PARCEL ID 03-28134, BRUNSWICK, GLYNN COUNTY, GEORGIA** will be received by the Brunswick-Glynn County Joint Water and Sewer Commission (JWSC) at the JWSC's Office of the Director, 1703 Gloucester Street, Brunswick, Georgia 31520 until ***12:00 NOON, EST, Tuesday, July 11, 2023,*** at which time and place they will be publicly opened and read aloud.

Bidding documents are available, free of charge, on the JWSC website using the link below:

https://www.bgjwsc.org/departments/procurement/

All updates and relevant information for the solicitation may be found here.

The work to be performed under this contract consists of furnishing all labor, materials, tools, equipment, and incidentals required to construct complete in place and ready to operate a new Wastewater Pumping Station and associated force main. More specifically the work includes, butis not limited to:

- Demolition of existing equipment and accessories
- Security fencing and related site work
- Erosion and sedimentation controls
- New precast concrete wetwell with aluminum access covers
- New precast valve pit
- New electrical panel shelter
- Pumping equipment and accessories
- Electrical work including controls and SCADA.
- Discharge piping, gravity piping, valves, effluent flow meter, etc.
- Forcemain with associated fittings and appurtenances
- Retrofit of existing wetwell and conversion of private lift station to a manhole

The Bidder is ***encouraged*** to examine the location of the work and inform himself fully as to the conditions present at the site. A ***mandatory pre-bid teleconference*** will be held in the JWSC Commission Chambers, 1703 Gloucester Street, Brunswick, Georgia 31520 on **Tuesday, June 6, 2023,** ***at 10:00 a.m. local time*** followed by an optional site visit for anyone interested in attending. Please pre-register via email, pcrosby@bgjwsc.org no later than Monday, June 5, 2023, at 5:00 p.m. Questions regarding this solicitation shall be made in writing to the Purchasing Director,Pam Crosby, via email: pcrosby@bgjwsc.org. All responses to submitted questions will be issued viaAddendum to pre-bid attendees and posted on the JWSC website for reference.

A bid guarantee in an amount not less than five percent (5%) of the amount bid must accompanyeach bid. Acceptable forms of bid guarantees are a bid bond, certified check or cashier's check made payable to the Brunswick-Glynn County Joint Water and Sewer Commission. Performanceand Payment bonds, each in an amount equal to hundred percent (100%) of the contract amountwill be required of the successful Bidder.

The Brunswick-Glynn County Joint Water and Sewer Commission provides equal opportunity forall businesses and does not discriminate against any person or business because of race, color,religion, sex, national origin, disability, or veteran status. This policy ensures all segments of the business community have access to supplying the goods and services needed by the JWSC.

The JWSC reserves the right to reject any and all bids, waive technicalities and make an award in the best interest of the JWSC.

SECTION 00200

INSTRUCTIONS TO BIDDERS

1.0 Intent

It is intended that the Instructions to Bidders, General Conditions, Construction Plans and Technical Specifications shall define and describe the complete work to which they relate. Requests for clarification during the bidding period must be submitted to the Purchasing Director, Pam Crosby via email pcrosby@bgjwsc.org on or before ***5:00 p.m. EST on Friday, June 9, 2023.*** Requests for clarification received after this date will not be considered. Responses to requests for clarification will be issued by addendum to all pre-bid attendees and will also be posted on the JWSC website:

https://www.bgjwsc.org/departments/procurement/

2.1 Work to be Done

The work to be performed under this contract consists of furnishing all labor, materials, tools, equipment, and incidentals required to construct complete in place and ready to operate a new Wastewater Pumping Station and associated force main. More specifically the work includes, but is not limited to:

- Demolition of existing equipment and accessories
- Security fencing and related site work
- Erosion and sedimentation controls
- New precast concrete wetwell with aluminum access covers
- New precast valve pit
- New electrical panel shelter
- Pumping equipment and accessories
- Electrical work including controls and SCADA
- Discharge piping, gravity piping, valves, effluent flow meter, etc.
- Forcemain with associated fittings and appurtenances
- Retrofit of existing wetwell and conversion of private lift station to a manhole

3.0 Site Examination

The Bidder is ***encouraged*** to examine the location of the work and inform himself fully as to the conditions present at the site. A ***mandatory*** pre-bid teleconference will be held in the JWSC Commission Chambers, 1703 Gloucester Street, Brunswick, Georgia 31520 on **Tuesday, June 6, 2023,** ***at 10:00 a.m. local time*** followed by an ***optional*** site visit at 128 Altama Connector #17000, Brunswick, Georgia for anyone interested in attending. Please pre-register via email, pcrosby@bgjwsc.org no later than Monday, June 5, 2023, at 5:00 p.m. to obtain login credentials for the call.

4.0 Bid and Contract Security

A bid guarantee in an amount not less than five percent (5%) of the amount bid must accompany each bid. Acceptable forms of bid guarantees are a bid bond, certified check or cashier's check made payable to the Brunswick-Glynn County Joint Water and Sewer Commission. The JWSC will return bid guarantees, other than bid bonds, to unsuccessful bidders as soon as practicable, but not sooner than the execution of a contract with the successful bidder. If for any reason whatsoever the successful Bidder withdraws from the competition after opening the bids, or refuses to execute the Contract, the Owner

will proceed on the Bid Bond or deposit the certified check or cashier's check as damages for the Bidder's failure to enter into a contract for the work.

Performance and Payment bonds, each in an amount equal to one hundred percent (100%) of the contract amount will be required of the successful Bidder.

The Surety of the Bid Bond, Performance Bond, and Payment Bond shall be a surety company authorized to do business in the State of Georgia, shall be listed in the Department of the Treasury Circular 570, and shall have an underwriting limitation in excess of one hundred percent (100%) of the bid amount. The Bonds and Surety shall be subject to approval by the JWSC legal counsel.

Attorneys-in-fact who sign and seal Bid Bonds or Contract Bonds must file with each bond a certified and effectively dated copy of their power of attorney.

5.0 Determination of Successful Bidder

The contract, if awarded, will be awarded to the lowest responsive, responsible Bidder. The determinationof the Bidder's ***responsibility*** will be made by the JWSC based on whether the Bidder:

- Maintains a permanent place of business,
- Has the appropriate technical experience,
- Has adequate plant and equipment to do the work properly and expeditiously,
- Has suitable financial means to meet obligations incidental to this work, and
- Is appropriately licensed for the described work in the State of Georgia
- Submitted the E-Verify Affidavits and Agreements with bid.

The Bidder shall furnish, to the JWSC, all such information and data for this purpose as the JWSC may request. The JWSC reserves the right to reject any bid if the evidence submitted by, or investigation of, the Bidder fails to satisfy the JWSC that he is properly qualified to carry out the obligations of the Contract.

The determination of ***responsiveness*** will be made by the JWSC based on a consideration of whether the Bidder has submitted a complete Bid Form without irregularities, excisions, special conditions, or alternative bids for any item unless specifically requested in the Bid Form.

The JWSC reserves the right to reject any and all bids including without limitation, the right to reject any or all nonconforming, nonresponsive, unbalanced or conditional bids; the right to award each of the contract components individually or to a single qualified Bidder; the right to waive technicalities and make an award in the best interest of the JWSC; the right to award any, all or none.

6.0 Bid Alternates

Bidders are requested to review bid alternates, if any, as outlined on the Bid Form.

7.0 Contract Time

Contract time shall consist of **three hundred and thirty (330)** consecutive calendar days for the completion of

work, to be computed from the date of the Notice to Proceed. Time is of the essence and is an essential element of this Agreement, and the Contractor shall pay to the JWSC, not as a penalty, but as liquidated damages, the sum of **One Thousand Dollars ($1,000.00)** for each calendar day that he shall be in default of completing the work within the time limit named herein.

8.0 Bid Form

Bids shall be submitted on the Bid Form included. Bids shall be based upon unit or lump sum prices as indicated by the Bid Form. Where errors or omissions result in discrepancies in proposal totals, prices per unit as submitted will be binding. Final payment will be based upon completion and acceptance of the work by the JWSC.

9.0 Submission of Bids

The bidder shall submit ***an original and three (3) copies, plus one (1) electronic copy (USB)*** of its Bid in an opaque sealed envelope at thetime and place indicated in the Invitation. On the outside of the envelope containing the Bid shall be noted the following:

**"Sealed Bid – PUMP STATION 4044 REHABILITATION -
JWSC PROJECT NO. 2105"**

The outside of the envelope shall also bear the name, address, and Utility Contractor's License Numberof the Bidder.

All blanks in the Bid Form must be completed and written or printed in ink.

Bids by corporations must be executed in the corporate name by the president or vice-president (or other corporate officer accompanied by evidence of authority to sign), and the corporate seal must be affixed and attested to by the secretary or an assistant secretary of the corporation. The corporate addressand state of incorporation must be shown on the Bid Form.

Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown on the Bid Form.

The address, telephone number, facsimile number, and email address for communications regarding the Bid must be shown on the Bid Form.

All names and titles must be typed or printed in ink below the signature.

The Bid shall contain an acknowledgement of receipt of all Addenda, if any. The numbers of each Addendum must be filled in on the Bid Form.

The ***Oath, Bid Bond, Representation, Legal and Character Qualifications***, ***Affidavit, and E-Verify Affidavit and Agreement*** forms in this IFB shall be submitted with the Bid, and be executed in proper form.

IN ACCORDANCE WITH O.C.G.A. § 13-10-91, NO PROPOSAL FOR THE PHYSICAL PERFORMANCE OF SERVICES WILL BE CONSIDERED UNLESS THE BID INCLUDES A SIGNED, NOTARIZED E-VERIFY AFFIDAVIT AS SET FORTH HEREIN.

The submission of a Bid will constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of the IFB, that without exception the Bid is premised upon performingand furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents,and that the Contract Documents are sufficient in scope and detail to indicate and convey understandingof all terms and conditions of performance of the Project and furnishing of the Work.

SECTION 00410
BID FORM

DATE SUBMITTED: _____

PROJECT NAME: PUMP STATION 4044
REHAB PROJECT NO. 2105
BRUNSWICK, GEORGIA

SUBMITTED TO: Brunswick – Glynn County Joint
Water and Sewer Commission
1703 Gloucester Street,
Brunswick, Georgia 31520

SUBMITTED BY:

Company Name: _____

Address: _____

_____

_____

Georgia Utility Contractor's License No. _____

Acknowledge Receipt of Addenda Numbers _____

The undersigned as BIDDER hereby declares that the only person or persons interested in the BID as principal or Principals is or are named herein and that no other person than herein mentioned has any interest in the BID or in the Contract to be entered into; that this BID is made without connection with any other person or parties making a BID, and that it is in all respects fair and in good faith without collusion or fraud.

The BIDDER declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the plans and

specifications for the work and the documents relative thereto; and has read all General and Special Conditions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The BIDDER proposes and agrees, if the BID is accepted, to contract with the Brunswick – Glynn County Joint Water and Sewer Commission to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor to complete the work in full and complete accordance withthe shown, noted, described and reasonably intended requirements of the plans, specifications and contract documents to the full and entire satisfaction of the Brunswick – Glynn County Joint Water and Sewer

Commission with a definite understanding that no money will be allowed for extra work except asset forth in the attached General Conditions and contract documents for the prices set forth below.

ITEM 1 – WASTEWATER PUMPING STATION

For furnishing all labor materials and equipment (including the items of major mechanical equipment) necessary to construct the wastewater pumping station including, but not limited to, mobilization; earthwork; concrete work; installation of precast concrete wet well top; valve pit; electricalshelter; furnish and install new submersible pumps; furnish and install required station hardware; furnish and install new piping, effluent flow meter, valves and fittings; furnish and install new duplex control panel and SCADA system; electrical shelter and concrete pad; security fencing and related site work; electrical work; erosion control and grassing; demobilization; complete surface restoration and all other work and appurtenances required.

ITEM	EST QTY	UNIT	DESCRIPTON	UNIT PRICE	TOTAL PRICE
1	1	LS	Mobilization, Demobilization, Insurance & Bonds	$	$
2	1	LS	Demolition of existing structures, equipment, and materials (remove and dispose)	$	$
3	1	LS	Traffic Control	$	$
4	124	LF	Abandon Existing Forcemain	$	$
5	1	LS	Temporary Bypass Pumping	$	$
6	1	LS	Existing Wetwell Cleaning, Coating, new frame & cover	$	$
7	1	LS	Convert Private Lift Station to Manhole, new frame, and cover, 8 LF 8” PVC gravity connection	$	$
8	1	LS	Retrofit Existing Wetwell to Influent Manhole	$	$
9	1	LS	Abandon Existing Valve Pit	$	$
10	1	LS	Electrical	$	$
11	1	LS	SCADA	$	$

ITEM	EST QTY	UNIT	DESCRIPTON	UNIT PRICE	TOTAL PRICE
12	1	LS	New Precast Well	$	$
13	1	LS	Pumps, Piping, Vaults, Misc. Valves and Appurtenances	$	$
14	1	LS	Rosemount Meter, Vault, and Appurtenances	$	$
15	100	LF	15” PVC Gravity Sewer	$	$
16	45	LF	12” HDPE Forcemain	$	$
17	110	LF	2” Poly Water Service	$	$
18	1	LS	Fittings (Sewer Safe)	$	$
19	1	LS	Connect to Existing MH, new frame & cover, Coating manhole	$	$
20	1	LS	Relocate & install water meter & RPZ, yard hydrant, hose, nozzle, and hose rack	$	$
21	1	LS	Fencing and Gate	$	$
22	1	LS	Tree Removal	$	$
23	1	LS	Hydroseeding / sodding (stabilization)	$	$
24	1	LS	Erosion Control and Grassing	$	$
25	1	LS	Dewatering / Groundwater Control	$	$
26	1	LS	Trench Safety system for trench excavation	$	$
27	267	SY	Glynn County asphalt pavement replacement	$	$

ITEM	EST QTY	UNIT	DESCRIPTON	UNIT PRICE	TOTAL PRICE
28	50	LF	Sidewalk removal and replacement	$	$
29	25	LS	Remove & re place curb	$	$
30	1	EA	Pavement striping	$	$
31	1	EA	Cash allowance for signage	$ 200.00	$ 200.00
32	1	EA	Cash allowance for gas main relocation (AGL)	$ 78,600.00	$ 78,600.00
33	1	EA	Cash allowance for Georgia Power relocation	$ 2,500.00	$ 2,500.00
34	1	EA	Cash allowance for Glynn County permits	$ 5,000.00	$ 5,000.00
35	1	CY	Extra had excavation	$	$
36	10	CY	Extra machine excavation	$	$
37	5	CY	Extra placement of backfill material	$	$
38	1	CY	Extra placement of granular fill	$	$
39		CY	Extra cement – stabilized sand	$	$
40	.25	TN	Extra ductile iron compact fitting (in place)	$	$

Total Bid (Items 1 through 40) _____

_____

(Words)

($_____)

(Numbers)

The Bidder further agrees to accomplish all work and provide all material for the lump sum price submitted and understands that the lump sum price is subject to adjustment by either increase or decrease, only through a properly executed change order.

The Bidder further proposes and agrees to commence work under this contract, with adequate force and equipment, on a date to be specified in a written order of the Owner and shall fully complete all work hereunder within **three hundred and thirty (330)** consecutive calendar days from and including said date.

The undersigned further agrees that, in case of failure on his part to execute the said Contract and Bonds within fifteen (15) consecutive calendar days after receipt of the conformed Contract Documents,the check or bid bond accompanying this Bid and the monies payable thereto, shall be paid into the funds of the Owner as liquidated damages for such failure otherwise, the check or Bid Bond accompanying this Bid shall be returned to the undersigned.

I understand that collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards. I agree to abide by all conditions of this Invitation for Bids and certify that I am authorized to sign this Bid for the Bidder.

This_____day of_____2023.

Company Name: (*Please Type or Print*)

Name:_____

Street:_____

City:_____

State:_____Zip:_____

Fax Number: ( ) _____

E-Mail:_____

Person Authorized to Sign:

Name: _____

Signature: _____

Title: _____

Telephone Number: ( ) _____

EXPERIENCE AND REFERENCES:

The Bidder shall provide (3) Project references relative to work it has done of a similar nature as solicited in this Invitation for Bids. Give references that will afford the JWSC opportunity to judge as to experience, skill, business standing and financial ability.

PROJECT REFERENCE #1

Project Name: _____

Owner: _____

Owner Contact Name and Title:_____

Mailing Address: _____

_____

Email:_____ Phone: _____

Contract Amount: _____ Prime or Sub Contractor? _____

Start Date:_____ End Date: _____

Brief Scope of Project: _____

_____

_____

_____

PROJECT REFERENCE #2

Project Name: _____

Owner: _____

Owner Contact Name and Title:_____

Mailing Address: _____

_____

Email:_____ Phone: _____

Contract Amount: _____ Prime or Sub Contractor? _____

Start Date:_____ End Date: _____

Brief Scope of Project: _____

_____

_____

_____

_____

PROJECT REFERENCE #3

Project Name: _____

Owner: _____

Owner Contact Name and Title: _____

Mailing Address: _____

_____

Email:_____ Phone: _____

Contract Amount: _____ Prime or Sub Contractor? _____

Start Date:_____ End Date: _____

Brief Scope of Project: _____

_____

_____

_____

_____

SECTION 00420

BID BOND

State of Georgia

City of Brunswick

County of Glynn

KNOW ALL MEN BY THESE PRESENT, that we, _____

_____, as Principal, and

_____, as Surety, are held and firmly bound

unto the Brunswick-Glynn County Joint Water and Sewer Commission (JWSC) in the not to

exceed sum of_____Dollars
(words)

($_____) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, personal representatives, successors, and assign, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted to the JWSC a Bid for:

PUMP STATION 4044 REHABILITATION
JWSC PROJECT NO. 2105

BRUNSWICK, GEORGIA

NOW THEREFORE, the conditions of this obligation are such that if the Bid be accepted, the Principal shall, within fifteen days (15) days after receipt of conformed Contract Documents, execute a contract in accordance with the Bid upon the terms, conditions and prices set forth therein, and in the form and manner required by the JWSC and execute a sufficient and satisfactory Performance Bond and Payment bond payable to the JWSC, each in an amount of one hundred percent (100%) of the total contract price,

in form and with security satisfactory to the JWSC, then this obligation shall be void; otherwise, it shall be and remain in full force and virtue in law; and the Surety shall, upon failure of the Principal to comply with any or all to the foregoing requirements within the time specified above, immediately pay to the aforesaid JWSC, upon demand, the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

This bond is given pursuant to and in accordance with the provisions of O.C.G.A. § 36-91-50 *et seq*., as amended from time to time, and all the provisions of the law referring to this character of bond as set forth in said sections or as may be hereinafter enacted and these are hereby made a part hereof to the same extent as if set out herein in full.

(Continued on Next Page)

IN WITNESS WHEREOF, the said Principal has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers,on

This _____day of_____, 2023.

PRINCIPAL: _____

Signed and sealed in the

Presence of:

By:_____

Title: _____

1. _____ ***(Seal)***

2. _____

SURETY: _____

Signed and sealed in the

Presence of:

By:_____

Title: _____

(Seal)

1. _____

2. _____

SECTION 00430

OATH

State of Georgia

City of Brunswick

County of Glynn

I_____(Name of Individual) solemnly swear that in the procurement of the Contract for

PUMP STATION 4044 REHABILITATION
JWSC PROJECT NO. 2105
BRUNSWICK – GLYNN COUNTY,
GEORGIA

That I or any other person associated with me, or my business, corporation or partnership has prevented or attempted to prevent competition in the bidding of said project or from submitting a bid for this projectby any means whatsoever.

Lastly, I swear that neither I, nor any other person associated with me, or my business, Corporation or partnership has caused or induced any other bidder to withdraw his/her bid from consideration for this project. Said oath is filed in accordance with the requirements set forth in O.C.G.A. § 36-91-21 (e).

This_____Day of_____, 2023

Name of Party: _____

Corporate or Partnership Name: _____

Sworn to and subscribed before me this_____Day of_____, 2023.

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(SEAL)

SECTION 00440

REPRESENTATION

EQUAL EMPLOYMENT OPPORTUNITY (EEO) PRACTICE:

EEO Plan: The successful Bidder will develop and implement an EEO policy that, as a minimum, willrecruit, hire, train, and promote, at all levels, without regard to race, color, religion, national origin, sex, or age, except where sex or age is a bona fide occupational qualification.

EEO For Veterans/Handicapped: The successful Bidder will also provide equal employment opportunities for qualified disabled veterans, handicapped persons, and veterans of the Vietnam Era.

EEO For Successful Bidder Programs: The successful Bidder will ensure equal employment opportunity applies to all terms and conditions of employment, personnel actions, and successful Bidder-sponsored programs. Every effort shall be made to ensure that employment decisions, programs and personnel actions are non- discriminatory. That these decisions are administeredon the basis of an evaluation of an employee's eligibility, performance, ability, skill, and experience.

EEO Acquisitions: The successful Bidder will develop and implement a policy that will give equal opportunity to the purchase of various goods and services from small businesses and minority-owned businesses.

Does the Bidder have the above EEO policy in place?

Yes [ ] No [ ]

If the answer to a. above is no, will the Bidder have such a policy in place for the project?

Yes [ ] No [ ]

Statement of Assurance: The Bidder herein assures the JWSC that it is in compliance with Title VI & VII of the 1964 Civil Rights Act, as amended, in that it does not on the grounds ofrace, color, national origin, sex, age, disability, or veteran status, discriminate in any form or manner against employees or employers or applicants for employment and is in full compliance with A.D.A.

_____

(*Firm's Name*)

_____

(*Authorized*

Signature*)*

_____/_____

(*Title*) **(*Date*)**

SECTION 00450

LEGAL AND CHARACTER QUALIFICATIONS

Convictions: Has the Bidder (including parent corporation, if applicable) or any principal ever been convicted in a criminal proceeding (felonies or misdemeanors) in which any of the following offenses were charged?

	Yes	No		Yes	No
Fraud	[ ]	[ ]	Obstruction of justice (or any other misconduct affecting public or judicialofficers' performance of their official Duties	[ ]	[ ]
Embezzlement	[ ]	[ ]			
Tax Evasion	[ ]	[ ]			
Bribery	[ ]	[ ]	False/misleading advertising	[ ]	[ ]
Extortion	[ ]	[ ]	Perjury	[ ]	[ ]
Jury Tampering	[ ]	[ ]	Conspiracy to commit any of the Foregoing offenses	[ ]	[ ]
Anti-Trust Violations	[ ]	[ ]			

Civil Proceedings: Has the Bidder or any principal ever been a party, or is now a party, to a civilproceeding in which it was held liable for any of the following?

	Yes	No		Yes	No
Unfair/anti-competitive business practices	[ ]	[ ]	Violations of securities laws(state & federal)	[ ]	[ ]
Consumer fraud misrepresentation	[ ]	[ ]	False/misleading advertising	[ ]	[ ]
Violation of local government	[ ]	[ ]			

Ordinances

License Revocation: Has the Bidder or any principal ever had a business license revoked, suspended, or the renewal thereof denied, or is a party to such a proceeding that may result in same?

Yes	No
[ ]	[ ]

Responses: If yes is the response to any of the questions on the previous page, provide information such as date, court, sentence, fine, location, and all other specifics for each yes response.

SECTION 00460

AFFIDAVIT

This Bid is submitted to Brunswick-Glynn County Joint Water and Sewer Commission (JWSC) by the undersigned who is an authorized officer of the company and said company is licensed to do business in Georgia. Further, the undersigned is authorized to make these representations and certify these representations are valid. The Bidder recognizes that all representations herein are binding on the Company and failure to adhere to any of these commitments, at the JWSC's option, may result in a revocation of the granted contract.

Consent is hereby given to the JWSC to contact any person or organization in order to make inquiries into legal, character, technical, financial, and other qualifications of the Bidder.

The Bidder understands that, at such time as the JWSC decides to review this Bid, additional information may be requested. Failure to supply any requested information within a reasonable time may result in the rejection of the Bid with no re-submittal rights.

The successful Bidder understands that the JWSC, after considering the legal, financial, technical, and character qualifications of the Bidder, as well as what in the JWSC's judgment may best serve the interest of its rate payers and employees, may grant a contract.

The successful Bidder understands that this bid is made without prior understanding, agreement,or connection with any corporation, firm or person submitting a bid for the same, and is in all respects fair and without collusion or fraud. I understand that collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards.

Any contract issued will be on the basis of the Bidder's service, financial plans and arrangements being feasible and adequate to fulfill the conditions set forth in this project and the successful Bidder's response.

Company Name: _____

Authorized Person: _____ Signature: _____
(*Print/Type)*

Title: _____ Date: _____

Address: _____

Telephone: _____ Fax: _____ Email: _____

SECTION 00470

E-VERIFY CONTRACTOR AFFIDAVIT AND AGREEMENT

Georgia Security Immigration and Compliance (GSIC) Act

The Brunswick - Glynn County Joint Water and Sewer Commission and Contractor agree that compliance with the requirements of O.C.G.A. § 13-10-91 and Rule 300-10-1-.02 of the Rules of the Georgia Department of Labor are conditions of this Agreement for the physical performance of services.

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, s*tating affirmatively that the individual, firm, or corporation which is contracting with the Brunswick - Glynn County Joint Water and Sewer Commission has registered with and is participating in the federal work authorization program known as: "E-Verify", web address* https://e-verify.uscis.gov/enroll/ operated by the United States Citizenship and Immigration Services Bureau of the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], *in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91.* The undersigned Contractor also verifies that he/she/it is using and will continue to use the federal work authorization program throughout the contract period.

The undersigned Contractor agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services pursuant to the contract with the Brunswick - Glynn County Joint Water and Sewer Commission, Contractor will secure from each subcontractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01-.08 or a substantially similar form. Contractor further agrees the Contractor will advise the Brunswick - Glynn County Joint Water and Sewer Commission of the hiring of a new subcontractor and will provide the Brunswick - Glynn County Joint Water and Sewer Commission with a Subcontractor Affidavit attesting to the Subcontractor's name, address, user identification number, and date of authorization to use the Federal Work Authorization Program within five (5) days of the hiring before the Subcontractor begins working on the Project. Contractor also agrees to maintain all records of such compliance for inspection by the Brunswick - Glynn County Joint Water and Sewer Commission at any time and to provide a copy of each such verification to the Brunswick - Glynn County Joint Water and Sewer Commission at the time the subcontractor(s) is retained to perform such services.

(Continued on Next Page)

E-Verify Employment Eligibility Verification User I.D. Number

Date of Authorization To Use Federal Work Authorization Program

Name of Contractor

Title of Authorized Officer or Agent of Contractor

Signature and Printed Name of Authorized Officer or Agent

Sworn to and subscribed before me this the_____day of_____, 2023.

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(NOTARY SEAL)

As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV/Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

Authority O.C.G.A. § 13-10-91. **History**. Original Rule entitled "Contractor Affidavit and Agreement" adopted F. May 25, 2007; eff. June18, 2007, as specified by the Agency.

SECTION 00480

E-VERIFY SUBCONTRACTOR AFFIDAVIT AND AGREEMENT

Georgia Security Immigration and Compliance (GSIC) Act

The Brunswick - Glynn County Joint Water and Sewer Commission and Subcontractor agree that compliance with the requirements of O.C.G.A. § 13-10-91 and Rule 300-10-1-.02 of the Rules of the Georgia Department of Labor are conditions of this Agreement for the physical performance of services.

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, s*tating affirmatively that the individual, firm, or corporation which is contracting with a Contractor contracting with the Brunswick - Glynn County Joint Water and Sewer Commission has registered with and is participating in the federal work authorization program known as: E-Verify", web address* https://e-verify.uscis.gov/enroll/ operated by the United States Citizenship and Immigration Services Bureau of the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], *in accordance with the applicable provisions and deadlines established in O.C.G.A. §13-10-91.* The undersigned Subcontractor also verifies that he/she/it is using and will continue to use the federal work authorization program throughout the contract period.

The undersigned Subcontractor agrees that, should it employ or contract with any other subcontractor(s)in connection with the physical performance of services pursuant to the contract with the Brunswick - Glynn County Joint Water and Sewer Commission, Subcontractor will secure from such subcontractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 on the Subcontractor Affidavit provided in Rule300-10-01-.08 or a substantially similar form. Subcontractor further agrees the Subcontractor will advise the Brunswick - Glynn County Joint Water and Sewer Commission of the hiring of a new subcontractor and will provide the Brunswick - Glynn County Joint Water and Sewer Commission with a Subcontractor Affidavit attesting to the Subcontractor's name, address, user identification number, and date of authorization to use the Federal Work Authorization Program within five (5) days of the hiring before the Subcontractor begins working on the Project. Subcontractor also agrees to maintain all records of such compliance for inspection by the Brunswick - Glynn County Joint Water and Sewer Commission at any time and to provide a copy of each such verification to the Brunswick - Glynn County Joint Water and Sewer Commission at the time the subcontractor(s) is retained to perform such services.

(Continued on Next Page)

E-Verify Employment Eligibility Verification User I.D. Number

Date of Authorization To Use Federal Work Authorization Program

Name of Subcontractor

Title of Authorized Officer or Agent of Subcontractor

Signature and Printed Name of Authorized Officer or Agent

Sworn to and subscribed before me this the_____day of_____, 2023.

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(NOTARY SEAL)

As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV/Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

Authority O.C.G.A. § 13-10-91. **History**. Original Rule entitled "Contractor Affidavit and Agreement" adopted F. May 25, 2007; eff. June18, 2007, as specified by the Agency.

CONTRACTING REQUIREMENTS

SECTION 00520

PART A – CONTRACT FORM

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT

This Agreement is by and between Brunswick-Glynn County Joint Water and Sewer Commission ("Owner") and ("Contractor"). Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

WORK

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

Furnishing all labor, materials, tools, equipment, and incidentals required to construct complete in place and ready to operate a new Wastewater Pumping Station and associated force main. More specifically the work includes, butis not limited to:

- Demolition of existing equipment and accessories
- Security fencing and related site work
- Erosion and sedimentation controls
- New precast concrete wetwell with aluminum access covers
- New precast valve pit
- New electrical panel shelter
- Pumping equipment and accessories
- Electrical work including controls and SCADA.
- Discharge piping, gravity piping, valves, effluent flow meter, etc.
- Forcemain with associated fittings and appurtenances
- Retrofit of existing wetwell and conversion of private lift station to a manhole

THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: PS4044 Rehabilitation, JWSC Project No. 2105 located at 128 Altama Connector #17000, Brunswick, Georgia

2.02 Definitions: Levels of Project Completion

A. *Substantial Completion* shall be defined as the date on which the Work was sufficiently completed, in accordance with the contract as modified by any change order or amendments agreed by the parties, so that the owner could occupy the project for the use for which it was intended, the sufficiency of which to be determined and certified by the Engineer. Minor items, not necessary for the primary use of the project, determined as such by the Engineer, may still be incomplete.

B. *Final Completion* shall be defined as the date on which the construction is complete, and all items of the Work have been satisfactorily completed and accepted in accordance with the contract, as determined and certified by the Engineer.

ENGINEER

3.01 The Owner will assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

CONTRACT TIMES

4.01 Time is of the Essence

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Contract Times: Dates

A. The Work will be substantially complete completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions based on the issue date of the Notice To Proceed.

4.03 Contract Times: Days

A. The Work will reach Final Completion within 330 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 360 days after the date when the Contract Times commence to run.

4.04 Milestones

A. ADD PROJECT MILESTONES IF APPLICABLE

4.05 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 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. The parties agree that the following liquidated damage amounts are reasonable estimates of anticipated or actual harm that might arise from Contractor's breach. 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 $1,000 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 $1,000 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.

4.06 Special Damages

A. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor’s failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in

SAMPLE

Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

CONTRACT PRICE

5.01 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 Work, at the prices stated in Contractor's Bid, INSERT AMOUNT **,** attached hereto as Exhibit A.

PAYMENT PROCEDURES

6.01 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.

6.02 Progress Payments; Retainage

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the 20th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract.

1. Progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to retainage and liquidated damages, in accordance with the Contract and the General Conditions.

a. Except as otherwise provided herein following the completion of fifty percent (50%) of the Work, Owner shall pay Contractor ninety percent (90%) of the value of the Work completed as provided in the contract documents plus the value of materials and equipment suitably stored, insured, and protected at the construction site and, at the owner's discretion, such materials and equipment suitably stored, insured, and protected off site at a location approved by the owner's authorized contract representative, when allowed by the contract documents, with the remaining ten percent (10%) held as retainage; and

b. There shall be no amounts retained on progress payments submitted after 50 percent (50%) of the Work on the project has been completed if in the opinion of Owner or Engineer that such Work is satisfactory and has been completed on schedule; and

i. Discontinuation of retention shall not affect the retained amounts on the first fifty percent (50%) of the Work on the project which may continue to be held to ensure satisfactory completion of the project; and

ii. If, after discontinuing the retention, the Owner or Engineer determines that the work is unsatisfactory, or has fallen behind schedule, the Owner may resume retention at the previous rate of ten percent (10%).

B. At Substantial Completion of the Work, and as the Engineer determines the work to be reasonably satisfactory, Owner shall within thirty (30) days after invoice and other appropriate documentation as may be required by the contract documents are provided pay the retainage to the Contractor. If at that time there are any remaining incomplete minor items, an amount equal to 200 percent (200%) of the value of each item as determined by the Engineer shall be withheld until such item or items are completed.

C. Final payment of the retained amounts to the Contractor under the contract to which the retained amounts relate shall be made after certification by the Engineer in charge of the project covered

SAMPLE

by the contract that the work has been satisfactorily completed and is accepted in accordance with the contract, plans, and specifications.

D. Retainage shall be invested at the current market rate and any interest earned on the retained amount by Owner shall be paid to the Contractor when the project has been completed within the time limits specified and for the price specified in the contract, or in any amendments or change orders approved in accord with the terms of the contract, as certified pursuant to Subsection 1 of this paragraph; and

1. Payment to the Contractor of interest earned on the retained amounts shall be made after certification by the Engineer in charge of the project covered by the contract that the work has been completed within the time specified and within the price specified in the contract.

E. The Contractor shall, within ten days from the contractor's receipt of retainage from the owner, pass through payments to subcontractors and shall reduce each subcontractor's retainage in the same manner as the contractors retainage is reduced by the owner; provided, however, that the value of each subcontractor's work complete and in place equals 50 percent of his or her subcontract value, including approved change orders and other additions to the subcontract value, provided, further, that the work of the subcontractor is proceeding satisfactorily and the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his or her work including any warranty work as the contractor in his or her reasonable discretion may require, including, but not limited to, a payment and performance bond; and

1. The foregoing paragraph is intended to outline Contractor's responsibilities as set forth in O.C.G.A. § 13-10-80, and is not, by itself, intended to confer contractual privity or third party beneficiary status upon any subcontractor or lower tier subcontractor.

6.03 Consent of Surety

A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.04 Interest

A. All amounts not paid when due will bear interest at the rate of one percent per annum.

CONTRACT DOCUMENTS

7.01 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 as listed in the bid documents table of contents of the project manual (copy of list attached).
6. Drawings listed on the attached sheet index.
8. Addenda (if any)

SAMPLE

9. Exhibits to this Agreement (enumerated as follows):
    a. Bid Form dated in response to Invitation For Bid 23-021 PS4044 Rehabilitation – JWSC Improvements released on May 11, 2023.
10. 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.
    e. Warranty Bond, if any.

B. The Contract Documents listed in Paragraph 7.01.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 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 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 carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
    5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
    6. 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.

SAMPLE

7. 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.
8. 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.
9. 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.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. 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.

8.02 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 8.02:
   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 bidding process or in the Contract execution;
   2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid 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 Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
   4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 Standard General Conditions

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

SAMPLE

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

This Agreement will be effective on **insert date 2023** (which is the Effective Date of the Contract).

Owner:	Contractor:
Brunswick-Glynn Count Joint Water and Sewer Commission	
(typed or printed name of organization)	*(typed or printed name of organization)*
By:	By:
(individual's signature)	*(individual's signature)*
Date:	Date:
(date signed)	*(date signed)*
Name: G. Ben Turnipseed, Sr.	Name:
(typed or printed)	*(typed or printed)*
Title: Chairman	Title:
(typed or printed)	*(typed or printed)*

*(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest:	Attest:
(individual's signature)	*(individual's signature)*
Title:	Title:
(typed or printed)	*(typed or printed)*
Address for giving notices:	Address for giving notices:
1703 Gloucester Street	
Brunswick, GA 31520	
Designated Representative:	Designated Representative:
Name: Andrew Burroughs	Name:
(typed or printed)	*(typed or printed)*
Title: Executive Director	Title:
(typed or printed)	*(typed or printed)*
Address:	Address :
1703 Gloucester Street	
Brunswick, GA 31520	
Email: aburroughs@bgjwsc.org	

License No.: _____
(where applicable)

State: Georgia

SAMPLE

SECTION 00610

PERFORMANCE

BOND

State of Georgia
City of
Brunswick
County of Glynn

KNOW ALL MEN BY THESE PRESENT, that we _____

_____ , as Principal, and _____

_____ , as Surety, do hereby acknowledge ourselves indebted and firmly bound and held unto the Brunswick – Glynn County Joint Water and Sewer Commission , for the use and benefit of those entitled thereto in the not to exceed sum of _____

_____ $ (_____)
for the payment of which will and truly to be made, in lawful money of the United States, we do hereby bind ourselves, successors, assigns, heirs, and personal representatives.

BUT THE CONDITION OF THE FOREGOING OBLIGATION OR BOND IS THIS:

WHEREAS, the Brunswick –Glynn County Joint Water and Sewer Commission has engaged the saidContractor for the not to exceed sum of _____

_____ $ (_____)

for the Project entitled:

PUMP STATION 4044 REHABILITATION
JWSC PROJECT NO. 2105
BRUNSWICK – GLYNN COUNTY,
GEORGIA

as more fully appears in a written Agreement bearing the same project title, a copy of which Agreementis by reference hereby made a part thereof.

NOW, THEREFORE, if said Contractor shall fully and faithfully perform all the undertakings and obligationsunder the said agreement or contract herein before referred to and shall fully indemnify and save harmless the Brunswick-Glynn County Joint Water and Sewer Commission from all costs and damage whatsoever which it may suffer by reason of any failure on the part of said Contractor to do so, and shall fully reimburseand repay the Brunswick-Glynn County Joint Water and Sewer Commission such default, and shall guarantee all products and workmanship against defects for a period of one year, then this obligation or bond shall be null and void, otherwise, it shall remain in full force and effect.

And for value received it is hereby stipulated and agreed that no change, extension of time, alteration or addition to the terms of the said Agreement or Contract or in the work to be performed there under, or the Specifications accompanying the same shall in any way affect the obligations under this obligation or bond,

and notice is hereby waived of any such damage, extension of time, alteration or addition to the terms of the

Agreement or Contract or to the work or to the Specifications.

This bond is given pursuant to and in accordance with the provisions of O.C.G.A. §§ 36-10-1 *et seq.* and 36-82-100 *et seq*. and all the provisions of the law referring to this character of bond as set forth in said sections or as may be hereinafter enacted, and these are hereby made a part hereof to the same extent as if set out herein in full.

IN WITNESS WHEREOF, the said Principal has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on

This the_____day of_____, 2023, executed in three (3) counterparts.

PRINCIPAL: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SURETY: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SECTION 00620

PAYMENT BOND

State of Georgia
City of
Brunswick
County of Glynn

KNOW ALL MEN BY THESE PRESENT, that we _____

_____ , as Principal, and _____

_____ , as Surety, do hereby acknowledge ourselves indebted and firmly bound and held unto the Brunswick – Glynn County Joint Water and Sewer Commission, for the use and benefit of those entitled thereto in the not to exceed penal sum of

_____

_____ $ (_____)

for the payment of which will and truly to be made, in lawful money of the United States, we do hereby bind ourselves, successors, assigns, heirs, and personal representatives.

BUT THE CONDITION OF THE FOREGOING OBLIGATION OR BOND IS THIS:

WHEREAS, the Brunswick – Glynn County Joint Water and Sewer Commission has engaged the saidContractor for the not to exceed sum of _____

_____ $ (_____)

for the Project entitled:

PUMP STATION 4044 REHABILITATION
JWSC PROJECT NO. 2105
BRUNSWICK – GLYNN COUNTY,
GEORGIA

as more fully appears in a written Agreement bearing the same project title, a copy of which Agreementis by reference hereby made a part thereof.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Contractor and all subcontractors to whom any portion of the work provided for in said Contract is sublet and all assignees of said Contract and of such subcontractors shall promptly make payments to all persons supplying him or them with labor, products, services, or supplies for or in the prosecution of the work provided for in such Contract, or in any amendment or extension of or addition to said Contract, and for the payment ofreasonable attorney's fees, incurred by the claimants in suits on this bond, then the above obligation shall be void; otherwise, it shall remain in full force and effect.

HOWEVER, this bond is subject to the following conditions and limitations:

(a) Any person, firm or corporation that has furnished labor, products, or supplies for or in the prosecution of the work provided for in said Contract shall have a direct right of action against the Contractor and Surety on this bond, which right of action shall be asserted in a proceeding, instituted in the county in which the work provided for in said Contract to be performed or in any county in which Contractor or Surety does business. Such right of action shall be asserted in proceedings instituted in the name of the claimant or claimants for his or their use and benefit against said Contractor and Surety or either of them (but not later than one year after the final settlement of said Contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.

(b) The Principal and Surety hereby designate and appoint _____ as agent of each of them to receive and accept service of process or other pleading issue or filed in any proceeding instituted on this bond and hereby consent that such service shall be the same as personal service on the Contractor and/or Surety.

(c) In no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action or proceeding thereon that is instituted later than one year after the final settlement of said Contract.

(d) This bond is given pursuant to and in accordance with the provisions of O.C.G.A. §§ 36-10-1 *et seq.* and 36-82-100 *et seq.* and all the provisions of the law referring to this character of bond as set forth in said sections or as may be hereinafter enacted, and these are hereby made a part hereof to the same extent as if set out herein in full.

(Signatures on Next Page)

IN WITNESS WHEREOF, the said Principal has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on

This the_____day of_____, 2023, executed in two (2) counterparts.

PRINCIPAL: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SURETY: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SECTION 00630
PART D - AFFIDAVIT OF PAYMENT OF CLAIMS

_____ This the_____day of_____, 2023

appeared before me,_____, a Notary Public, in and for

_____, and being by me first duly sworn states that all subcontractors and suppliers of labor and materials have been paid all sums due them to date for work performed or material furnished in the performance of the Contract between the Brunswick – Glynn County Joint Water and Sewer Commission (JWSC) and Contractor to be Named (Contractor) last signed on _____, for the

PUMP STATION 4044 REHABILITATION
JWSSC PROJECT NO. 2105
BRUNSWICK – GLYNN COUNTY,
GEORGIA

CONTRACTOR **Company:** _____

By: _____

Title: _____

(SEAL)

Sworn to and subscribed before me this the_____day of_____, 2023.

NOTARY PUBLIC **Name:** _____

My Commission Expires: _____

(NOTARY SEAL)

SECTION 00640

PART E – CERTIFICATE OF INSURANCE

This is to certify that _____
(Insurance Company)

Of _____
(Insurance Company Address)

has issued policies of insurance, as identified by a policy number to the insured named below, and that such policies are in full force and effect at this time. Furthermore, this is to certify that these policies meet the requirements described in the General Conditions of this project; and it's agreed that none of these policies will be canceled or changed so as to affect this Certificate until thirty (30) days after written notice of such cancellation or change has been delivered to:

BRUNSWICK – GLYNN COUNTY JOINT WATER AND SEWER COMMISSION
EXECUTIVE DIRECTOR
1703 GLOUCESTER STREET
BRUNSWICK, GEORGIA 31520

It is further agreed that the Brunswick – Glynn County Joint Water and Sewer Commission shall be named as an additional insured on the Contractor's policy.

Insured: _____

Project Name: **PUMP STATION 4044 REHABILITATION**
JWSC PROJECT NO. 2105
BRUNSWICK – GLYNN COUNTY, GEORGIA

Policy Number(s): _____

Date: _____ _____
(Insurance Company)

Issued At: _____ _____
(Authorized Representative)

Address: _____

_____

_____

Note: Please attach Certificate of Insurance form to this page.

SECTION 00650

PART E - CERTIFICATE OF DRUG FREE WORKPLACE

In order to have a drug- free workplace, a business shall:

Publish a statement notifying employees that the unlawful, manufacture, distribution, dispensing, possession, or use of controlled substances is prohibited in the workplace and specifying the actions that shall be taken against employees for violation of such prohibition.

Inform employees about the dangers of drug abuse in the workplace, the business's policyof maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employeesfor drug abuse violations.

As a condition of working on the commodities or contractual services then under bid, the employee shall notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of any controlled substance law of the United States or any State, for a violation occurring in the workplace no later than five (5) days after such conviction.

Impose a sanction on, or require satisfactory participation in a drug abuse assistance or rehabilitation program if such in available in the employee's community, by any employee who is so convicted.

Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

Company Name: _____

Authorized Signature: _____

Title: _____

Date: _____

SECTION 00700

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
3. *Application for Payment*—The 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. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; 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 Bidding 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 Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice 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 are 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 Bidding 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 bidding 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 Proposals

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 rests 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, expediters, 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 that 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 reviewan 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, Contractormay 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 beresponsible, 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 proposal.

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.

DIVISION ONE

SECTION 01100
SUMMARY OF WORK

PART 1 GENERAL

1.1 DESCRIPTION

The work covered by this Contract includes furnishing all labor, equipment, materials, and incidentals and performing all work required to relocate PS4044 located near the intersection of AltamaConnector and Scranton Connector. The work includes, but is not limited to, demolition, excavation, dewatering, backfill and compaction, new precast concrete wetwell, valve pit, flow meter, electrical panel shelter,pumps, controls, site work, fencing, discharge piping and valves, 15-inch gravity main, new 12-inch forcemainwith associated fittings, electrical work, conversion of existing wetwell and private lift station, erosion control and grassing, complete surface restoration and all other work and appurtenances required.

1.2 PLANS AND SPECIFICATIONS

The completed work shall be in accordance with these specifications and the construction plans prepared by LEA entitled ***"PUMP STATION 4044 REHAB"*** last revised on May 5, 2023, as follows:

INDEX OF DRAWINGS		
Sheet	**Title**	**Date**
C-1	Cover	
C-2	General Notes	
C-3	Existing Conditions and Demo Plan	
C-4	Site Plan	
C-5	System Profile	
C-6	Pump Station Elevation	
C-7	Construction Details (1 of 3)	
C-8	Construction Details (2 of 3)	
C-9	Construction Details (3 of 3)	
C-10	ESPC Plan	
C-11	ESPC Details	
C-12	Electrical Plan	
C-13	Pump Details	
C-14	MOT Plan	
E-1	JWSC Inter-Connecting Diagram VFD	
E-2	JWSC Standard VFD One Line	
E-3	Electrical Details	
E-4	Electrical Details	
I-1	JWSC Typical Instrumentation	

1.3 APPLICABLE STANDARDS

In general, all work is intended to conform to the JWSC's Standards for Water and Sewer Design and Construction, latest edition. In the event of a conflict between these project specifications, the aforementioned construction plans and the JWSC Standards, the project specifications and construction plans shall take precedence.

PART 2 (Not Used)

(END OF SECTION)

SECTION 01110
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SCOPE

Under this section shall be included the methods of measurement and payment for items ofwork under this Contract.

1.2 ESTIMATED QUANTITIES

All estimated quantities for unit price items, stipulated in the Proposal, or other Contract Documents, are approximate and are to be used as a basis for estimating the probable cost of the Work and for comparing the bids submitted for the Project. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities.The basis of payment for work and materials will be the actual amount of the work done and material furnished as shown on the Plans. The Contractor agrees to make no claim for damages, anticipated profits or otherwise on account of any difference between the amountsof work actually performed and materials actually furnished and the estimated amounts included in the Proposal. The Contractor will provide assistance to the Owner to check quantities and elevations when so requested.

1.3 LUMP SUM AND UNIT PRICE QUANTITIES

All quantities are for unit price or lump sum items stipulated in the Bid Form. The Contactor, having read and understood the Bidding Documents and examined the Project Site and adjoining areas and being familiar with the obstacles and conditions that will affect proposed work, hereby offers and agrees to furnish all labor, products, and services needed to provide work in accordance with the Bidding Documents and will provide a properly itemized listing for each bid item, supported by sufficiently substantially data, to permit evaluation of partial pay requests.

1.3 CONSTRUCTION ITEMS

Bid Item No. 1 – Wastewater Pumping Station

(1) Mobilization, Demobilization, Insurance & Bonds

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. The lump sum pricefor this item shall not exceed 5% of the total of all bid items in the Base Bid.

Payment shall include all compensation for mobilization, demobilization, insurance requirements and bonds for the project. Payment for 50% of the item shall be made when the contractor completes project mobilization and satisfies the insurance and bonding requirements to the satisfaction of the Owner. Payment for the remaining 50%

of the item shall be after demobilization and completion of the work to the satisfaction of the Owner.

(2) Demolition

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment, and materials necessary for demolition of the existing structures, foundations, and utilities as shown in the drawings.

(3) Traffic Control

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for traffic control to be installed and maintained as necessary to complete the work as described in the bid documents.

(4) Abandon Existing Forcemain

Payment for this item will be made based on the unit contract price per linear foot as shown in the Bid Form. Payment includes all labor, equipment, and materials necessary for abandoning the existing forcemain as shown in the drawings.

(5) Temporary Bypass Pumping

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for temporary bypass pumping operations with temporary bypass pumps, as necessary to complete the work as described in the bid documents.

(6) Existing Wetwell Cleaning, Coating, new frame, and cover

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(7) Convert Private Lift Station to Manhole, new frame and cover, Coating, 8 LF of 8" PVC gravity piping

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(8) Retrofit Existing Wetwell to Influent Manhole

There will be no separate measurement of the items under this heading. Payment for this

item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment, and materials necessary for retrofitting the existing wetwell to the influent manhole as shown on the drawings.

(9) Abandon Existing Valve Pit

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment, and materials necessary for the abandonment of the existing valve pit as shown in the drawings.

(10) Electrical

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for complete installation of all electrical components per plans and bid documents.

(11) SCADA Coordination

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(12) New Precast Wetwell

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(13) Pumps, Piping, Vaults, Misc. Valves and Appurtenances

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for installation of pumps, interior piping, valves, valve pit(s) per plans and bid documents.

(14) Rosemount Flow Meter, Vault, and Appurtenances

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(15) 15" PVC Gravity Sewer

Pipe, installed in accordance with the specifications and accepted by the Owner, will be measured along the pipe from center of structure to center of structure. Payment will be made based on the unit contract price per linear foot as shown in the Bid Form

and includes, but is not limited to, mobilization; SDR-21 Class 200 pipe; trenching and backfill; dewatering; demobilization; complete surface restoration; and all other work and appurtenances required.

(16) 12" HDPE Forcemain

Pipe, installed in accordance with the specifications and accepted by the Owner, will be measured along the pipe from center of structure to center of structure. Payment will be made based on the unit contract price per linear foot as shown in the Bid Form and includes, but is not limited to, mobilization; SDR-21 Class 200 pipe; trenching and backfill; dewatering; demobilization; complete surface restoration; and all other work and appurtenances required.

(17) 2" Poly Water Service

Pipe, installed in accordance with the specifications and accepted by the Owner, will be measured along the pipe from center of structure to center of structure. Payment will be made based on the unit contract price per linear foot as shown in the Bid Form and includes, but is not limited to, mobilization; SDR-21 Class 200 pipe; trenching and backfill; dewatering; demobilization; complete surface restoration; and all other work and appurtenances required.

(18) Fittings

Mechanical joint ductile iron (sewer safe) fittings, installed in accordance with the specifications and accepted by the owner, will be measured on the basis of each unit installed. Payment will be made based on the unit contract price per fitting as shown in the Bid Form and includes, but is not limited to, mobilization; fittings and Mega-Lug jointrestraints; trenching and backfill; dewatering; demobilization; complete surface restoration; and all other work and appurtenances required.

(19) Connect to Existing MH, new frame and cover, Coating MH

Connection to existing MH40210250 shall be made at the location noted on the drawings and in accordance with the details. Measurement and payment for connections to existing manhole shall be made based of the lump sum price in theBid Form. Payment includes all labor, equipment and materials required for to complete the work as described in the plans and Bid Documents.

(20) Relocate & Install Water Meter & RPZ, yard hydrant, hose, nozzle, and hose rack

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(21) Fencing

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all

labor, equipment and materials required for the installation of yard fencing and gates per plans and bid documents.

(22) Tree Removal

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for tree removal per plans and bid documents.

(23) Hydroseeding/sodding (stabilization)

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for the installation of hydroseed and sod per plans and bid documents**.**

(24) Erosion Control and Grassing

Erosion control and grassing will be measured on the basis of the completed item. Payment will be made in accordance with the lump sum price stated in the Bid Form and includes all structural practices and vegetative measures directed by the Engineer, required and/or as shown to ensure effective erosion control at the work site.

(25) Dewatering / Groundwater Control

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(26) Trench Safety System

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(27) Glynn County Asphalt Pavement Replacement

Paymentwill be made based on the unit contract price per linear foot as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the work as described in the bid documents.

(28) Sidewalk Removal and Replacement

Payment will be made based on the unit contract price per square foot as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the work as described in the bid documents.

(29) Remove and Replace Curb

Payment will be made based on the unit contract price per linear foot as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the work as described in the bid documents.

(30) Pavement Striping

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required to complete the work as described in the bid documents.

(31) Cash Allowance for Signage

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the cost incurred by the contractor to purchase the signage.

(32) Cash Allowance for gas main relocation

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the cost incurred by the contractor to pay AGL/Southern Company for the relocation of the gas main. The contractor shall coordinate the work with AGL for the relocation of the gas main that will be done by AGL contractors.

(33) Cash Allowance for Georgia Power relocation

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the cost incurred by the contractor to pay Georgia Power/Southern Company for the relocation and installation of the power service. The contractor shall coordinate the work with Georgia Power.

(34) Cash Allowance for Glynn County Permits

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the cost incurred by the contractor to pay for any required permits from Glynn County.

(35) Extra Hand Excavation

Payment will be made based on the unit contract price per cubic yard as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the extra hand excavation.

(36) Extra Machine Excavation

Payment will be made based on the unit contract price per cubic yard as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the extra machine excavation.

(37) Extra placement of backfill material

Payment will be made based on the unit contract price per cubic yard as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the extra placement of backfill material, including acceptable structural backfill.

(38) Extra placement of granular fill

Payment will be made based on the unit contract price per cubic yard as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the extra placement of granular fill, including granular fill.

(39) Extra cement stabilized sand

Payment will be made based on the unit contract price per cubic yard as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the extra placement of sand, including cement stabilized sand.

(40) Extra ductile iron compact fitting

Payment will be made based on the unit contract price per ton as shown in the Bid Form. Payment includes all labor, equipment, and materials required to complete the installation of extra fittings.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01120
FIELD
ENGINEERING

PART 1 GENERAL

1.1 SCOPE

Field engineering shall include all surveying work required to layout the proposed facilities and control the location of the finished project. The Contractor shall be solely responsible for constructing the project to the correct horizontal and vertical alignment as shown in the drawingsand as specified herein. The Contractor shall assume all costs associated with rectifying any work constructed in the wrong location.

The drawings provide the location and/or coordinates of principal components of the project.

1.2 JWSC'S RESPONSIBILITIES

The JWSC will provide the following:

One (1) vertical control point on the project site with its elevation (included on the drawings – Plan Sheet C-3)

A topographic survey (included on the drawings)

The JWSC may, acting through the Engineer, order changes to the location of some of the components of the project or provide clarification to questions regarding the correct alignment.

1.3 CONTRACTOR'S RESPONSIBILITIES

The Contractor's responsibilities include but are not limited to the following:

Be responsible for setting reference points and/or offsets, establishment of baselines, andall other layout, staking and other surveying required for the construction of the project.

Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and bear the cost of re-establishing same if disturbed.

Stake out temporary and permanent easements or the limits of construction to ensure the work is not deviating from the indicated limits.

Record drawing surveys shall be performed in accordance with Section 01700 of these specifications. Baselines shall be defined as the line to which the location of the work is referenced, i.e., edge of pavement, road centerline, property line, right of way or survey line.

1.4 STAKING PRECISION

1.4.1 Site Work

The precision of construction staking shall match the precision of a component's location as indicated on the drawings. Staking of utilities shall be done in accordance withgenerally accepted practice for the type of utility.

1.4.2 Water Mains and Accessories

The precision of construction staking required shall be that which the correct location of the water main can be established for construction and verified by the Engineer of Record. Where the location of the components of the water main, such as valves, fittings, fire hydrants, etc. are not dimensioned on the drawings, they shall be located based upon scaling these locations from the drawings with relation to readily identifiable landmarks (survey reference points, power poles, manholes, etc.).

1.4.3 Sewer Mains, Manholes and Appurtenances

The precision of construction staking shall be no less than 1:10,000. Horizontal distances shall be measured with a precision of no less than 0.01 feet and horizontal angles measured with a precision of no less than 10 seconds.

1.5 QUALITY ASSURANCE

The Contractor shall furnish documentation, prepared by a Registered Professional Surveyor currently licensed in the State of Georgia, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This requires that the Contractor hire at his own expense, a registered surveyor suitable to the JWSC to provide on-going construction staking and confirmation of such.

Any deviations from the drawings shall be confirmed by the Engineer of Record prior to construction of that portion of the project.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01340
SHOP
DRAWINGS

PART 1 GENERAL

1.1 SCOPE

The work under this Section includes submittal to the JWSC of shop drawings, product data and samples required by the various Sections of these specifications. The submittal contents requiredare specified under each Section.

1.2 DEFINITIONS

1.2.1 Shop Drawings

Shop drawings 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 forwhich the shop drawing is prepared.

1.2.2 Product Data

Product data includes standard printed information on materials, products, and systems, not specifically prepared for this project other than the designation of selections from among available choices printed therein.

1.2.3 Samples

Samples include both fabricated and un-fabricated physical examples of materials, products, and units of work, both as complete units and smaller portions of units of work, either for limited visual inspection or more detailed testing and analysis.

1.3 ROUTING OF SUBMITTALS

Submittals and routine correspondence shall be routed as follows:

Supplier to Contractor
Contractor To Engineer/JWSC
Engineer/JWSC to Contractor
Contractor to Supplier

1.4 SUBMITTAL LOG

At the discretion of the JWSC, a submittal log shall be created and issued to the Contractor as the complete listing of submittals required for the project.

PART 2 (Not used)

PART 3

EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

The Contractor shall be responsible for the accuracy and completeness of the informationcontained in each submittal and shall ensure that the material or equipment shall be as described in the submittal. The Contractor shall verify in writing that all features of all products conform tothe requirements of the drawings and specifications. Submittal documents shall be clearly editedto indicate only those items which are being submitted for review. All extraneous material shall be crossed out or otherwise obliterated. The Contractor shall ensure that there is no conflict withother submittals and shall notify the JWSC in each case where his submittal may affect the work of another contractor or the JWSC. The Contractor shall ensure coordination of submittals amongthe related crafts and subcontractors.

Before each submittal, the Contractor shall have determined and verified all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto; all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to theperformance of the work; and all information relative to the Contractor's sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

Submittal documents common to more than one piece of equipment shall be identified with the appropriate equipment numbers and specification section and paragraph. Each submittal shall bear a stamp or written indication that the Contractor's obligations under the contract with respect to the Contractor's review and approval of that submittal have been met. Any deviations from the requirements of the drawings and specifications shall be noted on the submittals. The Contractor shall submit six copies of all specified information. **Submittals which do not have all the information required to be submitted including deviations, are not acceptable and will be returned without review.**

In lieu of hard copies, submittals may be made electronically via email to EOR and Owner. **The routing of submittals shall remain as specified in Paragraph 1.3 of this Section.**

3.2 REVIEW PROCEDURES

The JWSC's review will not extend to means, methods, techniques, sequences, or procedures of construction, or to verifying quantities, dimensions, weights, or fabrication processes, or to safety precautions or programs incident thereto. Unless otherwise specified, within fourteen days after receipt of a submittal, The JWSC will review the submittal and return three copies to the Contractor with comments. The returned submittals will indicate one of the following actions:

If the review indicates conformance with the drawings and specifications, submittal copies will be marked **"NO EXCEPTIONS TAKEN."** In this event, the Contractor may beginto implement the work or incorporate the material or equipment covered by this

submittal.

If the review indicates limited corrections are required, submittal copies will be marked **"MAKE CORRECTIONS NOTED."** The Contractor may begin implementing the work or incorporate the materials or equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated into Operation and Maintenance data, a corrected copy shall be provided.

If the review indicates that the submittal is insufficient or contains incorrect data, submittal copies will be marked **"AMEND AND RESUBMIT."** Except at his own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted, and returned marked either "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED."

If the review indicates that the submittal does not comply with the drawings and specifications, submittal copies will be marked **"REJECTED - SEE REMARKS."** Submittals with deviations that have not been clearly identified will be rejected. Except at his own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

Review of drawings, submittals, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibility for errors and omissions therein and shall not be regarded as an assumption of risks or liability by the JWSC or the Engineer of Record or by any officer or employee thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure, or the method of work, material, or equipmentso reviewed. A mark of "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the JWSC has no objection to the Contractor, upon his own responsibility, using or providingthe materials or equipment proposed.

(END OF SECTION)

SECTION 01500
TEMPORARY
FACILITIES

PART 1 GENERAL

1.1 SCOPE

Temporary facilities required for this work include, but are not necessarily limited to the following:

Temporary utilities such as water and electricity

First aid facilities

Sanitary

facilitiesPotable

water

Temporary enclosures and construction facilities

1.2 GENERAL

First aid facilities, sanitary facilities and potable water shall be available on the project site on the first day that any activities are conducted on site. The other facilities shall be provided as the schedule of the project dictates.

Use all means necessary to maintain temporary facilities in proper and safe condition throughoutthe construction period. In the event of loss or damage, immediately make all repairs and replacements necessary at no additional cost to the JWSC.

Remove all temporary facilities as rapidly as the progress of the work will allow.

1.3 TEMPORARY UTILITIES

1.3.1 General

Provide and pay all costs for water, electricity and other utilities required for the performance of the work. Pay all costs for temporary utilities until project completion.

1.3.2 Temporary Water

Provide temporary piping and upon completion of the work remove all such temporarypiping. Provide and remove water meters.

1.3.3 Temporary Electricity

Provide all necessary wiring for the Contractor’s use. Furnish, locate, and install area

distribution boxes such that the individual trades may use their own construction type extension cords to obtain adequate power and artificial lighting at all points where required.

1.4 FIRST AID FACILITIES

The Contractor shall provide a suitable first aid station, equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. All first aidfacilities and emergency ambulance service shall be made available by the Contractor to the JWSCand the Engineer's personnel.

1.5 SANITARY FACILITIES

The Contractor shall furnish, for use of the Contractor's personnel all necessary toilet facilities which shall be secluded from public observation. These facilities shall be chemical toilets. All facilities shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the work is performed.

1.6 POTABLE WATER

The Contractor shall be responsible for furnishing a supply of potable drinking water for employees, subcontractors, inspectors, engineers and the JWSC who are associated with the work.

1.7 ENCLOSURES AND CONSTRUCTION FACILITIES

The Contractor shall furnish, install, and maintain for the duration of the construction all required scaffolds, tarpaulins,canopies, steps, bridges, platforms and other temporary construction necessary for the completion of the work in compliance with all pertinent safety and other regulations.

1.8 PARKING FACILITIES

Parking facilities for the Contractor's employees and subcontractors shall be the Contractor's responsibility. The storage and work facilities provided by the JWSC, if any, shall not be used for parking by the Contractor.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01510
JOB SITE
SECURITY

PART 1 GENERAL

1.1 BARRICADES, LIGHTS AND SIGNALS

The Contractor shall furnish and erect such barricades, fences, lights, and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the work as necessary. Barricades shall be painted in a color that will be visible at night. From sunsetto sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any work under construction.

The Contractor will be held responsible for any damage to the work due to failure of barricades, signs, and lights. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the project has been accepted by the JWSC.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01600
SUBSTITUTIONS

PART 1 GENERAL

1.1 SCOPE

This Section outlines the restrictions and requirements for substitutions, product andmanufacturer options, and construction method options.

1.2 DEFINITIONS

For the purposes of these Contract Documents, a "substitute item" shall be defined as one of the following:

A product or manufacturer offered as a replacement to a specified product or manufacturer.

A product or manufacturer offered in addition to a specified product or manufacturer.

A "substitute construction method" shall be defined as one of the following:

A mean, method, technique, sequence, or procedure of construction offered as a replacement for a specified mean, method, technique, sequence or procedure of construction.

A mean, method, technique, sequence, or procedure of construction offered in addition to a specified mean, method, technique, sequence or procedure of construction.

1.3 GENERAL

An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence or procedure of construction is specified or shown on the drawings, shall not be considered a substitute and shall be at the option of the Contractor, subject to compliance with all provisions in the Contract Documents for that item or construction method.

For products specified only by a referenced standard, the Contractor may select any product by any manufacturer which meets the requirements of the Specifications, unless otherwise indicated in the Contract Documents.

If the manufacturer is named on the drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the drawings and specifications are acceptable.

Whenever the JWSC's or Engineer of Record's design is based upon a specific product or process of a specific manufacturer, that manufacturer shall be listed in the specifications and such product or process ***shall be used in the base bid***.

1.4 APPROVALS

Any ***Contractor*** proposing to furnish products or processes other than those listed in the specifications shall make a written application for approval of the proposed substitution to the JWSC or Engineer of Record at least 10 days prior to the date set for receipt of bids. The minimum information required in the application is listed below.

A. Documentation demonstrating that the item being proposed as a substitute will fit in the space allowed, perform the same functions, and have the same capabilities as the productor process specified.

B. A letter signed by an officer of the company certifying compliance with the specifications without exception.

C. Installation list with contacts and phone numbers for the same minimum number of installations and years of experience as the specified product or process.

D. Complete descriptive and technical data addressing all specification requirements.

E. Complete list of deviations from the specifications as written.

F. Identification of accessory items required as a result of the proposed substitution.

G. Identification of all architectural, structural, mechanical, piping, electrical or other modifications required as a result of the proposed substitution.

Whenever a product specification includes minimum experience requirements which the proposed substitution cannot meet, a condition of approval will require that the manufacturer furnish the JWSC with a cash deposit or bond acceptable to the JWSC in an amount equal to the cost of the product or process which shall remain in effect until the experience requirement has been met.

The burden of proving equivalency of a proposed substitute to an item designated by trade nameor manufacturer's name referenced on the drawings or in the specifications rests on the party submitting the request for approval. The JWSC will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed product with previous users or any other written information that is reasonable under the circumstances. The degree of proof required for approval of a proposed substitute as equivalent to a named product is the amount of proof necessary to convince the JWSC beyond alldoubt. To be acceptable, a proposed substitute must meet or exceed all requirements of the plans or specifications.

If the proposed substitution is approved, an addendum will be issued to all prospective bidders at least five days prior to the date set for the opening of bids listing any and all approved substitutions. If approved the bidder may offer a price for the substitution. The bid offered shallinclude the cost of all additional architectural, structural, mechanical, piping, electrical or other modifications, including engineering and design costs, required as a result of the proposed substitution. The JWSC shall be the final judge on questions of equivalence.

PART 2 (Not Used)

PART 3 (not Used)

(END OF SECTION)

SECTION 01700
RECORD
DOCUMENTS

PART 1 GENERAL

1.1 SCOPE

The work under this Section includes but is not limited to the compiling, maintaining, recording, and submitting of project record documents as herein specified.

Record documents include but are not limited to the following:

1. Drawings
2. Specifications
3. Change orders and other modifications to the Contract.
4. JWSC field orders or written instructions, including requests for information (RFI)and clarification memos.
5. Reviewed shop drawings, product data and samples.
6. Test records

The Contractor shall maintain an up to date set of Record Drawings.

1.2 SYSTEM SOURCE AND QUALITY ASSURANCE

1.2.1 STORAGE

Store documents and samples in the Contractor's office, apart from documents used for construction. File documents and samples in accordance with the format of these specifications

1.2.2 Maintenance

Maintain documents in a clean, dry legible condition and in good order. Do not use record documents for construction purposes. Record documents shall at all times be available for inspection by the JWSC. Failure to maintain record documents in a satisfactory mannermay be cause for withholding of a certificate for payment.

Each document shall be labeled "PROJECT RECORD" in neat, large, printed letters. All record information shall be kept concurrently with construction progress. Do not conceal any work until the project information is recorded.

1.3 RECORD DRAWINGS

Record drawings maintained by the Contractor shall provide dimensions, distances, and coordinates to the nearest 0.1 foot. Elevations shall be provided to the nearest 0.01 foot.

Final record drawings shall be prepared by a professional surveyor licensed in the State of Georgia from a post construction field run survey. The Contractor shall pay all surveying and preparation costs associated with the final record drawings. The final record drawings shall provide elevations to the nearest 0.01 foot for the invert of all precast structures, access covers, and all other pertinent items constructed by the Contractor. The final record drawings shall provide dimensions, distances, and coordinates to the nearest 0.01 foot and angles to the nearest 10 seconds.

Final Record Drawing shall be labeled "FINAL RECORD DRAWINGS" and shall include the name ofthe surveyor who prepared the drawings as well as the date the drawings were prepared.

Record drawings shall include the following:

Horizontal and vertical location of all exposed and underground piping systems including manholes, services, cleanouts, valves, hydrants, and fittings.

Location and dimensions of roadways and parking areas

Location of structures including finish floor elevations.

1.4 SPECIFICATIONS

Legibly mark each section to record the manufacturer, trade name, catalog number and supplierof each product and item of equipment actually furnished. Also record all changes made by Requests for Information (RFI), field order, clarification memorandums of Contract change order.

1.5 SUBMITTAL

At the completion of the project, deliver Record Documents to the JWSC. Include a signed transmittal letter which lists the title and number of each record document.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01710

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.1 SCOPE

The Contractor shall provide five copies of complete Operation and Maintenance manuals for each item of equipment installed containing sufficient information to enable system operators tocorrectly operate service and maintain all equipment and accessories provided under the Contract. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instructions, maintenance and calibration procedures and safety precautions and procedures for the equipment involved.

1.2 SUBMITTAL FORMAT

Each copy of the manual shall be assembled in one or more 3-ring hardback loose-leaf binders, each with a title page, table of contents and lists of tables and figures. The cover and binding edgeof each manual shall have the project name, specification number and title and manual title printed thereon.

1.3 CONTENTS

Each manual shall the following items:

Title page which includes the equipment name and model number as well as the name, address and contact information of the Manufacturer, Supplier and Contractor.

Detailed Table of Contents

Equipment function, normal operating characteristics, performance data and limiting conditions.

Detailed disassembly, overhaul and reassembly, installation, alignment, adjustment, and testing procedures

Operating checklists

Detailed operating instructions for startup, calibration, routine and normal operation, regulation and control, safety procedures, shut down and emergency conditions.

Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valves, rupture discs, etc.

Preventative maintenance procedures and schedules including detailed lubrication instructions, identification of required lubricants and operating fluids and diagrams illustrating lubrication points.

Detailed troubleshooting guide

Detailed parts list with name and part number

Recommended spare parts list.

Electrical and instrumentation schematics including motor control centers, control panels, instrument panels and analyzer panels.

List of special tools required.

Name, address, and contact information of nearest service center for parts, overhaul and service

Procedures for storing, handling and disposing of any chemicals or products used with the equipment or system.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

DIVISION TWO

SECTION 02110
DEMOLITION

PART 1 GENERAL

1.1 SCOPE

This Section provides for the complete or partial removal and disposal of specified existing structures, foundations, slabs, piping, mechanical, electrical, existing (to be abandoned) piping and miscellaneous appurtenances encountered during construction operations.

Demolition includes:

a. Demolition, partial removal and cutting of existing masonry and metals as required for the new construction.

b. Distribution of salvageable and excess unacceptable material and equipment as specified below.

c. Off-site disposal of excess and unacceptable materials and equipment.

The Contractor shall examine the various Drawings regarding the existing site, visit the project site and determine for himself the extent of the work affected therein and all conditions under which he is required to perform the various operations.

1.2 PERMITS AND NOTICES

Permits and Licenses: Contractor shall obtain all necessary permits and licenses for performing the work and shall furnish a copy of same to the Owner and Engineer prior to commencing the work. The Contractor shall comply with the requirements of the permits.

Notices: Contractor shall issue written notices of planned demolition to companies or local authorities owning utility conduit, wires or pipes running to or through the project site. Copies of said notices shall be submitted to the Owner and Engineer.

Utility Services: Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone or sewer service to remove any equipment owned by them in structures to be demolished and to remove, disconnect, cap, or plug their services to facilitate demolition.

1.3 CONDITIONS OF STRUCTURES

The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.

1.4 REMOVAL OF EXISTING EQUIPMENT

Contractor shall furnish all labor, equipment, materials, and incidentals necessary to remove existing equipment, piping, fittings, valves, and/or appurtenances not required for the proper operation of the project improvements as indicated on the Drawings and Specifications. Removal shall be consistent with the final configuration of the new and modified systems as indicated in the Drawings, as specified herein, or as required by the Owner.

The Contractor shall not proceed with the removal of any equipment, piping, or appurtenances without specific approval of the Owner. Any equipment, piping, or appurtenances removed without proper authorization, which are necessary for the operation of the project improvementsshall be replaced to the satisfaction of the Owner at the Contractor’s expense.

All equipment removed shall remain the property of the Owner unless designated otherwise by the Owner.

If the Owner elects not to retain ownership of a certain item, the item shall become the propertyof the Contractor and shall be removed from the site at the Contractor’s expense.

Concrete, concrete blocks and unsalvageable bricks shall be hauled to an appropriate waste disposal site by the Contractor.

All other material shall be hauled to an appropriate waste disposal site by the Contractor.

The storage of or sale of removed items on the site will not be allowed.

1.5 TRAFFIC AND ACCESS

Conduct demolition and modification operations, and the removal of equipment and debris to ensure minimum interference with roads, streets, walkways both on-site and off-site, and to ensure minimum interference with occupied or used facilities.

Special attention is directed towards maintaining safe and convenient access to the new and existing facilities by the Owner’s personnel and associated vehicles. Relocation of the Contractor's materials, labor, or equipment due to uncoordinated interruption will be at the Contractor's expense.

Do not close or obstruct streets, walkways or other occupied or used facilities without permission from the authorizing agency, Engineer, and Owner. Provide approved alternate routes around closed or obstructed traffic in access ways.

1.6 DAMAGE

Promptly repair damage caused to adjacent facilities by demolition operations as directed by the Engineer and at no cost to the Owner.

1.7 UTILITIES

Maintain new and existing utilities to remain in service and protect against damage during demolition operations.

Do not interrupt existing or new utilities serving occupied or used facilities, except when authorized by the Owner or Engineer. Provide temporary services during interruptions to existingutilities as acceptable to the Owner and Engineer.

The Contractor shall cooperate and coordinate with the Owner to shut off utilities serving structures of the existing facilities as required by demolition operations.

The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption ofall public and private utilities or services under this jurisdiction of the utility companies.

All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.8 POLLUTION CONTROL

For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. Comply with the governing regulations.

1.9 QUALITY CONTROL

Protect all existing materials and equipment to be salvaged or reused from damage.

Cap or plug all lines to be abandoned. Place covers and label all junction boxes, conduits and wire as abandoned.

Leave all exposed ends of all pipe and conduit or junction boxes covered and safe.

PART 2 – MATERIALS (NOT USED)

PART 3 – EXECUTION (NOT USED)

(END OF SECTION)

SECTION 02120
EROSION, SEDIMENTATION AND POLLUTION CONTROL

PART 1 GENERAL

The requirements of this Section apply only to those projects for which the Contractor is under direct contract to the JWSC.

1.1 SCOPE

The work of this section includes implementation of the Erosion, Sedimentation and Pollution Control plan including but not limited to the installation and maintenance of all structural and vegetative Best Management Practices (BMP's), and all other work and appurtenances required.

1.2 RELATED WORK SPECIFIED ELSEWHERE

SECTION 02220	Trenching Excavation, Bedding and Backfill
SECTION 02555	Water Distribution System
SECTION 02650	Sanitary Sewer System

1.3 APPLICABLE STANDARDS

The following standards and/or publications are made a part of this specification by reference. The Contractor shall obtain copies of all referenced standards or publications and keep available onthe jobsite at all times during the construction period. In the event of conflicts among the varioussources cited below, the most stringent criteria shall take precedence.

"Manual for Erosion and Sediment Control in Georgia", latest edition copies of which are available from the State Soil and Water Conservation Commission.

1.4 QUALIFICATIONS

1.4.1 Installers

Installation of BMP's must be performed by an installer who has completed Erosion, Sedimentation and Pollution Control Plans similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

The Contractor must disclose to the JWSC/ENGINEER prior to project award all violations and citations received in the last five (5) years from the Georgia Environmental Protection Division, Army Corps of Engineers, and other City/County/State agencies dealing with erosion and sediment control deficiencies or wetlands deficiencies.

1.4.2 Inspectors

Contractor shall have Qualified Personnel, as defined by the NPDES Permit on site whenever construction activity occurs. "Qualified Personnel" means a person who has successfully completed an erosion and sediment control short course eligible for continuing education units, or an equivalent course approved by the Georgia Environmental Protection Division and the State Soil and Water Conservation Commission.

1.5 SUBMITTALS

The following information shall be submitted to the JWSC prior to commencement of the work.

Copy of Certification with GSWCC number of Qualified

Person(s)Technical Product Data for

Sediment barriers
Inlet protection materials

NPDES Forms

A Notice of Intent (NOI) with the JWSC's and Operator's signatures is ***required*** forthis project.

Notice of Implementation immediately after completing the installation of the initial BMP's

PART 2 MATERIALS

2.1 MATERIALS

All materials shall conform to these specifications and to the applicable standards listed in Paragraph 1.3 of this Section. BMP's required but not specified below shall be in accordance with the "Manual for Erosion and Sediment Control in Georgia" latest edition.

2.1.1 Ds1 - Disturbed Area Stabilization (Mulching Only)

Ds1 is a temporary cover of plant residues applied to the soil surface for a period of six (6) months or less when seeding is not practical. Materials shall consist of the following.

Compressed and compacted bound bundles of wheat, oat, rye, or other local hays free of weeds.

Wood waste consisting of chips, sawdust, or bark

Polyethylene film.

Hydro-mulch

Composed of wood cellulose fiber containing no germination or growth inhibiting factors

Colored green to allow visual metering in application and propertiesevenly dispersed and suspended when agitated in water.

Add hydro-mulch water slurry in hydraulic seeder after proportionate quantities of seed, fertilizer and other materials have been introduced.

Moisture Content	9.9% (+ or -) 3.0%
Organic Matter	99.2% (+ or -) 0.8%
Ash Content	0.8% (+ or -) 0.2%
Water Holding Capacity (min)	1150 grams water per 100 grams fiber

2.1.2 Ds2 - Disturbed Area Stabilization (Temporary Seeding)

Ds2 is a temporary vegetative cover with fast growing seedings for up to a twelve (12) month period or until permanent vegetation is established. Materials shall consist of the following.

Lime

Lime shall be natural limestone containing a minimum of 85% total carbonates.

95% or more pass 20 mesh sieve
55% pass 60 mesh sieve
40% pass 100 mesh sieve

Fertilizer

Fertilizer shall be as follows.

Dry or hydro

Commercial grade manufactured in accordance with Georgia Department of Agriculture Specifications and bearing approval label of State of Georgia

Grade containing plant food elements determined by laboratory analysis.

Grass Seed

Grass Seed must be planted according to recommendations contained the "Manual for Erosion and Sediment Control in Georgia" or as approved by a

Landscape Architect.

Ryegrass, annual (Lolium Multiflorum) containing minimum 98% pure seed with 90% minimum germination and maximum 0.5% weed seed.

Bermuda 100% hulled common Bermuda grass (Cynodun Dactylon) containing minimum 87% pure Bermuda with 85% minimum germination and maximum 1% weed seed.

All seed types listed in the "Manual for Erosion and Sediment Control in Georgia".

Hydro-seed shall be applied at the following rates.

Ryegrass	250	Lbs/Acre
Bermuda	175	Lbs/Acre

2.1.3 Ds3 - Disturbed Area Stabilization (Permanent Vegetation)

Ds3 is permanent vegetative cover using grasses, trees, shrubs, or legumes on highly erodible or critically eroded lands. Materials shall consist of the following.

Lime

Lime shall be natural limestone containing a minimum of 85% total carbonates. Dolomitic limestone shall be used in sandy plains and coastal soils. Conventional equipment shall be used to ground limestone.

95% or more pass 20 mesh sieve
55% pass 60 mesh sieve
25% pass 100 mesh sieve

For hydraulic seeding use finely ground limestone.

98% or more pass 20 mesh sieve
70% pass 100 mesh sieve

Fertilizer

Fertilizer shall be as follows.

Dry or hydro

Commercial grade manufactured in accordance with Georgia Department of Agriculture Specifications and bearing approval label of State of Georgia

Grade containing plant food elements determined by laboratory analysis.

Grass Seed

Grass Seed must be planted according to recommendations contained the "Manual for Erosion and Sediment Control in Georgia" or as approved by a Landscape Architect.

Ryegrass, annual (Lolium Multiflorum) containing minimum 98% pure seed with 90% minimum germination and maximum 0.5% weed seed.

Bermuda 100% hulled common Bermuda grass (Cynodun Dactylon) containing minimum 87% pure Bermuda with 85% minimum germination and maximum 1% weed seed.

Hydro-seed shall be applied at the following rates.

Ryegrass	250	Lbs/Acre
Bermuda	175	Lbs/Acre

2.1.4 Cd - Check Dam

Check dam (Cd) is a small temporary barrier consisting of stone or hay bales constructed across a swale, drainage ditch or area of concentrated flow.

Hay Bale Check Dams

Compressed and compacted bound bundles of wheat, oat, rye, or other local hays free of weeds.

2.1.5 Co - Construction Exit

Construction Exit (Co) is a stone stabilized pad located at any point where traffic will be leaving a construction site to a public right of way, street, alley, sidewalk, or parking area.

Aggregate size shall be National Stone Association R-2 (1 1/2-inch to 3 1/2-inch stone)

Approved Geo-textiles:

Amoco CEF-1199, 2019
Carthage 6%
Contech C70/06
GT-400E
Geotex 104 F
Filterweave 403, 700
TNS Advanced Technologies
M706US Fabrics 670

Terratex EP

2.1.6 Sd1-Sediment Barrier

A temporary structure made of silt fence supported by steel or wooden posts, sandbags, straw bales, or other filtering material.

Sediment Barrier Type 'A' (Sd1-A)

Fabric height	36-inches
Trench Depth	6-inches
Fence Posts	48-inches long 1 1/2-inch by 1 1/2-inch Oak 3-inch diameter or 2-inch by 4-inch softwood Steel 1.3 Lbs/Ft Minimum

Approved silt fence fabrics

Amoco CEF 2019
Beltech 755 & 890
Cady bag Company 20-CSF 350/26
LINQ Industrial Fabrics, Inc. GTF-
200SGeotex 914SC, 915SC
TNS Advanced Technologies
TNSW101Terratex GASF
Willacoochee Industrial Fabrics, Inc. 1215 Silt Fence

PART 3 EXECUTION

3.1 PERFORMANCE REQUIREMENTS

Erosion control devices shall be installed as shown on the plans (and elsewhere as deemed necessary) and are required for all earth areas disturbed by grading and construction operations.The extent of disturbed areas is shown on the construction plans. Erosion control activities includebut are not limited to:

Initial installation of erosion control devices
Implementation of Best management Practices (BMP's)
Application of temporary ground cover
Maintenance of erosion control devices for the duration of the construction period.
Application of permanent ground cover
Removal of erosion control devices

3.1.1 Non-Compliance

Upon notification by the JWSC/ENGINEER of non-compliance with this specification, the Contractor has seven (7) days to address and install additional erosion control devices or otherwise correct the deficiencies noted.

3.1.2 Temporary Erosion Control Measures

Contractor shall install, maintain, repair and/or replace all temporary erosion control measures including, but not limited to, the following:

Silt fences
Construction exits
Check Dams

The Contractor shall be responsible for providing additional erosion control measures as needed to prevent sediment from leaving the site. Contractor shall be responsible for all additional costs associated with additional erosion control measures.

3.1.3 Maintenance of Erosion Control Measures

The Contractor is responsible for maintenance, repair and/or replacement of erosion control measures throughout the construction period due to any of the following causes:

Downed silt fences
Washed out silt fences and rock
Vandalism
When silt overburden's structure
Erosion of earth or dam
Damage due to abnormal weather conditions

3.2 SEQUENCE OF EVENTS

Best Management Practices (BMP's) shall be implemented during construction activities from commencement of construction to completion. Schedule grading operations so as to minimize the time that denuded soils are exposed. Any exposed area left undisturbed for a period of 14 days or longer shall be stabilized with mulch or temporary seeding.

3.3 INSTALLATION AND MAINTENANCE

3.3.1 Ds1 - Disturbed Area Stabilization (Mulching Only)

Install mulch on all building pad area left for more than seven (7) days. Mulch shall re-applied whenever ground cover is less than 90%.

Dry straw or hay shall be applied uniformly at a depth of 2-inches to 4-inches by hand or by mechanical equipment. Straw or hay mulch shall be anchored immediately after application. Mulch can be pressed into the soil with a disk harrow using packer disk. Mulch spread with special blower-type equipment may be anchored with emulsified asphalt, tackifiers and/or binders.

Wood waste shall be applied at a depth of 2-inches to 3-inches.

Cut back asphalt shall be applied at the rate of 1200 gallons per acre.

Polyethylene film shall be secured over banks or stockpiled soil material for temporary protection.

3.3.2 Ds2 - Disturbed Area Stabilization (Temporary Seeding)

All disturbed areas shall be seeded within seven (7) days of the completion of land disturbing activities or when land disturbing activities are to be discontinued for longer than two weeks. Seed areas outside buildings, walks and paving not to immediately receive permanent grass or landscaping with temporary seed producing fast growing cover resistant to erosion.

Maintenance of seeded areas shall include but not be limited to watering, re-fertilization, weeding, mowing, and repairing washouts and gullies.

3.3.3 Ds3 - Disturbed Area Stabilization (Permanent Vegetation)

Permanent vegetation and structural control measures must be installed as soon as practicable.

3.3.4 Cd - Check Dams

Construct temporary ditch checks of stone, sand or cement bagged, rip-rap, or treated timber post in all ditches and drainage areas on or adjacent to the work area and/or as shown on the plans. The toe of the upstream dam shall be at the same elevation as the top of the downstream dam. The height of check dams shall be 24-inches maximum at center. Check dams shall be 9-inches lower at the center than the outer edges. Side slopesshall be 2:1 or flatter.

3.3.5 Co - Construction Exit

Contractor shall provide temporary construction exits at all locations where vehicles exit the construction site. The stone pad's thickness shall be at least 6-inches and shall cover the full width of the entrance. in no case shall the pad width be less than 20 feet. The length of the stone pad shall be at least 50 feet. A layer of geo-textile fabric shall be placedbetween the stone pad and the soil surface as specified in paragraph 2.1.6 above. Periodically add a 2-inch-thick top dressing to maintain pad effectiveness and sprinkle regularly to settle accumulated sediment.

3.3.6 Sd1 - Sediment Barriers

Construct silt fences in accordance with applicable regulations and details. Sediment barriers shall be installed at the toe of all embankments or at the perimeter of all disturbed areas and shall be located to interrupt silt transport conveyed by surface runoff.

Remove, re-distribute and compact sediments which accumulate behind silt fences when such accumulations reach one-half the original height of the barrier and immediately before beginning temporary grassing operations.

Replace fabric whenever it has deteriorated to such an extent that the effectiveness of the barrier is compromised or every six months, whichever comes first.

3.4 CONCRETE WASHOUT AREAS

Contractor shall provide at least one 10' by 10' washout area for the disposal of excess concrete, mortar, and similar products. Washout areas shall be cleaned as needed. Washout areas shall be completely removed after construction has been completed. Remove all concrete and silt and dispose of materials in an approved landfill. Backfill, grade and stabilize area.

3.5 REMOVAL OF TEMPORARY DEVICES

Temporary erosion control devices shall remain in place and be properly maintained until one of the following has occurred:

A permanent device has been installed to replace the function of the temporary device.

The Contractor has achieved 95% stabilization of disturbed areas and a Notice of Termination has been submitted.

Remove erosion control devices installed under this contract and any erosion control devices left from previous phases of work.

(END OF SECTION)

SECTION 02220
TRENCHING EXCAVATION, BEDDING AND BACKFILL

PART 1 GENERAL

1.1 SCOPE

The work of this section includes trench excavation, dewatering, bedding, backfilling and all other work required for the installation of underground water, and sewer systems as shown on the drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

02120	Erosion, Sedimentation and Pollution Control
02555	Water Distribution System
02650	Sanitary Sewer System

1.3 APPLICABLE STANDARDS

All work is to be performed in accordance with applicable provisions of the Southern Standard Building Code, OSHA Safety Requirement, State and Local Ordinances and other authorities having jurisdiction.

All construction shall comply with the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, subpart P, revised July 1, 1995.

If local authorities have standard specifications for pavement removal and replacement, work shall be done in accordance with such standards.

In the event of conflicts among the various sources cited above, the most stringent criteria shall take precedence.

1.4 PROTECTION

1.4.1 Existing Utilities

Contractor shall contact the Utilities Protection Center at 1-800-282-7411 at least 72 hours in advance of trenching operations. The location of existing underground utilities shown on the plans is based upon the best information available and may not be accurate or complete. The Contractor shall verify the location of all underground utilities prior to commencing work and shall be responsible for the protection of same. Any damage to existing utilities shall be promptly repaired at the Contractor's expense to the full and complete satisfaction of the utility owner.

1.4.2 Existing Structures

Contractor shall protect from damage all existing structures, roads, sidewalks, curbing, etc. against damage from foot or vehicular traffic. Install and maintain adequate barricades, planking, bridging as necessary. Underpin or otherwise support adjacent structures, including service lines and pipe chases, to prevent damage by excavation work.

1.4.3 Excavations

Protect excavations by shoring, sheeting, bracing or other means as required to prevent cave-ins or loose dirt from falling into excavated trenches. Methods and procedures utilized shall conform to, as a minimum, the requirements of OSHA and other governing authorities having jurisdiction.

1.5 QUALITY ASSURANCE

Tests for compaction and density, where required, shall be conducted by an independent testing laboratory selected by EOR and Owner and paid for by the Contractor. The Contractor shall make all necessary excavations and provide access to the work by the testing laboratory. The cost of all retests made necessary by the failure of materials to conform to the requirements of these specifications shall be paid for the Contractor.

PART 2 MATERIALS

2.1 BEDDING AND BACKFILL MATERIALS

Pipe bedding and backfill materials shall be as follows:

Class I:
This Class includes angular, 1/4-inch to 1-1/2-inch graded stone including a number of fill materials including coral, slag, crushed stone and crushed shells.

Class II:
This Class includes coarse sands and gravels with maximum particle size of 1-1/2-inches including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this Class.

Class III:
This Class includes fine sand with clayey gravels including fine sands, clay-sand mixtures, and gravel-clay mixtures. Soil types of GM, GC, SM and SC are included in this Class.

Class IV:
This Class includes silt, silty clays and clays including organic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this Class.

Class IV materials may only be used with the approval of the Engineer.

Class V:
This Class includes the organic soils OL, OH and PT as well as soil containing frozen earth, debris, rocks larger than 1-1/2-inches in diameter and other foreign materials. ***Class V materials shall not be used.***

PART 3 EXECUTION

3.1 EXCAVATION

The contractor shall examine the work site and inform himself fully as to the nature of all materialsto be encountered during excavation for the construction of the various facilities and related appurtenances. The contractor shall perform excavation of all substances encountered to the depth shown on the drawings.

During excavation, pile excavated materials that are suitable for backfilling in an orderly manner and at a sufficient distance from the trench banks to avoid overloading and prevent slides or cave-ins. Remove and dispose of unsuitable material in a manner acceptable to the EOR and Owner.

Grade work site as necessary to prevent surface water from flowing into trenches or other excavations and remove any water accumulating therein by pumping or other approved methods.

Excavation shall not be carried out below the required level. Where excavation is carried out below the grade indicated through error, the contractor shall refill to the proper grade with Class I or Class II material as directed by the EOR and Owner to obtain a suitable pipe support.

Where wet or otherwise unsuitable material incapable of properly supporting the pipe, as determined by the JWSC/Engineer, is encountered in the trench bottom, the Contractor shall remove such soil or unsuitable material, dewater to the depth required and backfill trench to proper grade with a foundation of Class I or Class II material as directed by the JWSC to obtain a suitable pipe support.

3.2 DEWATERING

The contractor shall keep all excavations clear of water while pipes and appurtenances are being installed. All water pumped or bailed from trenches and other excavated areas shall be conveyedto a point of discharge where it will cause no hazard to the safety and protection of the public, toprivate property or to other work in progress.

Provide all necessary equipment including well points, pumps, piping and temporary drains sufficient to handle both surface and subsurface water. Maintain equipment for the duration of trench exposure to the elements.

3.3 PIPE BEDDING

Pipe bedding shall be Class A, B, C or D as specified below or as shown on the construction plans.

Rigid pipe includes ductile iron (DIP), reinforced concrete (RCP), or steel pipes with or without coatings. Flexible pipe includes PVC and HDPE.

3.3.1 Bedding Classifications

The following bedding classifications shall be used as specified below or where shown on the drawings.

Class A:
This bedding class shall consist of a continuous concrete cradle or a concrete arch with granular bedding. Locations shall be as shown in the drawings.

Class B:
Class B Standard - shall consist of granular Class I material placed a minimum of 4-inches below the pipe and continuing to the spring line of the pipe.

Class B Modified - shall consist of granular Class I material placed a minimum of 4-inches below the pipe and continuing to 6-inches above the top of the pipe.

Class C:
This bedding class shall consist of granular Class I material placed a minimum of 4-inches below the pipe with Class II or Class III material continuing to the spring line of the pipe.

Class D:
This bedding class shall consist of a native undisturbed earth trench bottom with an area excavated for the pipe bell. This bedding class may only be used for dry trench conditions. If the trench becomes wet, Class B bedding shall be used.

3.3.2 Bedding Requirements

Bedding requirements for the various piping systems shall be as shown in the following table.

PIPE SYSTEM	BEDDING CLASS
Sanitary & Storm Sewers (Gravity)	
Rigid Pipe	Class C
Flexible Pipe	Class B Modified
Watermains & Forcemains	
Rigid Pipe	Class C
Flexible Pipe	Class B Standard

Bedding material under and around the pipe shall be placed in 6-inch layers and compacted by rodding, spading or with approved vibratory equipment to obtain not lessthan 98% standard proctor as determined by ASTM Method D698.

3.4 BACKFILLING

If unsuitable materials are encountered, such materials may not be used for backfilling operations and shall be removed from the site. Unsuitable material includes but is not limited to debris, muck, clay, large clods, stones, wood, stumps, and roots. Prior to backfilling, piping and appurtenances shall be observed by the JWSC's Inspector.

Contractor shall carefully backfill trenches with approved materials. Only Class III (or Class IV if approved by the JWSC/Engineer) materials shall be used. Backfill materials shall be free from large clods of earth or stone and shall be deposited in 6-inch layers and carefully compacted until the following densities are obtained:

Areas under structures	100%	Standard	Proctor	(ASTM D698)
Areas under walks and pavements	98%	Standard	Proctor	(ASTM D698)
Areas under lawns and landscaping	95%	Standard	Proctor	(ASTM D698)

Re-open improperly backfilled trenches (trenches where settlement occurs, or where tests indicate non-compliance with the densities specified above) to depth required for proper compaction. Then refill and compact with surface restored to required grade.

3.5 PAVEMENT REMOVAL AND REPLACEMENT

3.5.1 Removal

Where necessary to cut existing pavements, curbs and gutters, walks, driveways, etc. make cut with neat parallel straight lines at least 12" wider than the required trench widthon each side.

3.5.2 Replacement

Replace pavements, curbs and gutters, walks and driveways with the same materials and cross section as the original except when otherwise detailed on the construction plans.

Backfill open trenches across roadways, or other areas to be paved as specified inParagraph 3.4 above except backfill entire trench depth in 6-inch layers, moisten and compact each layer to density of 100% of standard proctor test, so that paving of area can proceed immediately after backfilling is complete.

3.5.2 Temporary Surfaces

Use temporary road surface of gravel or crushed stone as approved. Maintain one-way traffic at all times and the street must be fully opened to traffic as quickly as possible. Completely remove temporary materials and dispose of them when permanent pavement is placed.

(End of Section)

SECTION 02555

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

Provide all labor, materials and equipment necessary to install, test, disinfect (where required) and place into operation the water distribution system as shown on the drawings, as specified herein and as required for a complete and operational system.

1.2 SUBMITTALS

Complete shop drawings and product data on all piping and fittings shall be submitted to the Engineer in accordance with the requirements of Section 01340 of these specifications.

1.3 RELATED WORK SPECIFIED ELSEWHERE

01340	Shop Drawings
02220	Trench Excavation, Bedding and Backfill

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The contractor shall furnish and install water distribution systems in accordance with the material specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shallbe to the latest revision unless stated otherwise. All materials shall be new.

2.2 PIPING

Pipe sizes and applications shall be as indicated on the plans and shall conform to the following table.

Pipe Size and Application Table

Pipe Material	Pipe Size	Joint Types	Applications
PVC (ASTM D2241 SDR-21)	2-inch	Push-on Joint – Below Ground	Potable Water
Polyethylene Tubing	≤2-inch	See Specifications Below	Water Services

2.2.1 PVC Pressure Pipe

Pipe shall be virgin polyvinyl chloride (PVC) pressure pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3139. Provisions must be made for expansion and contraction at each joint with flexible ring gaskets made of rubber or other suitable material. Elastomeric seals shall meet ASTM F477.

PVC pressure pipe two (2) inches in diameter and smaller shall conform to ASTM D2241, Class 200 SDR-21 with push-on type jointing. Glued or Solvent weld joints shall not be used. PVC 1120, SDR-21 fittings shall be injection molded push-on bell type with elastomeric rubber seals in accordance with ASTM D3139. Seals shall conform to ASTM F477. Pipe for domestic potable water mains shall be ***blue*** in color with each length marked with name of the manufacturer, pressure rating, nominal pipe diameter and theseal of the National Sanitation Foundation (NSF).

2.2.2 Polyethylene Tubing

All water services two (2) inches in diameter and smaller shall be manufactured of PE 3408, high density polyethylene in accordance with AWWA C901, ASTM D1248, ASTM D2239, ASTM D2737 and ASTM D3350. Tubing shall have a minimum working pressure of200 PSI, shall be copper tube size SDR-9 and shall be blue in color. Couplings shall be made of bronze with compression fittings on both ends suitable for connection to polyethylenetubing with inserts.

Tubing shall be approved for use with potable water by the National Sanitation Foundation and shall be continuously marked at intervals of not more than four (4) feet with the nominal size, pressure rating, NSF seal, manufacturer's name, standard dimension ratio and ASTM specification.

2.3 WATER VALVES AND APPURTENANCES

Water valves shall be of the size and type shown on the approved construction plans. All valves shall open by turning left or "counterclockwise". Extension stems on buried valves will be used only at the direction of the Engineer.

2.3.1 Gate Valves (<4-inch)

Gate valves two (2) inches to three (3) inches in diameter shall be non-rising stem, resilient seat wedge type with epoxy coated iron body and two (2) inch square operatingnut. Valve shall conform to the applicable requirements of AWWA C509 and ASTM A126Class B with threaded ends and designed for 200 PSI working pressure.

2.3.2 Valve Boxes

Valve boxes shall be cast iron, heavy duty roadway, screw type adjustable to six (6) inches up and down from the nominal required cover over the pipe. Six (6) inch PVC C900 Pipe shall be used to extend valve boxes to grade. Cast iron castings shall be manufactured of

clean, even grain, gray cast iron conforming to ASTM A48, Class 20B. Valve boxes shall have cast iron drop covers with the word "WATER" stamped on them.

2.3.3 Yard Hydrants

Yard hydrant shall be high-capacity freeze proof type hydrants as Merrill Manufacturing C-1000 Series or approved equal with the following features:

- Inlet – 1" NPT in no lead brass casting
- Outlet – ¾" no-lead hose thread & outside of nozzle has 1" pipe thread
- Stainless steel operating rod
- Teflon packing
- Stainless steel and molded rubber plunger made of self-lubricating material
- 1" no-lead galvanized pipe

2.4 WATER SERVICES AND APPURTENANCES

2.4.1 Corporation Stops

Corporation stops are required on all water services. Corporation stops shall be made of brass conforming to AWWA C800, ASTM B62 and/or ASTM B584 and shall accommodate the full working pressure of the system. The inlet connection shall be AWWA standard iron pipe (IPT) thread. The outlet connection shall be compression type for polyethylene tubing.

2.4.2 Curb Stops

Curb stops shall be ball valve type conforming to AWWA C800. Curb stops shall be made of brass conforming to AWWA C800, ASTM B62 and/or ASTM B584 and shall accommodate the full working pressure of the system. Service line connections shall be compression type for polyethylene tubing.

2.4.3 Double Strap Tapping Saddles

Double strapped tapping saddles shall be epoxy coated ductile iron body type with NPT service outlet. The saddles shall have a self- energizing, o-ring rubber gasket, two alloy steel straps, and a female iron pipe tap conforming to AWWA C800.

2.5 BACKFLOW PREVENTION DEVICES

Provide reduced pressure zone backflow preventers where shown on the drawings. Backflow preventers shall be rated for operation with inlet water pressures up to 175 psig and water temperatures up to 140°F. Backflow preventers shall be tested and certified in accordance with ASSE 1013, AWWA C506, and USC-FCCCHR.

Provide bronze body construction, rubber check valve and relief valve assemblies, and Cleconcheck seats.

Provide isolation valves on the inlet and outlet of each backflow preventer. These valves shall be ¼ turn, full port, resilient seated, bronze ball valves.

Provide bronze body ball valve test cocks.

Provide bronze body strainer on the inlet.

Acceptable manufacturers: Watts Series 909, Wilkins, Hersey.

2.6 MISCELLANEOUS ITEMS

2.6.1 Detection Tape

Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. The tape shall be safety blue in color, shall be at least two and half (2-1/2) inches wide and will bear the printed identification "CAUTION: BURIED WATER LINE BELOW".

2.6.2 Tracer Wire

Water pipe tracer wire shall be AWG 12/1, single conductor solid copper with blue jacket, UL rated suitable for direct burial, temperature range -20° C to 60° C, 600 Volts RMS.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

The contractor shall inspect all materials delivered to the job site for damage. Materials shall be unloaded and stored with a minimum of handling. Materials shall be stored above ground and the interior of the pipe and fittings shall be kept free of dirt and debris. Store non-metallic piping and rubber gaskets under cover and protect from exposure to sunlight.

Valves, hydrants, and other appurtenances shall be handled to ensure delivery at the point of installation in sound, undamaged condition. If coating or linings of pipe or fittings are damaged, such pipe and fittings shall be removed from the site and new materials furnished. Pipe shall notbe dragged.

3.2 INSTALLATION

The contractor shall install all pipes, valves, hydrants and other appurtenances in accordance with the specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise.

3.2.1 Pipe and Fittings

3.2.1.1 General Requirements

Excavation, cleaning, laying, jointing and backfilling shall follow as closely as possible during prosecution of the work. In no case shall pipe be left in the trench overnight without completing the jointing. All precautions shall be taken to

prevent sand, dirt and debris from entering the pipe during installation. Any time that pipe installation is not in progress, open pipe ends shall be closed by a watertight plug or other method approved by the JWSC/Engineer.

Plugs shall remain in pipe ends until all water has been removed from the trench and any foreign material that enters the pipe shall be removed immediately. No pipe shall be installed when trench or weather conditions are unsuitable for such work.

Water lines shall not be laid closer than ten (10) feet horizontally from a sanitary sewer main unless otherwise indicated on the drawings or directed by the JWSC/Engineer. Sanitary sewer lines shall pass beneath water lines with the top of the sewer being at least eighteen (18) inches below the bottom of the water line, where sewer lines cross water lines, no joints in the sewer line shall be located closer than ten (10) feet horizontal distance from the water line.

3.2.1.2 Pressure Pipe

All PVC C900 pipe shall be laid in accordance with AWWA C605. All ductile iron pipe and fittings shall be laid in accordance with the manufacturer's recommendations and AWWA C600. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints.

Pipe alignment and gradient shall be straight or shall follow true curves as near as practicable. Curvature in pipelines, where required, shall be well within (no more than 80% of) the manufacturer's allowable joint deflection or laying radiusfor the pipe supplied. Otherwise, fittings shall be required.

Pipe shall be laid with a minimum cover of forty-two (42) inches in paved areas and thirty-six (36) inches in unpaved areas with an allowable maximum of sixty (60) inches. Cover in paved areas shall be measured from crown of pipe to finish grade. Greater depths are permissible when required to clear obstructions, conflicts, etc.

Contractor shall furnish and install locate wiring on all non-metallic pressure mains. Locate wire shall be brought to grade outside a valve box or locating station box, as required, at four hundred and seventy-five (475) foot intervals (maximum). In addition, all pressure mains shall have detection tape installed two (2) feet above the pipe.

Installed locate wiring shall be tested by the contractor as part of the inspection process, using a qualified tester and suitable testing equipment. The contractor shall notify the Engineer at least 48 hours in advance of the locate wire field testing schedule.

3.2.2 Valves

All buried valves shall be carefully mounted in their respective positions free from distortion and strain. Valves shall be placed as shown on the drawings. Gate valves shall be installed as near as possible to tee and cross fittings. The contractor shall check all exposed bolts on all valves to ensure that they are tight prior to installation. Where required, extension stems shall be furnished and located as directed by the Engineer.

Adjustable valve boxes shall be installed with each buried valve, placed vertically and concentric with the valve stem. Any valve box which has been moved from its original position by trench settlement or other causes, and which prevents the use of a valve wrench for opening and closing of the valve, shall be reset by the Contractor prior to final acceptance. The entire assembly shall be plumb.

In unpaved areas, a poured in place reinforced concrete valve pad shall be installed around all valve boxes. The concrete thickness shall be four (4) inches for poured in placecollars. The top of poured in place collar shall be level with the top of the cast iron valve box and level with the ***final grade.***

3.2.3 Backflow Prevention Devices

Backflow prevention devices shall be installed in accordance with the manufacturer's instructions and AWWA M14.

3.3 DISINFECTION

Upon satisfactory completion of the hydrostatic test (where applicable), all new potable water lines and other pipe related installations which may have been contaminated by the work shall be disinfected in accordance with AWWA C651, the Rules for Safe Drinking Water as published bythe Georgia Environmental Protection Division, and as outlined below. The contractor shall disinfect all new water lines in the presence of the Engineer.

Prior to disinfection, water lines shall be thoroughly flushed to remove contaminated materials from the line. The contractor is referred to AWWA C651 for precautions during construction and procedures for flushing.

Disinfection shall be accomplished by introducing chlorine into the main to be disinfected. The disinfection procedure used may be any of the methods or procedures outlined in AWWA C651. A chlorine residual of at least 25 milligrams per liter (mg/l) shall be maintained for 24 hours in the water line to be disinfected. After the 24-hour holding or contact period, the heavily chlorinated water shall be flushed from the main until the chlorine residual within the main reaches the levelof chlorine normally carried in the distribution system (1.0 mg/l). De-chlorination of the flushing water may be required if the highly chlorinated water is to be discharged directly to a surface water stream or storm drain system. If the water can be sheet-flowed over a large area or discharged to a holding pond, de-chlorination may be avoided.

After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from thenew main.

At least one set of samples shall be collected from every twelve hundred (1200) linear feet of the new water main, plus one set from the end of each line and at least one set from each branch. The JWSC/Engineer will determine the number and location of the required sampling points to meet the current standards. All required sampling taps shall be installed by the contractor, at his expense, prior to disinfection.

The collection of samples and bacteriological testing will be performed by the JWSC at the Contractor's expense unless noted otherwise on the construction plans. If the bacteriological testsare unsatisfactory, the disinfection procedure shall be repeated until satisfactory results are obtained.

(END OF SECTION)

SECTION 02650
SANITARY SEWER SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

Provide all labor, materials and equipment necessary to install, test, and place into operation the precast concrete wetwell top, valve pit, gravity sewer mains, pump station discharge piping and valves, effluent flow meter, HDPE forcemain with related fittings and appurtenances as shown on the drawings, as specified herein and as required for a complete and operational system.

1.2 SUBMITTALS

Complete shop drawings and product data in accordance with the requirements of Section 01340of these specifications shall be submitted on all the following items:

1. Round precast manhole and wetwell bottoms, riser sections and top
2. Complete product data on wetwell and influent manhole coating system
3. Square and rectangular precast structures (Flow Meter Vault)
4. Complete product data on all piping, valves, flow meter and appurtenances

1.3 RELATED WORK SPECIFIED ELSEWHERE

01340	Shop Drawings
02220	Trench Excavation, Bedding and Backfill
11210	Submersible Sewage Pumps

PART 2 PRODUCTS

2.1 PIPING

The contractor shall furnish piping systems in accordance with the material specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise. All materials shall be new. Pipe sizes and applications shall be as indicated on the plans and shall conform to the following table.

Pipe Size and Application Table

Pipe Material	Pipe Size	Joint Types	Applications
Ductile Iron	≥ 4-inch	Mech. Joint – Below Ground Flanged Joint – Above Ground Flanged Joint – Inside Structures	Sewage Forcemains
PVC (AWWA C900 DR-18)	4 to 12-inch	Push-on Joint – Below Ground	Sewage Forcemains
PVC (ASTM D2241 SDR-21)	3/4 to 8-inch	Push-on Joint – Below Ground	Sewage Forcemains
PVC (ASTM D3034 SDR-26)	4 to 15-inch	Push-on Joint – Below Ground	Gravity Sewer Mains
HDPE (DR-11)	≥2-inch	Fused – Below Ground Flanged – Inside Structures	Sewage Forcemains

2.1.1 Polyvinyl Chloride (PVC) Pipe and Fittings

Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter and length. All PVC sanitary sewer pipes shall be green in color. Storage and handling of PVC pipe shall be in accordance with Chapter 6 of AWWA Manual M23.

2.1.1.1 PVC Gravity Sewer Pipe

Gravity sewer pipe shall be PVC 1120, Class 160, SDR-26 and shall conform to ASTM D3034 for size 4-inch through 15-inch and ASTM F679 for 18-inch through36-inch.

The pipe material shall be clean, virgin, National Sanitation Foundation approves, Class 12454-B PVC compound conforming to ASTM resin specification D1784 withwall thickness T-1. Pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3212. Elastomeric seals shall meet ASTM F477 or ASTM F913. The pipe shall be designed to pass without failure a sustained pressure test of 340 PSI in conformance with ASTM D1598 and a quick burst test of 400 PSI in conformance with ASTM D1784.

2.1.1.2 PVC Fittings

Fittings shall meet the requirements of ASTM D3034 and ASTM F1336 for sizes 4-inch through 15-inch in diameter and ASTM F679 and ASTM F1336 for sizes 18- inch through 36-inch in diameter with minimum wall thickness of SDR-26. Fittings shall be gasket joint type meeting the requirements of ASTM D3212. Elastomericgaskets shall conform to ASTN F477 or ASTM F913. PVC material shall have a cellclassification of 12454-B in accordance with ASTM D1784.

2.1.1.3 PVC Pressure Pipe

PVC force main piping shall be green in color and shall be either SDR-21 Class 200 meeting the requirements of ASTM D2241 with elastomeric integral bell gasketed joints meeting the requirements of ASTM D3036; or AWWA C900 and C905 DR-
18. Fittings on PVC force mains shall be ductile iron as specified under Section 2.1.2 below.

2.1.2 Ductile Iron Pipe and Fittings

All buried ductile iron pipe shall have mechanical joints or push-on type pipe joints. Buried fittings shall be mechanical joints with mega-lug type joint restraints. Exposed or above ground ductile iron pipe and fittings shall have flanged joints.

2.1.2.1 Pipe

Ductile iron pipe wall thickness and pressure class shall conform to ANSI A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151) with pressure class 350 as a minimum. Pipe shall be clearly marked with the name of the manufacturer, location of the foundry, pressure rating, thickness or pressure class, nominal pipediameter, weight of pipe without lining, maximum depth of bury and length. All pipe furnished by the approved manufacturer shall be cast and machined at onefoundry location to ensure quality control and provide satisfactory test data. All ductile iron pipe for sewer service shall be color coded green by field painting green stripe, three (3) inches wide along the crown of the pipe barrel.

2.1.2.2 Fittings

Ductile iron fittings shall have a minimum working pressure of 350 PSI. Fittings shall conform to ANSI A21.10 (AWWA C110), ANSI A21.11 (AWWA C111), ANSI
A21.15 (AWWA C115) and/or ANSI A21.53 (AWWA C153). Compact fittings shall normally be installed. Long body fittings shall be used where shown in the drawings, where compact fittings are not available, or at the option of the Contractor when the laying length is not controlled by compact fitting patterns. All fittings shall be UL/FM approved and shall conform to NSF Standard 61 as applicable. All fittings furnished by the approved manufacturer shall be cast and machined at one foundry location to ensure quality control and provide satisfactory test data. Fittings shall have cast on them the pressure rating, nominal diameter, manufacturer's name, foundry location, plant code and degrees or fraction of a circle. Cast letters and figures shall be on the outside bodyof the fitting.

2.1.2.3 Coatings

All buried ductile iron pipe and fittings shall be externally coated with a bituminous coating as specified in ANSI A21.51 and be continuous, smooth, neither brittle when cold or sticky when exposed to the sun and be strongly adherent to the fitting. If pipe is installed in corrosive soil, all nuts, bolts, studs and other uncoated parts of joints for underground installation shall be coated with asphalt or coal tar prior to backfilling. All exposed or above ground ductile iron pipe and fittings shall be painted in accordance with Section 09900 of these specifications.

All ductile iron pipes and fittings for sewer service applications shall be Sewer Safe internally lined with an approved amine cured novalac epoxy coating containing at least 20% by volume of ceramic quartz pigment.

2.1.3 High Density Polyethylene (HDPE) Pipe and Fittings

All interior wetwell discharge piping shall be IPS DR-11 (160 PSI) flange by flange high density polyethylene (HDPE) pipe with 316 stainless steel backup rings, nuts, bolts and washers. Each discharge leg shall be one continuous pipe joint.

2.1.4 Joint Restraints

Force mains shall have mechanically restrained joints at changes in direction. The restrainer shall be manufactured of ductile iron and shall meet or exceed the requirements of ANSI A21.11 (AWWA C111) and ASTM A536. The restrainer system shallprovide anchoring of ductile iron pipe or fittings or bell to spigot PVC pipe joints. The restrainer shall accommodate the full working pressure rating of the pipe plus surge allowance.

2.2 PRECAST CONCRETE STRUCTURES

2.2.1 Wetwell

Precast wet well base, sections and related structures shall be of the size indicated on the drawings and shall conform to the requirements of ASTM C478 (specification for precast concrete manhole sections and structures) except as modified herein. Cement shall be minimum 4,000 psi concrete meeting the requirements of ASTM C150 (specification for Portland cement, type II). Precast sections shall be provided with "O" ring gasket type joints, conforming to ASTM Designation C443-77, or flexible joint sealant roping of butyl rubber conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B-Butyl Rubber with a minimum cross section of 1 ¼ inches. Lifting devices for handling precast section components shall comply with OSHA Standard 1926.704. Wetwell coatings shall be in accordance with Section 09900 of these specifications.

Wall thickness shall be determined by the precast manufacturer and shall ***be not less than*** $1/12^{th}$ the inside diameter in inches plus one (1) inch. Ring reinforcement shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. Bases for wet wells shall be cast integrally with the bottom section.

A Flexible Neoprene-EPDM pipe connector, conforming to ASTM C443 shall be used to connect the sewer influent pipe to the precast concrete wet well. The connector shall bea minimum of three-eighths (3/8) inches thick or greater and resistant to ozone, weathering, aging, chemicals and petroleum products. The securing bands shall be stainless steel and screw assembly and totally non-magnetic Series 304 stainless steel. The connector shall be of a size specifically designed for the specified pipe material and size. The interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II lean cement grout. The exterior (below grade) of precast concrete wet wells shall be given two coats of an approved bituminous water proofing materials.

2.2.2 Round Precast Concrete Manholes

Precast concrete manholes or calcium aluminate cement concrete manholes used shall conform to all requirements of ASTM Designation C478 at minimum and be provided with "O" ring gasket type joints, conforming to ASTM Designation C443-77, or flexible joint sealant roping of butyl rubber conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B-Butyl Rubber with a minimum cross section of 1 ¼ inches. Lifting devices for handling precast manhole section components shall comply with OSHA Standard 1926.704. Manhole coatings shall be in accordance with Section 09900 of these specifications.

2.2.2.1 Top Section

Top Section shall be cast monolithically and shaped as an eccentric cone except that a concentric cone shall be used for manhole depths 5-feet or less. Joint systems must match associated riser or base sections. The clear opening for the manhole frame and cover shall not be less than 24-inches for main sewers 6- inches 18-inches in diameter, and not less than 32-inches for main sewers greaterthan 18-inches in diameter.

Where manhole depth will not permit a diameter transition or cone section, a precast flat slab top section shall be provided with a 24-inch or 32-inch diameter hole (as required above) for the manhole frame and cover opening.

2.2.2.2 Riser Section

Riser sections shall be cast monolithically and have a minimum length of 16-inches. Joint systems must match associated riser, cone or base sections.

2.2.2.3 Base Section

Base sections shall be cast monolithically and have a minimum length of 16-inches. Joint systems must match associated riser sections.

2.2.2.4 Manhole Inverts

Manhole inverts shall be precast and provide clearance for pipe projecting a minimum of 2-inches inside the manhole wall. For straight through flow manholes, troughs shall be formed and finished to the same slope as the incomingand outgoing sewer mains. Manholes placed at changes in grade or direction shallbe formed and finished to provide a minimum drop of 0.10-feet between the inletand outlet pipes.

The minimum thickness of precast inverts from the bottom of the lowest invert to the bottom of the base shall not be less than 8- inches. Benches shall have a uniform 2:1 slope from the high point at the manhole wall to the lip of the inverttrough. The invert trough shall have a minimum depth of ½ of the main pipe

diameter. Precast inverts shall be free from depressions, high points, voids, chipsor fractures over ¼-inch in diameter or depth.

Hand-formed inverts, when approved for use, shall meet or exceed the durability, strength, configuration and hydraulic "smoothness" required for precast inverts. Filler for hand formed inverts shall be holed burned brick.

2.2.2.5 Manhole Steps

Manhole steps shall be provided on the vertical or straight wall of 4-foot and 5-foot diameter manholes and shall be aligned vertically on 16-inch centers. Steps shall be secured to the manhole wall with a compression fit in tapered holes or cast in place. Steps shall be coated with a copolymer polypropylene plasticcoating, reinforced with a ½-inch diameter grade 60 bar, and be provided with serrated treads and tall end lugs. Step pullout strength shall be 2000 lbs. minimum when tested according to ASTM C497. Steps shall begin no less than 18-inches from the manhole rim and end no closer than 16-inches above the manhole bench.

Manhole steps shall not be used on manholes greater than 5-feet in diameter or where a concentric cone or flat-slab top is the final section.

2.2.2.6 Pipe Connections

Provide preformed rubber boots at all pipe connections to manholes. Rubber boots, with stainless steel fasteners shall be equal to those manufactured by Kor-N-Seal or Press Seal Gasket Corporation.

2.2.3 Square and Rectangular Precast Structures and Vaults

Precast concrete sections shall meet the requirements of ASTM C 913. The minimum 28-day compressive strength of the concrete in precast sections shall be 4,000 PSI.

The design of each structure shall be the responsibility of the manufacturer and shall conform to ACI 318 and the minimum structural design loading requirements as defined in ASTM C 890. The minimum design deadload shall be based on the depth shown on the drawings.

Precast sections shall be manufactured such that the spigot end is at the top of each section. Dimensions for square and rectangular precast sections, where required, are shown in the drawings.

2.3 MANHOLE FRAMES AND COVERS

Manhole frames and covers shall be Gray Cast iron conforming to specification ASTM-A48 Class 35B. Castings shall be of uniform quality, and free from blowholes, porosity, hard spots, shrinkage distortion and other defects. Frames and covers shall be smooth, well-cleaned by shot blasting and shall remain unpainted. All castings shall be manufactured true to pattern, and component parts shall fit together in a satisfactory manner. The frame and cover shall be designed to withstand an AASHTO H-20 wheel loading. The frame and cover shall have an "O" Ring type rubberseal or neoprene gasket designed to eliminate or significantly reduce surface water infiltration, have two non-penetrating pick-holes in the cover and four one (1) inch diameter anchor hole inthe frame flange. The cover shall read "Sanitary Sewer".

Manhole frames and covers on 4-foot diameter manholes shall have a minimum inside opening diameter of not less than 23-inches and no more than 24-inches. Manhole frames and covers on 5-foot diameter manholes and greater shall have a minimum inside opening diameter of not less30-inches and not more than of 31-inches.

Manhole frames and covers within easements or in areas where security is an issue shall be equipped with manhole locking devices or bolt down covers.

2.4 VALVES

All lift stations shall be equipped with an isolation valve, check valve and gauge fitting on its discharge header. The common manifold header for the pumps shall be equipped with a combination air/vacuum release valve and isolation valve to isolate the entire pumping system from the serving force main.

2.4.1 Plug Valves

Lift station isolation valves shall be plug valves mounted horizontally on the discharge header. All plug valves shall be non-lubricated eccentric plug type with Buna "N" neoprene, epoxy or fusion bonded, nylon faced plugs. Valve bodies shall be ASTM A126, Class B cast iron with all exterior mounted bolts and nuts to be of stainless steel. The interior of all plug valves shall be epoxy coated. Plug valves shall be rated for a minimum of 150 PSI and shall provide drip tight shut off with this pressure in either direction.

Port areas of four (4) inch through twelve (12) inch valves shall be 100% of full pipe area. Valve seat shall consist of either a welded 1/8-inch overlay of pure nickel or shall be 316 stainless steel screwed into the cast iron body.

The upper and lower plug stem bearings shall be sleeve type of a stainless steel or other non-corrosive bearing material. The packing shall be adjustable, and the bonnet shall be bolted.All bolts, nuts and washers shall be 316 stainless steel.

Plug valves up to six (6) inches in size shall be lever operated. All plug valves eight (8) inches and larger shall be equipped with totally enclosed worm gear actuators complying with AWWA C504. All gearing shall run in oil. The actuator housing shall be semi-steel with seals to prevent dirt or water from entering the housing. Shaft bearings shall be permanently lubricated bronze bushings. Appropriately sized hand wheel operators shallbe provided for each gear actuated valve.

Plug valves shall be as manufactured by Dezurik.

2.4.2 Check Valves

Lift station check valves shall be swing check valves mounted horizontally on the discharge header upstream of the isolation plug valve. Swing check valves shall conform to the requirements of AWWA C508. All check valve interiors shall be fully coated with a liquid thermosetting epoxy suitable for use in wastewater applications.

Swing check valves larger than two (2) inches in diameter shall be rated for a working pressure of 150 PSI. Valves shall have a cast iron body with stainless steel bolts and nuts, flanged ends, 316 stainless steel shaft connected to steel outside lever and stainless-steel spring, swing type with straight away passageway of full pipe area. The valve shall have a renewable bronze seat ring and rubber faced disk.

Swing check valves two (2) inches in diameter and smaller shall be all brass swing check valves with a 200 PSI working pressure.

Check valves shall be as manufactured by Clow.

2.4.3 Air Release Valves

Lift station air release valves shall be combination air and vacuum release valves placed on the discharge header manifold piping upstream of the manifold's station isolation valve on the common header.

Combination air release valves shall have a minimum inlet size of two (2) inches, stainless steel internal trim (including float, lever arm, linkage, etc.), stainless steel assembly bolts, and stainless-steel ball valves. The body of the air valve shall be of composite material, stainless steel (SAE 316) or ductile iron.

Air release valves shall be Model D-025 as manufactured by A.R.I. optimal Flow Solutions.

2.5 DISCHARGE GAUGE FITTINGS

A discharge gauge fitting shall be installed on the discharge header of each submersible pump a minimum of six (6) inches upstream from the discharge valve. Gauges shall be 4-1/2-inch diameter glycerin filled Wika discharge gauge, graduated in one (1) PSI increments (0 to 60 PSI) and one (1) foot increments of water (0 to 140 feet) scale range. Gauges shall be provided in plastic protective cases and equipped with quick disconnects. Complete assembly to include gauge, 316 stainless steel nipple approximately two (2) inches in length, ¼ inch stainless steel ball valve and a ¼ inch NPT quick connect coupler.

2.6 MAGNETIC FLOW METER

Furnish, install and test electromagnetic flowmeters and all necessary appurtenances on lift station discharge piping at the locations indicated. The function of the flowmeter shall be to measure, indicate and transmit the flow of a conductive process liquid in a full pipe.

2.6.1 Type

Electromagnetic flowmeter with operation based on Faraday's Law utilizing pulsed dc coil excitation. The meter shall utilize a full-bore flow tube with magnetic field traversing the entire cross-section. Insertion style, multiple point probes inserted into a spool piece, or "liner less" spool piece designs with modular sensors inserted into standpipes are not acceptable. The unit shall be suitable for raw wastewater or liquids with a minimum conductivity of 5 microS/cm. Meter shall be Emerson Process Management – Rosemount Division model 8750WA Magmeter. See Specification Section 01600 for restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

2.6.2 Operating Temperature

Flow Tube:	Ambient	5°F to 150°F
	Process	0°F to 140°F for polyurethane
Transmitter:	Ambient	-20°F to 140° (For surface mount w/integral display)
	Storage	-22°F to 175°F (For surface mount)

2.6.3 Performance

Flow Ranges: Site specific - to suit pumping requirements:

Minimum flow	0	GPM
Maximum flow	1800	GPM

Accuracy: Plus or minus 0.5% of rate for all flows resulting from pipe velocities of one (1) to thirty (30) FPS, with option for 0.25% of rate

Turndown ratio: Minimum of 30 to 1 when flow velocity at minimum flow is at least one (1) FPS

Repeatability: Plus or minus 0.1% of reading

Response Time: 0.2 seconds maximum response to step change in output

Stability: Plus or minus 0.1% of rate over six (6) months

Ambient Temperature Effect: 0.25% over operating temperature range

2.6.4 Features

The flowmeter shall be equipped with the following features:

- Ability to check zero alignment without stopping flow
- Capable of measuring bi-directional flow
- Low flow adjustable between 0.01 FPS and 1 FPS. Below selected value, output isdriven to the zero-flow rate signal level
- Non-volatile totalizer
- Forward, reverse and net totals
- 75 process updates per second

2.6.5 Process Connection

Meter size:	(Site specific)	6	inches
Connection Type:	150-pound ANSI raised-face flanges		
Flange Material:	Carbon steel		

2.6.6 Materials of Construction

Power Transmitter:	120V ac, 60 Hz	
Flow Tube:	Meter Tube	316 SS
	Liner Material	Polyurethane
	Coil Drive Power	Not less than 0.5 Amps
	Electrode Type	Flush
	Electrode Material	316 SS or Hastelloy-
	CGrounding Rings	316 SS
	Enclosure	NEMA 4X 316 SS

2.6.7 Transmitter

Transmitter shall be field mounted with a digital LCD display indicating flow rate and total. Parameter adjustments shall be by keypad or non-intrusive means. Enclosure shall be NEMA 4X 316 SS dual compartment housing with the terminal block isolated from the electronics compartment.

Empty Pipe Detection:	Drives display and outputs to zero when empty pipe is detected
4 to 20 mA Output Signal:	Isolated 4 to 20 mA, jumper selectable as internally or externally powered 5 to 24 volt dc, 0 to 1000 ohm load

	Supports superimposed digital HART protocol for reading totalized flow values
Frequency Adjustment:	0 to 10,000 Hz, externally powered at 5 to 24 volt dc
	Transistor switch closure supports power loads up to 2W for frequencies up to 4,000 Hz and 5-volt dc at 0.1W at maximum frequency of 10,000 Hz
	Pulse can be set to equal desired velocity or volume in user selectable engineering units
	Pulse width adjustable from 1.5 to 500 msec, below 1.5 msec pulse width automatically switches to 50% duty cycle
Discrete Outputs:	Two discrete outputs rated for up to 30 volts typical
	Programmable for the following typical parameters: • High/low flow rates • Percent of range • Empty pipe zero • Fault conditions
Discrete Inputs:	Configured for the following typical parameters: • Reset totalizer • Change rate • Hold output constant • Drive output to zero • Low flow cutoff
Output Testing:	Analog output test – transmitter may be commanded to supply a specific current between 3.75 and 23.25 mA
	Pulse output test – transmitter may be commanded to supply a specified frequency between 1 pulse/day and 10,000 Hz
Damping:	Adjustable between 0.0 and 256 seconds
Cables:	Cables used to interconnect the flow tube and transmitter for remote operation shall be standard Belden or Alpha equivalent, lengths as required to accommodate device locations

Built-in Diagnostics:	Features: • Field programmable electronics • Self-diagnostics with troubleshooting codes Meter verification capability • Coil resistance • Coil signature value • Electrode resistance • High process noise detection • Electronics temperature monitoring • Wiring and grounding verification • Coil fault detection • Empty pipe detection Fully functional diagnostics in AMS Device manager including help screens with troubleshooting guidance. Transmitter shall be capable of interoperability with flow tubes from all manufacturers. This includes the ability to drive the flow tubes at different coil currents and provide meter verification diagnostics for the magmeter system. The flow meter system will be verifiable without an external device.
Factory Calibration:	Shall be calibrated in an ISO 9001 and NIST certified facility Factory flow calibration system must be certified by volume or weight certified calibration devices.

2.7 MISCELLANEOUS ITEMS

2.7.1 Detection Tape

Detection tape shall be provided on all gravity sewer and force mains. Detection tape shallbe at least two inches wide mylar encased metal marking tape and will bear the printed identification "CAUTION: SEWAGE FORCE MAIN BELOW" or “CAUTION: GRAVITY SEWER
MAIN BELOW”. Detection tape shall be buried eight to twelve inches below plan finished grades.

2.7.2 Tracer Wire

Tracer wire shall be installed on all buried PVC force mains. Tracer wire shall be continuous or properly spliced single strand No. 10 solid plastic coated (30 mil) copper wire from iron fitting to iron fitting.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

The contractor shall inspect all materials delivered to the job site for damage. Materials shall be unloaded and stored with a minimum of handling. Materials shall be stored above ground and the interior of pipe and fittings shall be kept free of dirt and debris. Store non-metallic piping andrubber gaskets under cover and protect from exposure to sunlight.

Precast concrete manholes and other appurtenances shall be handled to ensure delivery at the point of installation in sound, undamaged condition. If coating or linings of pipe or fittings are damaged, such pipe and fittings shall be removed from the site and new materials furnished. Pipeshall not be dragged.

3.2 INSTALLATION

The contractor shall install all pipe, fittings, valves, wetwells, manholes and appurtenances in accordance with the specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise.

3.2.1 Pipe and Fittings

The type, class, grade, and alignment of sewer pipe may be changed only at manholes. Sanitary sewer mains crossing under storm drains shall be installed in a casing pipe centered under the storm drain.

3.2.1.1 General

Excavation, cleaning, laying, jointing and backfilling shall follow as closely as possible during prosecution of the work. In no case shall pipe be left in the trench overnight without completing the jointing. All precautions shall be taken to prevent sand, dirt and debris from entering the pipe during installation. Any timethat pipe installation is not in progress, open pipe ends shall be closed by a watertight plug or other method approved by the Engineer.

Plugs shall remain in pipe ends until all water has been removed from the trench and any foreign material that enters the pipe shall be removed immediately. No pipe shall be installed when trench or weather conditions are unsuitable for such work.

Sewer mains shall not be laid closer than ten (10) feet horizontally from a water line unless otherwise indicated in the drawings or directed by the Engineer. Sanitary sewer lines shall pass beneath water lines with the top of the sewer beingat least eighteen (18) inches below the bottom of the water line, where sewer lines cross water lines, no joints in the sewer line shall be located closer than ten (10) feet horizontal distance from the water line.

Trench excavation, bedding, backfill and compactions shall be in accordance with Section 02220 of these specifications.

3.2.1.2 Pressure Pipe

All PVC C900/C905 pipe shall be laid in accordance with AWWA C605. All ductile iron pipe and fittings shall be laid in accordance with the manufacturer's recommendations and AWWA C600. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints.

Pipe alignment and gradient shall be straight or shall follow true curves as near as practicable. Curvature in pipe lines, where required, shall be well within (no more than 80% of) the manufacturer's allowable joint deflection or laying radiusfor the pipe supplied. Otherwise, fittings shall be required.

Forcemain pipe shall be laid with a minimum cover of forty-two (42) inches in paved areas and thirty-six (36) inches in unpaved areas with an allowable maximum of sixty (60) inches. Cover in paved areas shall be measured from crown of pipe to finish grade. Greater depths are permissible when required to clear obstructions, conflicts, etc.

Contractor shall furnish and install locate wiring on all non-metallic pressure mains. Locate wire shall be brought to grade outside a valve box or locating station box, as required, at four hundred and seventy-five (475) foot intervals (maximum). In addition, all pressure mains shall have detection tape installed two
(2) feet above the pipe. Tracer wire and detection tape shall be as specified in Paragraph 2.7 of this Section.

Installed locate wiring shall be tested by the contractor as part of the inspection process, using a qualified tester and suitable testing equipment. The contractor shall notify the JWSC/Engineer at least 48 hours in advance of the locate wire field testing schedule.

3.2.1.3 Non-Pressure Pipe

Plastic piping installation shall be in accordance with ASTM D2321. Pipe laying shall proceed upgrade with pipe bells on the upper end. Pipe to be laid with joints close and even, butting all around. Sagging joints will not be tolerated. Pipe shall be straight and of uniform grade between manholes, laid to line and grade. Bell holes shall be dug so that the pipe barrel will carry the load of the pipe.

Where sewers or force mains, are to be connected to existing manholes or other structures, and where no stub or opening has been provided for the connection,the Contractor shall core drill an opening of minimum diameter through the sidewall of the existing structure for inserting the sewer pipe. A flexible rubber bootshall then be installed to seal around the new pipe for a watertight connection.

The Contractor shall install a continuous run of plasticized metallic detection tape above the top of the sewer main at 12" to 18" below finished grade. Detection tape shall be as specified in Paragraph 2.6 of this Section.

3.2.2 Wet Wells and Manholes

Wet wells and manholes shall be installed at the locations and elevations shown on the plans. Standard details for the installation of precast concrete wet wells manholes are provided on the construction plans. Outside drop connections shall be installed where indicated.

Wet well and manhole coatings shall be in accordance with Section 09900 of these specifications.

3.2.3 Manhole Frame and Covers

The top rim of manhole frames and covers shall be set to conform to grades and transverse slopes. Manhole rim elevations are indicated on the plans but shall be adjusted as required to meet these specifications. Generally, along outfall lines, the manhole frame and covers shall extend approximately 6" above finish grade or to a designated elevation for flood protection. Generally, along paved streets and parking areas, and other unpaved areas subject to vehicular traffic the manhole frames and covers shall be set flush with the surface.

Grade rings, where necessary to serve as spacers between the top cone of the manholesand the base of the manhole cover frame to bring the manhole to design or finish grade,shall be hard rubber in paved areas and high-density polyethylene or cement rings in off road applications. Adjustments using clay or cement brick are not acceptable. On new construction, an adjustment using metal riser rings to extend the manhole cover frame to grade is not permitted. No adjustment using grade rings between the top cone section and the manhole cover frame shall exceed 12-inches.

3.2.4 Valves

All valves and appurtenances shall be installed in the locations shown on the drawings, true to alignment and properly supported. Any damaged items shall be repaired to the satisfaction of the JWSC/Engineer before they are installed.

Install all valve boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown in the drawings. Flanged or buried mechanical joints shall be made with cadmium plated bolts. All exposed bolts shall be cadmium plated bolts. All exposed bolts and nuts and all above ground valves shall be painted in accordance with Section 09900 of these specifications.

3.2.5 Discharge Gauge Fittings

The gauge fittings shall be installed on discharge header piping a minimum of six (6) inches upstream from each pump's check valve. The gauge fitting shall be installed by drilling and tapping a ¼-inch NPT hole, installing a 316 stainless steel nipple, a ¼-inch stainless steel ball valve, another 316 stainless steel nipple to the ball valve and attaching a ¼-inch NPT quick connect coupler to the nipple.

3.3 FORCE MAIN TESTING

Force mains shall be hydrostatically tested to 1.5 times the working pressure of the associated lift station or 100 PSI, whichever is greater in accordance with the procedures of AWWA C600. Testing shall be observed by the JWSC inspector.

All installed isolation, air release and check valves shall be tested for proper operation. Force main tracer wire shall be checked for continuity along the pipe run and checked at terminus points for proper connection.

(END OF SECTION)

SECTION 02820
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 WORK INCLUDED

Provide all labor, materials and equipment necessary for the installation of a complete fencesystem to the limits and at the locations shown on the construction plans.

1.2 SUBMITTALS

Complete shop drawings and product data shall be submitted in accordance with therequirements of Section 01340 of these specifications.

1.3 RELATED WORK SPECIFIED ELSEWHERE

01340 Shop Drawings

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

Overall height for new fencing shall be 8-feet including three strands of barbed wire. Posts shall be set at no more than 10-foot centers and anchored a full three feet deep in concrete footings poured to the limits of the excavation. Corner posts shall have the necessary strut and tie bracing.Provide gates of the sizes and at the locations indicated.

2.2 MATERIALS

2.2.1 Fence Posts, Rails and Appurtenances

All fence posts, rails and appurtenances shall be hot dipped galvanized with a minimum of 0.9 ounces per square foot of surface area. Dimensions of the various members shall be as follows:

Member	Dimension
Corner Posts	3.0-inch O.D. (5.79 #/Ft)
Intermediate Posts	2.5-inch O.D. (3.65 #/Ft)
Gate Posts	4.0-inch O.D. (9.11 #/Ft)
Gate Frames	2.0-inch O.D. (2.72 #/Ft)
Braces	1.625-inch O.D. (2.27 #/Ft)
Top Rails	1.625-inch O.D. (2.27 #/Ft)

2.2.2 Fence Fabric

Fence fabric shall be steel chain link fabric of No. 9 gauge aluminum coated steel fabric

woven into a 2" mesh with black PVC coating. Fabric shall be 72" wide. Fence fabric shall conform to the requirements of ASTM A491. Continuous tension wire shall be provided at the lower edge of the mesh. Black privacy slats shall be provided for all fencing.

2.2.3 Barbed Wire

Barbed wire shall consist of three strands of 12-1/2-gauge galvanized wire with 14-gauge 4 point round barbs spaced not more than 5" apart.

2.2.4 Concrete

Concrete for fence posts shall be 3,000 PSI.

2.2.5 Gates

Gates shall be complete with latches, stops and hinges. Gate frames shall be as specifiedin Paragraph 2.2.1 above. Welds shall be painted with aluminum or zinc-based paint. Fabric shall be as specified for the fence material. Provisions for padlocking shall be provided.

2.2.7 Miscellaneous Hardware

All miscellaneous hardware shall conform to the Chain Link Fence Manufacturer's Institute standards. All parts shall be galvanized and black vinyl coated.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

The contractor shall inspect all materials delivered to the job site for damage. Materials shall be unloaded and stored with a minimum of handling. Materials shall be stored above ground.

3.2 INSTALLATION

Fence posts shall be uniformly spaced and shall not exceed 10 on centers. Line posts shall be setin 16" diameter holes, 36" deep with a 33" post embedment. Corner posts shall be set in 24" diameter holes, 36" deep with a 33" post embedment. Post holes shall be filled with concrete.

Terminal and gate posts shall be set as specified above and braced to the nearest post. Intermediate posts shall have waterproof tops with cast openings through which the tops rails pass.

Tension wire shall be stretched taut between terminal posts and securely fastened to intermediateposts 6" above finished grade line. Fabric shall not be stretched until concrete footings have curedfor a minimum of 3 days.

(END OF SECTION)

SECTION 02960
TEMPORARY SEWER BYPASS SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

The Contractor shall design the systems and furnish all tools, supplies, materials, labor, equipment, fuel and maintenance necessary for the installation, testing, placing into operation, maintaining, and monitoring of temporary bypass systems for the purpose of diverting sewer flow around components of the JWSC existing sewer system. At no point during the setup, installation,operation or demobilization of the temporary bypass systems shall interruption of the sewer flowupstream or downstream of the bypassing location be caused. Should such interruption or backupof existing sewer infrastructure occur, Contractor shall provide all equipment and vacuum/pumper trucks which may be necessary to reduce potential for sewer spills and maintainthe up and downstream flows, and properly dispose of all collected sewage.

The design, installation, operation, and monitoring of the temporary bypass pumping systems shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor whocan demonstrate to the JWSC and Engineer that it specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references of projects of a similar size and complexity as this project performed by the vendor's firm within thepast ten (10) years.

1.2 SUBMITTALS

Bypass Systems Plan: The Contractor shall submit to the JWSC/Engineer detailed Drawings and shop drawings outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing sewer flows. The Bypass Systems Plan shall be specific and complete, including such items as schedules, locations, capacities of equipment, materials, connections, fuel storage, and all other incidental items necessary to provide satisfactory bypassing operations and backups for each of the proposed activities identified in paragraph 1.1.

The Bypass Systems Plan shall provide sufficient detail to ensure proper protection of the existing forcemains and gravity sewer, and other relevant JWSC facilities, including protection of the access and bypass pumping locations. **No bypassing activities or construction shall begin until all provisions and requirements have been reviewed and approved by the JWSC and Engineer.** TheBypass Systems Plan shall include, but is not limited to, the following details for each of the proposed activities identified in paragraph 1.1:

1. Detailed drawings showing all required equipment and staging areas for pumps, tanks, fuel storage, and piping within the project site at PS4021 and/or Glynn County right-of-way areas;

2. Plugging methods and types of plugs;

3. Number, size, material, location and method of installation of suction piping;

4. Number, size, material, method of installation and location of installation of discharge piping;

5. Bypass pump sizes, capacity, number of each size to be on site and fuel requirements;

6. Pump curves showing pump operating range are to be submitted;

7. Fuel storage information and tank size;

8. Thrust and restraint block sizes and locations as necessary in accordance with manufacturer/supplier of LineStops, Insert Valves, and other equipment to be installed within piping;

9. Sections showing suction and discharge bypass piping depth, embedment, select fill and special backfill, and any equipment necessary to maintain vehicular and construction equipment in driveways and parking areas; modification of existing structures including manholes to allow for efficient installation of bypass pumping equipment and operation.

10. Method of noise control for each bypass pump. Dunbar Creek WPCP is located within a residential area.

11. Any temporary pipe supports and anchoring required;

12. Design for access to bypass system operation locations indicated on the Drawings and specified herein;

13. Calculations and selection of bypass pump pipe size(s);

14. Schedule for installation of and maintenance of bypass pumping lines.

15. Emergency plan for adverse weather and flooding for various phases of the Work and bypass system operation locations.

16. Contractors plan for providing continuous monitoring of the bypass pumping operations including qualifications of any onsite monitoring persons and specifications of any electronic monitoring operations.

17. Necessary restoration including repairs to existing structures which were modified to install and operate bypass pumping equipment.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

It is essential for the operation of the JWSC's sewer system that there be no interruption in the conveyance of wastewater to and from any of the proposed bypass system locations throughoutthe duration of the project. To this end, the Contractor shall provide, maintain, operate, and monitor all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary fuel, and all other labor and equipment necessary tointercept the sewer flow before it reaches the point where it would interfere with the construction work, carry it past the work and return it to the existing sewer system downstream of the work.

It is the Contractor's responsibility to provide equipment that is adequate for the performance ofthe temporary bypassing operations under this Contract within the time specified. All equipmentshall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required operations, and shall be subject to review by the EOR and Owner's Representativeat any time within the duration of the Contract. All operations hereunder shall conform to the applicable requirements of the OSHA Standards for construction.

The Contractor shall provide for utilities and services for its own operations. The Contractor shall furnish, install and maintain all temporary utilities during the contract period including removal upon completion of the project work.

Pumps used shall be fully automatic self-priming units that do not require the use of foot-valves in the priming system.

The pumps shall be diesel/fuel powered, unless otherwise approved.

All pumps shall be sound attenuated and equipped with quiet packs.

All pumps used shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of the flows.

All pumps shall be High Pressure Solids Handling Self-Priming Pumps as manufactured by Thompson Pump & Manufacturing Co., Inc. in state of Georgia, Godwin Pumps by Xylem, or JWSC/Engineer approved equal.

Furnish each pump with the necessary stop/start and liquid level controls.

Contractor shall not be permitted to stop or impede the sewer system flow under any circumstances except as otherwise defined and approved by JWSC and Engineer. The Contractorshall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.

2.2 COORDINATION

The Contractor shall submit a Sequence of Bypass Operations in accordance with 2.1 which details the interruptions to be made which the Contractor shall be fully responsible for. One week prior to connections being made to existing structures or pipes, a coordination meeting shall be held between the Contractor, Engineer, and JWSC to discuss the approved construction plan.

Schedule of construction, interconnecting details, and other revisions necessary for proper interfacing of the Work shall be subsequently modified by Contractor accounting for results of said coordination meeting. The JWSC and Engineer shall be notified 24 hours prior to any actual interruptions or connections being made. No bypassing operations shall begin prior to securing JWSC's approval of respective connection plan and work schedule.

PART 3 EXECUTION

3.1 PREPARATION

The Contractor shall be responsible for locating any existing utilities in the area where the Contractor selects to locate the bypass equipment, pumps and pipelines. The Contractor shall locate the bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from JWSC and the Engineer. All costs associated with relocatingutilities and obtaining all approvals shall be paid by the Contractor. Driveway access and parking areas shall not be impeded by bypass piping.

The Contractor shall be responsible for all physical damage to existing infrastructure caused by human or mechanical failure.

During bypass pumping, Contractor shall not allow sewage to be leaked, dumped, or spilled in or onto any area outside of the existing sanitary sewer system.

In the event of accidental spill or overflow, Contractor shall immediately stop the discharge and take action to clean up and disinfect the spill. Promptly notify JWSC and Engineer so that required reporting can be made.

In the event of accidental spill or overflow, the Contractor is responsible for any damages that may have occurred to public or private property including cleaning, disinfection, and other corrections to the satisfaction of the Engineer at no cost to the Owner.

3.2 INSTALLATION AND REMOVAL

The Contractor shall pipe sections or make connections to the existing suction and discharge structures and shall construct temporary bypass pumping structures only at the access locations indicated on the Drawings, as approved in the Bypass Systems Plan and Sequence, and as may be required to provide an adequate suction and discharge conduit, unless otherwise approved by JWSC and Engineer.

Plugging or blocking of sewer flows shall be performed with the use of existing slide gates, plugs, and/or LineStops (if approved) which shall be installed by contractors approved by the EOR and Owner. When plugging or blocking is no longer needed for performance of the work, the plugs shall be removedin a manner that permits the sewer flow to slowly return to normal without surge, surcharging, or causing other major disturbances downstream.

When the bypass pipelines cross driveways or local streets, the Contractor must place the bypass pipelines in trenches and cover them with traffic rated plates or temporary pavement.

At the conclusion of the bypass system operations, when all of the relevant modifications are complete, tested, and ready for operation, the Contractor shall demonstrate the new system in automatic mode for 72 hours. At the completion of the demonstration period, and upon receipt of JWSC's/Engineer's written approval, the Contractor shall remove all the piping and bypass pumping equipment, restore all property to pre-construction condition and restore all pavement.

(END OF SECTION)

DIVISION 03

SECTION 03000
CONCRETE
WORK

PART 1 GENERAL

1.1 SUMMARY

Furnish and install cast-in-place concrete as shown and indicated on the Drawings and as specified in this Section, complete.

All formwork, reinforcing, sleeves, inserts, piping, hangers, anchors frames, and other items to be built into the concrete work shall be correctly positioned, secured and inspected by the Engineer prior to placing concrete.

1.2 SUBMITTALS

Submit concrete design mix and shop drawings on reinforcing, admixtures, waterstops and curing compound for the EOR and Engineer's review prior to any work.

1.3 STORAGE AND PROTECTION

All materials shall be stored and protected in accordance with the requirements of these Specifications.

1.4 QUALITY ASSURANCE

All concrete work shall be in accordance with the provisions of the American Concrete Institute's Building Code Requirements for Reinforced Concrete, Latest Edition (ACI 318), unless specified or noted otherwise.

PART 2 PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

Materials for use in concrete work including admixtures, aggregates, cement, form material, reinforcing and water shall be in accordance with the following:

1. Cement: All cement shall be Type I and meet the requirements of ASTM C 150.

2. Aggregates: Aggregates shall conform to requirements of ASTM C 33.

3. Water: Mixing water for concrete shall be fresh, clean and potable.

4. Admixtures: For each 100 pounds of cement the following amount of admixture shall be provided in accordance with the manufacturer's recommendations:

a. For air temperatures below 70 degrees F, provide 3 to 6 ounces of Master Builder's Pozzolith 344-N (or 122-N) or 2 ounces of Sika Chemical Company's Plastocrete-A.
b. For air temperature above 70 degrees F, provide 3 ounces of Master Builder's Pozzolith 300-R or 3 ounces of Sika Chemical Company's Plastocrete-A.
c. An air-entraining admixture conforming to the requirements of ASTM c 260, equal to Master Builder's MB-AE 10, shall be used in all concrete exposed to freezing temperatures. The air content of freshly mixed airentrained concrete, as determined by the method of ASTM C 233, shall be not less than three percent not more than six percent. The air-entrained admixture is in addition to the admixture specified in a. or b. above.

5. Formwork

a. Form Material: Forms shall be of plywood or architectural type steel panel forms.
b. Form Oil: Form oil shall be non-staining, paraffin base type oil equal toChevron K Pale40 as manufactured by Standard Oil Company.
c. Form Ties: Form ties shall have a minimum working strength of at least 3,000 pounds when fully assembled and shall be of the snap or break type with a water stop in the center. Ties shall be free of cones, washers or other devices which will leave a hole larger than 7/8-inch diameter in the exposed surface of the concrete. Ties shall be such thatwhen forms are removed no metal shall be within 1-1/2 inches of the finished surface.
d. Chamfer Strips: Chamfer strips shall be placed in forms for exposed corners of columns and exposed edges of beams, slabs and curbs. Chamfer Strips shall have a minimum dimension of 1-inch.

6. Reinforcing Steel: Reinforcing steel shall be properly supported and secured in position before concrete is placed.

a. Reinforcement Bars. Bar reinforcing steel shall conform to the requirements of ASTM A 615 Grade 60. The reinforcement shall be bent cold to the shapes indicated on the Drawings. This shall be done in the shop, before shipment, and not in the field, unless otherwise noted on the Drawings or directed by the Engineer.
b. Wire Fabric: Wire fabric for concrete reinforcement, shall conform to the requirements of ASTM A 185.
c. Bending: Hooks of 90 degrees shall have a radius bend of the axis of the bar of not less than six bar diameters plus an extension of 12 bar diameters at the free end.

7. Waterstops: In expansion joints and in construction joints not shown as expansion joints, waterstops shall be polyvinyl chloride (PVC) and shall incorporate a galvanized steel wire along both edges which shall be used to secure the waterstop in position during concrete placement. Waterstop shall be Wirestop Type No. CR-9380, Vinylex Waterstop Type No. RB-38r or approved equal. The waterstop shall extend the entire length of the joint and all splices shall be heat welded and tested in accordance with the manufacturer's instructions.

8. Non-Shrink Grout

   a. All grout shall be non-metallic, non-shrink type. Cement shall be Type IIIGrout shall meet the following requirements:

Criteria	Test Method	Result
Workability	ASTM C 191	Initial set time not less than 60 minutes
Compressive Strength	ASTM C 109 (restrained condition)	One day - 3,000 psi
Shrinkage	ASTM C 827 and CRD 621	No shrinkage after placement or shrinkage after set

   b. The contractor shall furnish independent laboratory test results as evidence of full compliance with these requirements.

9. Standard Grout: Grout which is required by the Drawings or Specifications and is not otherwise specified, shall be composed of one part of cement and three parts of sand. Grout shall have a maximum water/cement ratio of 5.0 U.S. gallons per 94-pound bag of cement.

10. Epoxy Bonding Compound: Epoxy bonding shall be 100 percent solids with a minimum bond strength of 2,100 psi at 14 days. Epoxy bonding compound shall be equal to Sikadur Hi-Mod.

11. Expansion Joint Filler: Joint filler shall be a preformed type meeting the requirements of ASTM D 1751.

12. Curing Compound: Curing compound shall be an all resin-cure (not acrylic) based compound conforming to ASTM C309, Type I, Class B. The curing compound shall form a moisture impermeable film which retains a minimum of 95 percent of the mixing water beyond the required curing time. Curing compound shall be equal to Meadows Sealtight CS-309.

PART 3 EXECUTION

3.1 PLACING AND FASTENING AND REINFORCING

Unless otherwise called for, provisions of the American Concrete Institute's Building Code Requirements for Reinforced Concrete (ACT 318), shall be strictly followed.

All reinforcement shall be furnished in full length as indicated on the Drawings. No splicing of bars, except where shown on the Drawing, will be permitted.

Splices which are permitted, shall have a lap of not less than forty times the diameter of the bar, unless otherwise shown. Splices shall be well distributed or otherwise located at points of low tensile stress.

3.2 CONCRETE COMPOSITION AND MIXING

Concrete shall be proportioned by weight to give an ultimate compressive strength of 4,000 psi at 28 days when sampled and tested in accordance with ASTM C 31 and C 39. Concrete shall contain not less than 517 pounds of cement per cubic yard of concrete. The mix design shall provide for a slump of 3-inches minimum, 5-inches maximum.

Ready-Mix: All reinforced structures shall be constructed using ready-mix concrete. Ready-mix concrete shall be mixed and transported in accordance with ASTM C 94.

Batch Mixing on Site: Non-reinforced concrete may be batch mixed. The concrete shall be mixed in a batch mixer conforming to the requirements of the Mixer Manufacturers Bureau of the Associated General Contractors of America. The mixer shall bear a manufacturers rating plate indicating rated capacity and the recommended revolutions per minute and shall be operated in accordance with these recommendations. It shall be equipped with a suitable charging hoper, water storage tank and a water-measuring device, and shall be capable of thoroughly mixing the aggregates, cement and water into a uniform mass within the specified mixing time, and of discharging the mix without segregation.

The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue to flow for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to insure that thebatch cannot be discharged until the required mixing time has elapsed. When concrete of normal weight is specified, controls shall be provided to insure that no additional water may be added during mixing. The entire batch shall be discharged before the mixer is recharged.

Each batch of two cubic yards or less shall be mixed for not less than 1-1/2 minutes. The mixing time shall be increased by 15 seconds for each additional cubic yard or fraction thereof.

The mixer shall be clean and the pickup and throw over blades in the drum shall be replaced when they have lost 10 percent of their original depth.
Admixtures

1. Air-entraining and chemical admixtures shall be charged into the mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by the manufacturer. The accuracy of any admixture shall be within ± three percent.

2. The addition of retarding admixtures shall not be significantly delayed after theaddition of the cement.

3.3 PLACING

Before concrete is placed, steel forms shall be uniformly coated with form oil and wood forms shall be thoroughly wetted.

Concrete shall be placed to avoid the segregation or separation of aggregates, and displacementof reinforcing. Concrete shall not be allowed to drop freely more than four feet.

All concrete shall be placed in daylight, the placing of concrete in any portion of the work shall not be begun if such work cannot be completed by daylight.

Concrete shall not be placed when the atmospheric temperature is below 40 degrees F. If after placing concrete the temperature drops below 40 degrees F, the Contractor shall cover, heat and protect the work in a manner to keep the air surrounding the fresh concrete at a temperature not less than 45 degrees F for period of five days after concrete is placed.

Concrete shall be compacted by the use of mechanical internal vibrating equipment supplemented by hand spading. Vibrating shall not be used to transport concrete within forms.Internal vibrators shall maintain a speed of at least 5,000 impulses per minute when submergedin concrete.

Keys shall be formed in all construction joints.

Waterstops shall be used where shown in the Drawings and as directed by the Engineer.

3.4 FINISHING

All exterior concrete surfaces shall be finished to a minimum of 12-inches below finish grade. Interior concrete surfaces within buildings, and other surfaces shall be finished to 12inches below finish grade. Interior concrete surfaces within buildings, and other such surfaces exposedto view shall be finished.

The interior of basins shall be finished to a level not less than 12-inches below overflow level. Concrete not exposed to view, therefore not specified to be finished, shall have rough edges tooled off and shall be pointed and spot finished to fill irregularities.

1. Vertical Surfaces

   a. When concrete has set sufficiently to permit, forms and form ties shall be carefully removed. All depressions resulting from removal of form ties and all other holes and rough places shall be thoroughly wetted with water and pointed with sand cement grout.

   b. After pointed surfaces have set sufficiently to permit, all surfaces specified to be finished shall be kept wetted with water and rubbed with a carborundum stone of medium fineness or other equally good abrasive, to bring the surface to a smooth texture and to remove all form and tie marks.

2. Slabs

   a. After concrete has been placed, struck off, consolidated and leveled, it shall not be worked further until ready for floating. Floating shall begin when the WATER sheen has disappeared, and the mix has hardened sufficiently that the weight of a man standing on it leaves only a slight imprint on the surface. The surface shall then be consolidated by hand floating with wood floats.

   b. After floating, interior surfaces shall be steel troweled until the surface is free from trowel marks or other imperfections, uniform in texture and appearance and true to plane.

   c. Immediately after the floating has been completed, exterior surfaces shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

3.5 CURING

A curing compound as previously specified shall be applied to all concrete surfaces except those which are to receive future concrete or mortar. The compound shall be applied in accordance with the manufacturer's recommendations.

3.6 TESTING

All testing shall be performed by an independent laboratory and paid for by the Contractor.

Required Tests: The following tests of materials and concrete are required to be conductedin accordance with the current ASTM Standards.

1. Test Cylinders: Cylinders shall be made and cured in accordance with ASTM C 31. One set of five cylinders from the same batch of concrete shall be made for each day's placing of concrete.

2. Two cylinders from each set shall be broken at seven days and two and 28 days in accordance with ASTM C 39. The test results shall be the average of the strengths of the cylinders tested at 28 days. One cylinder shall be held as a spare to be broken at 56 days in the event that cylinders broken at 28 days do not meet specified values.

3. All sampling, molding, transporting, storing, curing, preparation for breaking and testing of cylinders shall be the responsibility of the laboratory and shall be performed by qualified laboratory personnel. The Contractor shall supply wheelbarrows, shovels mixing boards and shaded area for molding cylinders, and similar equipment required by the laboratory representative for molding test cylinders.

4. Slump Tests: At least two slump tests shall be made on each day that concrete is placed. One slump test shall be made at the time cylinders are made for compression tests. Tests shall meet ASTM C 143.

5. Test Results: The laboratory shall send one copy of all reports to the EOR and Owner, one copy to the Contractor and one to the ready-mix plant. Concrete test reports shall include slump tests and state where concrete was used in the structure.

3.7 IMPERFECT OR DAMAGED WORK

Defective or damaged work, or any work damaged before final acceptance, shall be satisfactorily removed and replaced in accordance with the requirements of the Drawings and Specifications. Removal and replacement of concrete work shall be done in such a manner that the strength of the structure will not be impaired. All testing required to verify compliance with the Specifications and ACI Code shall be paid for by the Contractor.

3.8 CLEANING

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

(END OF SECTION)

DIVISION 09

SECTION 09900
PAINTING

PART 1 GENERAL

1.1 WORK INCLUDED

The work of this section includes furnishing all labor, materials and equipment required to clean and paint exposed ductile iron piping systems and equipment as described herein and as shown in the drawings.

1.2 SUBSTITUTIONS

To the maximum extent possible, all coatings shall be the products of a single manufacturer. Guidelines for determining acceptability of substitutions are given in Section 01600 of these specifications. Contractors intending to furnish substitute materials or equipment are cautioned to read and strictly comply with these guidelines.

1.3 SUBMITTALS

Complete manufacturer's literature in accordance with the requirements of Section 01340 of these specifications shall be submitted.

The Contractor shall submit to the EOR and Owner the following information:

1. A list of all components (paints or other materials) to be used in each painting system required herein.

2. A complete descriptive specification, including manufacturer's data sheet, of each component.

3. Prior to completing the purchase and delivery of the coating material selected by the Contractor, the Contractor shall obtain a letter from the material supplier stating that the selected material is suitable and compatible for application and use as directed under these Specifications, and that if properly applied will provide metal protection and a pleasing appearance for five years or longer.

4. A color chart for each product to be applied.

1.4 PAINTING REQUIREMENTS

Finish paint all new and exposed ductile iron piping (interior and exterior) systems including steel straps at pipe supports. Exposures and surfaces are defined in Part 3 of this Section, Paragraph 3.6. Items to be left unfinished or to receive other types of finishes are specifically shown on the drawings or specified. Properly protect existing finish painted items and surfaces from damage throughout the project. Repair any damage to existing coatings in accordance with the requirements of this Section, at no expense to the Owner.

1.5 QUALITY ASSURANCE

The following information shall be included on the label of all containers of materials supplied under this Section:

1. Manufacturer's Name
2. Type of paint or other generic identification
3. Manufacturer's stock number
4. Color (if any)
5. Instructions for mixing, thinning or reducing (as applicable)
6. Manufacturer's application recommendations
7. Safety and storage information

All coating material used on this project shall be purchased specifically for this project and furnished in new, unopened containers.

1.6 PRODUCT HANDLING

Deliver materials in original, sealed containers of the manufacturer with labels legible and intact. Each container shall be clearly marked or labeled to show paint identification, date of manufacture, batch number, analysis or contents, and special instructions. At all times a copy of every component's MSDS shall be available.

1.7 MATERIAL SCHEDULES

Material schedules included in Part 2, Paragraph2.2 of this Section list prime coats, intermediate coats, finish coats and cover coats that comprise a complete and compatible system of surface protection for a particular substrate. Maintain the unity of these systems, making sure all coats applied to any surface are from the same system and same manufacturer. Verify with the manufacturer the compatibility of the materials used.

PART 2 PRODUCTS

2.1 COATING MATERIALS

The only acceptable manufacturers and products shall be those listed in the material schedules below. All applicable data currently published by the paint manufacturer relating to surface preparation, coverage, film thickness, application technique, drying and over coating times is included by reference as a part of this section. It is the responsibility of the Contractor to obtain and fully understand the appropriate data sheets for the coatings specified.

Paints shall be factory mixed and delivered to the site in unbroken original packages bearing the manufacturer's name and brand designation and shall be applied in strict accordance with the manufacturer's printed instructions. Two component coatings shall be mixed in accordance with the manufacturer's instructions. All two component coatings, once mixed, shall be applied within the pot-life recommended by the manufacturer. Paints, thinners, driers, varnish, etc., shall be of the best grade and shall be furnished by the coating manufacturer for use with the specified

paints.

The Owner will select the colors to be used on the various portions of the work. Provide color cards for the coatings proposed. Where more than one coat of paint is required, job tint off-shadethe paint for each undercoat to show complete coverage.

Material Schedules

SYSTEM: 247 **TYPE: POLYURETHANE** **USE: EXTERIOR FERROUS METALS** **SURFACE PREPARATION: SP-6**						
Coat	**Minimum Dry Film Thickness (Mils)**	**Ameron**	**Carboline**	**Induron**	**Sherwin Williams**	**Tnemec**
1st	3.0	Amercoat 370 or 385	Carboguard 893 SG	Amourguard P-14 Primer	Macropoxy 646 FC Epoxy	Series 66-1211 Epoxoline
2nd	4.0 – 6.0	Amercoat 370 or 385	Carboguard 893 SG	Amourguard Epoxy	Macropoxy 646 FC Epoxy	Series 66-Color Epoxoline
3rd	2.0 – 3.0	Amercoat 450 Series	Carbothane 134HG	Indurethane 5500 Enamel	Sherthane 2K Urethane	Series 1074- Color Endura-Shield IV
System	11.0					

2.3 MIXING AND TINTING

When possible, all paints and other materials shall be mixed and tinted by the paint manufacturer prior to delivery to the job site. When job site mixing and/or tinting is required, the manufacturer's recommendations shall be strictly adhered to. The Contractor shall be solely responsible for the proper conduct of all on-site mixing and/or tinting.

2.4 PIPE AND EQUIPMENT IDENTIFICATION

Different colors will be used on pumps, motors, valves, piping systems and other surfaces as shown in the Table below.

Pipe Identification and Color Coding

	Paint Colors		
Pipe System	**Pipe**	**Letters and Arrows**	**Stencil Text**
Raw Sewage	To Be Selected by Owner	White	Raw Sewage

PART 3 EXECUTION

3.1 GENERAL

Protect other surfaces from paint and damage. Furnish sufficient shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted. Repair damageas a result of inadequate or unsuitable protection.

No coat of paint shall be applied until the surface has been inspected and accepted by the

EOR and Owner. The Contractor shall give at least 24-hour notice to the EOR and Owner when cleaning is to beperformed to prevent inspection delays. The Contractor shall provide the necessary access for inspection by the EOR and Owner.

Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the EOR and Owner. The Contractor shall use repair procedures which ensure the complete protection of all adjacentprimer. The specified repair method and equipment may include wire brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, small nozzle and abrasive particle sizes, shortblast nozzle, distance from surface, shielding and masking. If damage is too extensive or uneconomical to touch up, then the item shall be re-cleaned and coated or painted as directed bythe Engineer.

3.2 ENVIRONMENTAL CONDITIONS

Environmental conditions which affect coating application include, but are not necessarily limited to, ambient air temperature, surface temperature, humidity, dew point and environmental cleanliness. Comply with the manufacturer's recommendations regarding environmentalconditions under which coatings may be applied.

Surface preparation and cleaning of the exterior surfaces must be performed during periods of still air or only a slight breeze so that fall out of the dust produced does not drift onto adjacent property. The Owner reserves the right to temporarily stop the Contractor from exterior blasting(or painting) when by observation it is apparent that the wind direction or velocity prevents compliance with this requirement. Any cleanup of fallout on adjacent property shall be the responsibility of the Contractor. All blast residues shall be properly disposed of off-site by the Contractor.

No paint shall be applied on damp or frosty surfaces, or in wet or foggy weather. No paint shall be applied in temperatures below 40°F, when freezing is predicted within 24 hours of application,or under temperature or humidity conditions not recommended by the manufacturer. However,in no case shall coatings be applied when the surface temperature is within 5°F of dew point, andin no case shall coating be applied over a damp surface.

3.3 SAFETY

The Contractor is responsible for the safety of all workers and subcontractors and suppliers performing work on this project. The Contractor shall protect the Owner, their agents, and the general public from harm attributable to the Contractor's performance, or non-performance, of work on this project. The protection shall include, but not be limited to, providing the necessary safety equipment and instructions for its use by the Owner, and their agents.

The interior of tanks, vaults and manholes may be considered a confined space hazard. The Contractor shall confirm to the Owner, in writing, prior to the start of the project that the Contractor has training programs, trained personnel, and is otherwise in compliance with CFR 1910.146.

3.4 SURFACE PREPARATION

All surfaces shall be thoroughly clean, dry and free from oil, grease, or dust. The EOR and Owner will inspect the surface preparation prior to the application of coatings. Standards for the surface preparation of ferrous metals required in the Material Schedules are the Standards of the SSPC – Society for Protective Coatings (SSPC, SP-1 through SP-10).

3.5 APPLICATION

After specified surface preparation, all surfaces shall be brushed free of dust or foreign matter. Surfaces shall be completely dry before any paint is applied. Paint shall be evenly spread in the proper thickness, so that there shall be no drops, or runs of the coating. Where runs and drops do occur, they shall be removed, and the surface re-coated to the satisfaction of the EOR and Owner. Sufficient time, as directed by the manufacturer, shall be allowed for the paint to dry before the application of the succeeding coats.

Use drop cloths or other suitable means to protect other surfaces of the structure or equipment in place. Upon completion of the work, remove all paint spots from surfaces as directed by the EOR and Owner. The EOR and Owner will inspect each coat prior to the application of subsequent coats. Remove and replace any painting work found to be defective or applied under adverse conditions.

3.6 PAINTING SCHEDULE

The painting schedule below summarizes the painting systems to be applied to the various surfaces. Items which appear in the painting schedule are defined in subsequent paragraphs.

Painting Schedule

Exposures	Surfaces	System Schedules				
		Concrete & Concrete Block Substrate	Non-Ferrous Metals Substrate	Ferrous Metals Substrate	Wood Substrate	Drywall Substrate
Exterior	Ductile Iron Piping	NA	NA	247	NA	NA

Painting Schedule Numbering Guide

First Number - Exposure		Second Number - Substrate		Third Number – Coating Type	
1	Interior and Weather Protected	1	Non-Ferrous Metals	1	Alkyd
2	Exterior Weather Exposure	2	Wood	2	Asphaltic
3	Submerged in Potable Water but Protected from Sunlight	3	Concrete, Concrete Block, Masonry	3	Calcium Aluminate
4	Submerged in Potable Water and Exposed to Sunlight	4	Ferrous Metals	4	Epoxy
5	Submerged in Wastewater	5	Galvanized Ferrous Metals	5	Vinyl
6	Submerged in Wastewater and Exposed to Sunlight	6	Drywall	6	Coal Tar
7	Submerged in Wastewater and Exposed to Hydrogen Sulfide Gas	7	PVC Pipe	7	Polyurethane

				8	Acrylic
				9	Zinc

Exposure terms refer to the environmental conditions to which different surfaces may be exposed.

1. Interior: All surfaces within the confines of a building or other enclosure not constantly exposed to weather, including concealed surfaces subject to trapped moisture, heat or other deteriorating conditions and all surfaces exposed to view.

2. Exterior: All surfaces above finished grade and exposed to weather.

Surfaces include the following.

1. Piping: All plumbing and process piping and accessories including valves, fittings, pipe supports, electrical conduit and similar related items.

3.7 MAINTENANCE MATERIALS

Furnish the Owner at least one gallon of each type and color of paint used for finish coats and one gallon of each type of thinner required. Containers shall be tightly sealed and clearly labeled.

3.8 COATING REPAIR

Where coatings have been damaged, the surfaces shall be cleaned and re-painted. Surface preparation shall conform to SSPC-SP 11 and feathered into undamaged areas. Painting shall be performed as specified for the damaged surface.

(END OF SECTION

DIVISION 11

SECTION 11210
SUBMERSIBLE SEWAGE PUMPS

PART 1 GENERAL

1.1 WORK INCLUDED

The work covered by this Section includes furnishing all labor, equipment and materials required to install and place into operation submersible sewage pumping equipment, controls and accessories as shown on the drawings and specified herein.

The pumping units shall be designed and furnished in accordance with the latest hydraulic institute specifications for submersible sewage pumps. The pump and motor units shall be designed and constructed to operate continuously at full nameplate load while the motor is completely submerged, partially submerged, or totally non-submerged.

1.2 SYSTEM SOURCE AND QUALITY ASSURANCE

All pumps, controls and accessories shall be furnished by a single manufacturer who shall assume complete system responsibility for the pumping system as specified or shown on the construction plans.

1.3 SUBMITTALS

Complete manufacturer's literature in accordance with the requirements of Section 01340 of these specifications shall be submitted. Information to be submitted includes:

1. Manufacturer's data and bulletins
2. Performance curves for all pumps showing capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation.
3. Motor data
4. Dimensional drawings of all pumps, access covers and related equipment
5. Complete electrical diagrams for control panels
6. Control panel layout drawings
7. Catalog data on all ancillary electrical components

1.4 PERFORMANCE REQUIREMENTS

Submersible sewage pumps shall be suitable for pumping raw sewage under the operating conditions specified in the following table:

Pump	Capacity (GPM)	TDH (FT)	HP	Discharge Size (Inches)	Electrical	RPM	Shut-off Head (FT)	KSB Model No.
P-1	1800	16.3	10	8”	460V, 3Ph	1172	34.7	KRT K200-316/96XG-S
P-2	1800	16.3	10	8”	460V, 3Ph	1172	34.7	KRT K200-316/96XG-S

1.5 WARRANTY

In addition to the general guarantee required elsewhere in these specifications, the pump manufacturer shall furnish the Owner with a written warranty to cover the pumps, motors and controls against defects in workmanship and material for a period of 5 years under normal use and service.

1.7 ACCEPTABLE MANUFACTURERS

These specifications and accompanying drawings are based upon the use KSB Pumps and Controls and only such manufacturer shall be included in the Base Bid. Other manufacturers of submersible pumping equipment and controls will be considered in accordance with the provisions of Section 01600 of these specifications.

1.8 RELATED WORK SPECIFIED ELSEWHERE

Section 01340 Shop Drawings
Section 01600 Substitutions
Section 02650 Sanitary Sewer System

PART 2 PRODUCTS

2.1 PUMP DESIGN

The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two stainless steel guide bars extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal contact with no portion of the pumping unit bearing directly on the wetwell floor. Pumps shall be manufactured by KSB (Model numbers as specified in Paragraph 1.4 above). Pumps shall also be provided with stainless steel lifting cables or chains. All pump accessories inside the wet well, including but not limited to, cable holder, guide bars, guide bar brackets, lifting chains or cables and all other metal accessories shall be 316 stainless steel.

2.2 PUMP CONSTRUCTION

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 and bolts shall be AISI Type 304 stainless steel. All metal surfaces coming into contact with the pumped liquid, 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.

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 orViton rubber O-rings.

The cable entry seal design shall preclude specific torque requirements to ensure 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 compressed by the body containing a strain relief function, separate from the function of sealingthe cable. The cable entry junction chamber and motor shall be separated by a stator lead sealinggland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top.

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air-filled watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155 degrees C. Thermal switches setto open at 125 degrees C shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel.The combined service factor of the motor shall be a minimum of 1.15. Leakage sensors shall be provided to detect water in the stator chamber. The thermal switches and the leakage sensors shall be connected to a control and status monitoring unit mounted in the control panel.

The power cable shall be sized according to NEC and ICEA standards and shall be of sufficient length to reach from the pump to the control panel without the need for any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber.

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 1 Division 1, Groups C and D service as determined and approved by a nationally recognized testing laboratory (UL, FM, CSA).

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single roller bearing. The lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces.

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro- dynamically lubricates the lapped seal faces at a constant rate. The lower primary seal unit located between the pump and the lubricant chamber shall contain one stationary and one positively driven rotating tungsten carbide ring. The upper secondary seal unit located between

the lubricant chamber and the motor housing shall contain one stationary and one positively driven rotating tungsten carbide ring. Each seal interface shall be held in contact by its own springsystem.

The pump and motor shaft shall be the same unit and shall be AISI 431 stainless steel.

The impeller shall be of grey cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design capable of handling solids, fibrous material, heavy sludge and other matter normally found in wastewater. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

A wear ring system shall be used to provide efficient sealing between the volute and suction inletof the impeller. Each pump shall be equipped with a brass or nitrile rubber coated steel ring insertthat is drive fitted to the volute inlet.

The pump volute shall be a single piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

2.3 ACCESS HATCHES

Access hatches in the top slab of wet well structures shall have clear opening dimensions in accordance with the recommendations of the pump manufacturer and shall have a minimum load capacity of 300 psf.

Access hatches shall be Aluminum Alloy 6063-T5 and T6, minimum ¼" thick plate, flush type lockwith inside spoon handle. The frame shall be complete with hinged and hasp-equipped cover, upper guide holders, chain holders and cable holder. Chain and cable holder shall be stainless steel. Frame shall be securely mounted above the pumps. Hatch covers shall be torsion bar loaded for ease of lifting and shall have a safety locking handle in the open position and a safety grate.

Aluminum surfaces to be embedded in concrete shall be coated with bitumastic paint.

2.4 GUIDE BARS

Contractor shall furnish and install 316 stainless steel guide bars for each submersible pump. Guide bars shall be of adequate length and strength to extend from the lower guide holders on the pump discharge connection to the upper guide holder mounted on the access cover frame. Intermediate guide supports of stainless steel shall be provided as necessary.

2.5 DUPLEX CONTROLS

The control system shall be designed to operate the pumps in response to liquid level variations in the wet well as sensed by a system of float switches located in the wet well as shown on the drawings. The control function shall provide for the operation of the pumps under normal conditions and shall alternate the pumps on each pump draw down cycle to equalize pump run time.

Control panel shall be UL 508A certified and listed, completely assembled, wired, tested and properly labeled prior to shipment. Control panel to be supplied by pump manufacturer to ensure compatibility between pumps and controls.

The pump controls shall be housed in a NEMA 4X stainless steel enclosure with 3PT pad lockable latch and aluminum inner door. The inner door shall be 12 gauge with a 0.75-inch 90° break on all four sides. Wiring shall have not less than 600-volt insulation with a 75° Celsius rating. The enclosure shall be adequately sized to provide proper spacing of the equipment and have a properly sized cooling system if required.

Pumps shall be controlled by JWSC's standard SCADA pump controller as manufactured by Data Flow System's Inc.

The panel shall consist of the following components:

- Hand-Off-Automatic (H-O-A) switch for each pump
- Overload and short circuit protection for each pump
- Control power breaker
- GFCI outlet on dead front
- GFCI breaker
- 120-volt controls
- Red strobe high level alarm light
- Motor protection circuits for over and under current/voltage and phase change
- Circuit breaker for each pump with inner door lock when in "ON" position
- Field wiring connection using terminal strips with separate blocks for pump, SCADAcontrol and SCADA alarms
- Pump starting shall use NEMA rated contactors
- Pump ambient compensated overload with reset on dead front
- Pump seal leak detection and motor thermal monitor relay by pump manufacturer
- Pump seal failure amber warning pilot light
- Pump thermal fail red warning pilot light
- Green pump running pilot lights
- Pilot lights shall be LED for long life
- Breakers, pilot lights and switches shall be oil tight mounted on inner door for operator access
- Run time hour meters
- Lightning arrestor
- Alarm horn with silence button
- All mounting screws shall be stainless machine with back plate holes drilled and tapped

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 back plate shall be manufactured of 12 gauge sheet steel and be finished with a primer coat and two coats of baked on white enamel.

PART 3 EXECUTION

3.1 INSTALLATION

All equipment in this section shall be installed in accordance with approved shop drawings, the manufacturer's recommendations and these Specifications.

Stainless steel anchor bolts, nuts and washers, as well as any templates necessary for setting the anchorage, shall be furnished by the equipment manufacturer. Placement of the anchor bolts shall be done by the Contractor from certified dimension drawings supplied by the equipment manufacturer.

Level and align pump and motor in accordance with the manufacturer's published data. Grout pump and discharge base with non-shrink grout in accordance with the ACI and the equipment manufacturer and grout manufacturer's published specifications.

3.2 SHOP PAINTING AND PRIMING

All surfaces shall be prepared, shop primed and painted as part of the work of this Section. Surface preparation, shop priming and painting shall be in accordance with the manufacturer's standard specifications and be compatible with field painting as specified in Section 09900.

3.3 START UP SERVICE AND TESTING

At no additional cost to the owner, the pump manufacturer shall furnish the services of a qualified factory trained field service engineer to inspect the installation and instruct the Owners personnel in the proper operation and maintenance of the pumps and controls. All hydraulic, mechanical and electrical tests shall be run to ensure proper operation of the equipment. As a minimum, the site tests include but are not limited to checks for:

1. Compliance with operating requirements
2. Correct rotation before mounting to the discharge connection
3. Balanced voltage and current
4. Proper seating of the pumps to the discharge connection

(END OF SECTION)

DIVISION 15

SECTION 15000
MECHANICAL

PART 1 GENERAL

1.1 WORK INCLUDED

All equipment furnished and installed under this contract shall conform to the general stipulationsset forth in this section and with the JWSC Water and Sewer Standards for Design and Construction.

Contractor shall coordinate all details of equipment with other related parts of the Work,including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alternations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

The Contract Drawings and Specifications shall be considered as complementary, one to the other, so that materials and work indicated, called for, or implied by the one and not by the othershall be supplied and installed as though specifically called for by both. The Contract Drawings are to be considered diagrammatic, not necessarily showing in detail or to scale all of the equipment or minor items. In the event of discrepancies between the Contract Drawings and Specifications, or between either of these and any regulations or ordinances governing work of these specifications, the bidder shall notify the Engineer in ample time to permit revisions.

1.2 QUALITY ASSURANCE

Materials and Equipment: Unless otherwise specified, all materials and equipment furnished for permanent installation in the work shall conform to applicable standards and specifications and shall be new, unused, and undamaged when installed or otherwise incorporated in the work. No such material or equipment shall be used by the Contractor for any purpose other than that intended or specified, unless such use is specifically authorized in writing by the EOR and Owner. No material shall be delivered to the work site without prior acceptance of drawings and data by the Engineer.

Equivalent Materials and Equipment: Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specific item mentioned shall be understood as establishing the type, function, and quality desired. Other manufacturers' products will be accepted, if so noted, provided sufficient information is submitted to allow the EOR and Owner to determine that the products proposed are equivalent to those named. Such items shall be submitted for review in accordance with SpecialConditions section.

Governing Standards: Equipment and appurtenances shall be designed in conformity with ANSI, ASME, ASTM, IEEE, NEMA, OSHA, AGMA, and other generally accepted applicable standards. Theyshall be of rugged construction and of sufficient strength to withstand all stresses which may occurduring fabrication, testing, transportation, installation, and all conditions or operations. All bearings and moving parts shall be adequately protected against wear by bushings or other acceptable means. Provisions shall be made for adequate lubrication with readily accessible means.

Tolerances: Machinery parts shall conform to the dimensions indicated on the drawings within allowable tolerances. Protruding members such as joints, corners, and gear covers shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

Clearances: Ample clearances shall be provided for inspection and adjustment. All equipment shall fit the allotted space and shall leave reasonable access room for servicing and repairs. Greater space and room required by substituted equipment shall be provided by the Contractor and at his expense.

Testing:

1. When the equipment is specified to be factory tested, the results of the tests shallbe submitted to the Engineer and approval of the test results shall be obtained before shipment of the equipment.

2. When an item of equipment, including controls and instrumentation, has been completely erected, the Contractor shall notify the EOR and Owner, who will designate a time to make such tests as required, and operate the item to the satisfaction ofthe EOR and Owner. All testing shall be done in the presence of the EOR and Owner. "Completely erected" shall mean that the installation is erected, all necessary adjustments have been made, all required utility connections have been made, required lubricants and hydraulic fluid have been added and the unit has been cleaned and painted.

Pressure Test:

1. After installation, all of the pressurized piping shall be pressure tested. Piping shall be tested in accordance with Section 15044: Pressure Testing of Piping.

2. All tests shall be made in the presence of and to the satisfaction of the Owner’s Representative and Engineer and also, to the satisfaction of any local or state inspector having jurisdiction.

    a. Unless otherwise indicated in the Special Conditions or specific technical specifications, provide not less than three days’ notice to the Owner’s Representative, Engineer and the authority having jurisdiction when it is proposed to make the tests.

b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of the Engineer shall be retestedin part or in whole as directed by the Engineer.

c. The piping systems may be tested in sections as the work progresses but no joint or portion of the system shall be left untested.

3. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

4. All defects and leaks observed during the tests shall be corrected and made tightin an approved manner and the tests repeated until the system is proven tight.

5. Repair all damage done to existing or adjacent work or materials due to or on account of the tests at no cost to Owner.

6. Provide test pumps, gauges, or other instruments and equipment required for the performance of all tests. Provide all temporary bracing, test plugs, additional restraint, and thrust blocking which may be required for test pressures above normal working pressures.

7. All tests shall be maintained for as long a time as required to detect all defects and leaks but not outside of the minimum/maximum durations specified for eachtype of pipe or piping system.

Failure of Test:

1. Defects: Any defects in the equipment, or deviations from the guarantees or requirements of the Specifications, shall be promptly corrected by the Contractorby replacements or otherwise. The decision of the EOR and Owner as to whether or notthe Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to correct any defects or deviations, or if the replaced equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture for such equipment, may reject that equipment and order the Contractor to removeit from the premises at the Contractor's expense.

2. Rejection of Equipment: In case the Owner rejects a particular item of equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paidto him for the item and the Owner agrees to deliver to the Contractor a bill of sale of all his rights, title, and interestin and to the rejected equipment provided, however that the equipment shall notbe removed from the premises until the Owner obtains from other sources otherequipment to take the place of that rejected. The bill of sale shall not abrogate the Owner's right to recover damages for delays, losses or other conditions arising

out of the basic Contract. The Owner hereby agrees to obtain the alternate equipment within a reasonable time and the Contractor agrees that the Owner may use the original equipment furnished by him without rental or other chargeuntil the other equipment is obtained.

Responsibility during Tests: The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

Acceptance of Materials:

1. Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and acceptance of the Owner. No material shall be delivered to the work without prior submittal approval of the Engineer.

2. The Contractor shall submit to the Engineer data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.

3. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit samplesof materials for such a special test as may be necessary to demonstrate that they conform to the specification. Such a sample shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, theContractor will make arrangements for and pay for tests.

4. The Contractor shall submit data and samples sufficiently early to permit consideration and acceptance before materials are necessary for incorporation inthe work.

Safety Requirements: In addition to the components shown and specified, all machinery and equipment shall be safeguarded in accordance with the safety features required by the current codes and regulations of ANSI, OSHA, and local industrial codes.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

Packaging: All equipment shall be suitably packaged to facilitate handling and protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times.

Protection: All machined surfaces and shafting shall be cleaned and protected from corrosion by the proper type and amount of coating necessary to assure protection during shipment and prior to installation. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of EOR and Owner.

Lubrication: Grease and lubricating oil shall be applied to all bearings and similar items as necessary to prevent damage during shipment and storage.

Marking: Each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

Fabricated sub-assemblies, if any, shall be shipped in convenient sections as permitted by carrier regulations and shall be properly match-marked for ease of field erection.

Responsibility:

1. The Contractor shall be responsible for all material, equipment, and supplies sold and delivered to the site under this Contract until final inspection of the work and acceptance thereof by the EOR and Owner. In the event any such material, equipment, and supplies are lost, stolen, damaged, or destroyed prior to final inspection andacceptance, the Contractor shall replace same without additional cost to the Owner.

2. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within seven (7) days after written noticeto do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

Delivery: The Contractor shall arrange deliveries of products in accordance with construction schedules and coordinate to avoid conflict with work and condition at the site.

1. The Contractor shall deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, the Contractor shall inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

3. Under no circumstances shall the Contractor deliver equipment to the site more than one month prior to installation without written authorization from the Engineer.

Storage and Protection of Products: The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project. Storage of equipment shall be in strict accordance with the "Instructions for Storage" of each equipment supplier and manufacturer including connection of space heaters and placing of storage lubricants in equipment. Corroded, damaged, or deteriorated equipment and parts shall be replaced before acceptanceof the project. Equipment and materials not properly stored will not be included in the payment estimate.

1. The Contractor shall store products subject to damage by the elements in weather-tight enclosures.

2. The Contractor shall maintain temperature and humidity within the ranges required by the manufacturer’s instructions.

3. The Contractor shall store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. The Contractor shall cover products which are subject to deterioration with impervious sheet coverings and provide adequate ventilation to avoid condensation.

4. The Contractor shall store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

All materials and equipment to be incorporated in the work shall be handled and stored by the Contractor before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft, or damage of any kind whatsoever to the material or equipment.

Cement, sand, and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt, or grease, and in a position to prevent accumulations of standing water, staining, chipping, or cracking. Brick, block, and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking, and spalling to a minimum.

All materials which, in the opinion of the Engineer/Owner’s Representative, have become damaged and are unfit for the use intended or specified, shall be promptly removed from the siteof the work, and the Contractor shall receive no compensation for the damaged material or its removal.

The Contractor shall arrange storage in a manner to provide easy access for inspection. The Contractor shall make periodic inspections of stored products to assure products are maintained under specified conditions, and free from damage or deterioration.

Protection After Installation: The Contractor shall provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. The Contractor shall remove the covering when no longer needed.

1.4 WARRANTY AND GUARANTEES

The manufacturer's warranty period shall be concurrent with the Contractor's correction period for one (1) year (unless otherwise indicated in the technical specifications or other Contract Documents) after the time of final completion and acceptance.

1.5 MAINTENANCE MATERIALS

All grease, oil, and fuel required for testing equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.

PART 2 PRODUCTS

2.1 FABRICATION AND MANUFACTURE

Workmanship and Materials:

1. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage or other failure. Materials shall be suitable for service conditions.

2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

3. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least ¼-inch thick.

Lubrication:

1. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrications systems shall not require attention during startup or shutdown and shall not waste lubricants.

2. Lubricants of the type recommended by the equipment manufacturer shall be furnished by the Contractor in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by EOR and Owner. Unless otherwise specified or permitted, the use of synthetic lubricants will not be acceptable.

3. Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

Safety Guards: All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage or heavier galvanized or aluminum-clad sheet steel or ½-inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

Equipment Foundation Supports:

1. All foundations, platforms and hangers required for the proper installation of equipment shall be furnished and installed by the Contractor.

2. Unless otherwise indicated or specified, all equipment shall be installed on reinforced concrete bases at least 6 inches high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neatdesign. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage anda threaded drain connection. Baseplates shall be anchored to the concrete basewith suitable anchor bolts and the space beneath filled with grout. All open equipment bases shall be filled with non-shrinking grout sloped to drain to the perimeter of the base.

3. The Contractor shall furnish, install and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for

the installation of equipment. These shall be of ample size and strength for thepurpose intended.

4. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structuralconcrete is placed. Unless otherwise indicated or specified, anchor bolts for itemsof equipment mounted on baseplates shall be long enough to permit 1-1/2 inchesof grout beneath the baseplate and to provide adequate anchorage into structural concrete.

5. Structural steel supports and miscellaneous steel required for supporting and/or hanging equipment and piping furnished under this Section shall be provided and installed by the Contractor.

6. All foundations, anchor pads, piers, thrust blocks, inertia blocks and structural steel supports shall be built to template and reinforced as required for loads imposed on them.

7. The Contractor shall assume all responsibility for sizes, locations and design of all foundations, anchor pads, pier, thrust blocks, inertia blocks, curbs and structural steel supports.

Shop Painting:

1. All steel and iron surfaces shall be protected by suitable paint or coatings appliedin the shop. Surfaces which will be inaccessible after assembly shall be protectedfor the life of the equipment. Exposed surfaces shall be finished smoothly, thoroughly cleaned, and filled as necessary to provide a smooth uniform base forpainting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with a high-grade oil- resistant enamel suitable for coating in the field with an alkyd enamel. Coatings shall be suitable for the environment where the equipment is installed.

2. Surfaces to be painted after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer. Unless otherwisespecified, the shop primer for steel and iron surfaces shall be Cook "391-N-167 Barrier Coat", Koppers "No. 10 Inhibitive Primer", or EOR and Owner approved equal.

3. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound, Houghton "Rust Veto 344", Rust-Oleum "R-9", or EOR and Owner approved equal.

Nameplates: Contractor shall provide equipment identification nameplates for each item of equipment. Unless otherwise indicated, nameplates shall be 1/8inch Type 304 stainless steel and

shall be permanently fastened. Plates shall be fastened using round head metallic drive screws, or where metallic drive screws are impractical, with stainless steel pop rivets. Metallic drive screws shall be brass or stainless steel, Type V and No. 8 by 3/8-inch long. Names and/or equipment designations shall be engraved on the plates and the engraving painted with a primerand black paint system compatible with stainless steel. Contractor shall submit a list of proposed names and designations for review prior to fabrication of nameplates. At a minimum, each nameplate shall include the equipment manufacturer's name, year of manufacture, serial number andprincipal rating data.

Pipe Identification: Underground pipe: All non-metallic water and force main piping has had locate wire systems installed in accordance with Owner's standards and technical specifications. Detection tape shall be installed for all water and force main piping in accordance with Owner's standards.

2.3 ACCESSORIES

Special Tools and Accessories: Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

PART 3 EXECUTION

3.1 INSTALLATION AND OPERATION

Installation: Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper results. When so specified, or when employees of Contractor or his subcontractors are not qualified, such personnel shall be field representatives of the manufacturer of the equipment or materials beinginstalled.

1. The Contractor shall have on site sufficient proper construction equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory assembled when practical.

2. Equipment shall be erected in a neat and workmanlike manner on the foundations and supports at the locations and elevations shown on the Drawings, unless otherwise directed by the Engineer during installation.

3. All equipment shall be installed in such a manner as to provide access for routine maintenance, including lubrication.

4. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the equipment manufacturer's qualified mechanic, millwright, machinist, or authorized

representative, to align the pump and motor prior to making piping connectionsor anchoring the pump base.

5. Equipment of a portable nature which requires no installation shall be delivered to a location designated by the Owner.

Tolerances: Precision gauges and levels shall be used in setting all equipment. All piping and equipment shall be perfectly aligned, horizontally and vertically. Tolerances for piping and equipment installation shall be ½-inch to 30 ft. horizontal and vertically. All valves and operators shall be installed in the position shown on the Contract Drawings or as directed by the Engineer, if not shown.

Alignment and Level: The equipment shall be brought to the proper level by shims (1/4 inch maximum). After the machine has been leveled and aligned, the nuts on the anchor bolts shall be tightened to bind the machine firmly into place against the wedges or shims.

Grouting: The grout shall be tamped into position with a board, steel bar, or other tool. Tamping should not be so hard as to raise or otherwise displace the plate.

Contact of Dissimilar Metals: Where the contact of dissimilar metal may cause electrolysis and where aluminum will contact concrete, mortar, or plaster, the contact surface of the metals shallbe separated using not less than one coat of zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface.

Cutting and Patching: All cutting and patching necessary for the work shall be performed by the Contractor.

Operation: All equipment installed under this Contract, including that furnished by Owner or others under separate contract, shall be placed into successful operation according to the writteninstructions of the manufacturer or the instructions of the manufacturer's field representative. All required adjustments, tests, operation checks, and other startup activity shall be provided.

3.2 OBSERVATION OF PERFORMANCE TESTS

Where the specifications require observation of performance tests by the Owner’s Representativeor Engineer such tests shall comply with the quality assurance paragraph in this section.

3.3 MANUFACTURER’S FIELD SERVICES

Services Furnished Under This Contract:

1. An experienced, competent, and authorized representative of the manufacturer of each item of equipment shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall re-visit the job site as often

as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer/Owner's Representative at no additional cost to Owner. The authorized representative shall also utilize the site visit to instruct the Owner's staff in the proper operation of the equipment.

2. Each manufacturer's representative shall furnish to Owner and Engineer, a letterof certification stating that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

3. All costs for field services shall be included in the contract amount for such an item.

(END OF SECTION)

SECTION 15044
PRESSURE TESTING OF PIPING

PART 1 GENERAL

1.1 WORK INCLUDED

Scope of Work: Hydrostatic testing shall be conducted for all pressurized piping systems. Pressure and leakage testing shall be performed in accordance with the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications.

PART 2 PRODUCTS

2.1 GENERAL

Testing fluid shall be potable water.

2.2 MATERIALS AND EQUIPMENT

Unless otherwise indicated, Contractor shall provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic testing.

PART 3 EXECUTION

3.1 TESTING

All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications as noted below.

1. Reference Section 2.5.3.8 of the JWSC Standards for hydrostatic testing of water mains.

2. Reference Section 4.7.7 of the JWSC Standards for hydrostatic testing of force mains.

(END OF SECTION)

SECTION 15062
DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 WORK INCLUDED

Scope of Work: The work under this section includes the furnishing, installation, and testing of all Ductile Iron pipe and fittings and appurtenant materials and equipment as indicated on the Construction Drawings and/or as specified herein. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and as described in this Section.

1.2 QUALITY ASSURANCE

Reference Standards

1. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A21.51.
2. Ductile iron pipe thickness: ANSI A21.50.
3. Cement mortar lining for water: ANSI21.4.
4. Cast and ductile iron fittings: ANSI A21.10.
5. C.I. pipe flanges and fittings: ANSI B16.1.
6. Threaded flanges: CIPRA standard.

Qualifications: All ductile iron pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

Manufacturer: Pipe and fittings shall be as manufactured by the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, Star Pipe Products, or Engineer approved equal.

1.3 SUBMITTALS

1. Shop Drawings, including layouts within, and under buildings and structures shall be submitted to the Engineer for approval in accordance with Special Conditions. Shop Drawings shall be prepared by the pipe manufacturer.
2. Tabulated layout schedule, as appropriate for project.

3. Details of special elbows and fittings.

4. Calculations and/or test data demonstrating that the proposed retrained joint arrangement can transmit the required forces.

5. Copy of the manufacturer's quality control check of pipe material and production.

6. Provide an affidavit of compliance with AWWA standards referenced in this specification.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All pipe shall be shipped and stored at the jobsite with wood lagging between pipes such that pipes do not make contact with one another.

B. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

PART 2 PRODUCTS

2.1 MATERIALS

Pipe - Ductile Iron Pipe Conforming to ANSI A21.51 and AWWA C151:

1. Unless otherwise shown on the Construction Drawings or Contract Documents, the minimum thickness of ductile iron pipe shall be Pressure Class 350 for piping 3 in. through 12. in., and Pressure Class 250 for piping 14 in. and larger.

2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.

3. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the coupling manufacturer.

4. Pipe shall be supplied in lengths not in excess of 20 feet having rubber-ring type push-on joints, standard mechanical joints or restrained joints where required for underground piping and flanged joint piping, for all above ground piping as shown on the Drawings.

Coatings and Linings:

Interior Coatings and Linings:

1. Pipe for finished potable water and reclaimed water use shall be cement-mortar lined and seal coated, conforming to ANSI A21.4 and AWWA C104.

    a. Pipe and fittings for non-potable use, except as otherwise noted, shall have a ceramic epoxy coating installed on the interior of the pipe. The coating shall be Tnemec Series 431 Perma-Shield PL. Coating thickness shall be 40 mils minimum dry film thickness.

2. Exterior Coating: All ductile iron pipe and fittings shall be externally coated with a bituminous coating per ANSI A21.51.

Fittings:

1. All ductile iron pipe fittings shall match the pressure class rating of the adjacent piping.

2. Grooved-end fittings shall conform to AWWA C110 and ANSI B16.1 with groovedends conforming to AWWA C606, radius cut rigid joints. Fitting material shall conform to ASTM A 48, Class 30, or ASTM A 126, Class B.

Joints (as shown on the Construction Drawing and/or specified):

1. General: Joints in "runs" of aboveground piping or piping located in vaults and structures shall be rigid radius grooved end or flanged. Joints in "runs" of buried piping shall be of the push-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment.

2. Grooved-End Couplings:

    a. Grooved-end couplings shall be malleable iron, ASTM A 47 (Grade32510), or ductile iron, ASTM A 536 (Grade 65-45-12).

    b. Bolts: ASTM A 183, 110,000 psi tensile strength.

    c. Gaskets: Halogenated butyl rubber or EPDM for water service and Buna-N for sewage service, conforming to ASTM D 2000

    d. Couplings: AWWA C606 for rigid radius ductile-iron pipe. Couplings shallbe Victaulic Style 31, Gustin-Bacon No. 500, or equal.

e. Grooved-end adapter flanges for piping having an operating pressure of 150 psi and less shall be Victaulic Style 341, or equal. Flange dimensions shall conform to ANSI B16.1 Class 125.

3. Flanges:

a. Flanges shall be Class 125 per ANSI B16.1 unless otherwise specifically noted. Determine the pressure rating of the fittings based on the test pressures shown in Section 15044: Pressure Testing of Piping.

b. Gaskets: Fullface, 1/8 inch thick, neoprene: Johns-Manville, John Crane Co., or Engineer approved equal. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180 degrees Fahrenheit (°F). Gaskets shall comply with Appendix A of AWWA C110.

c. Bolts and Nuts for Flanges

1) Bolts and nuts for flanges located indoors, in enclosed vaults and structures, buried and submerged and located outdoors above ground or in open vaults in structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B&M for bolts, and ASTM A 194, Grade M for nuts. Bolts shall comply with Appendix A of AWWA C110.

2) Provide washers for each nut. Washers shall be of the same material as the nuts.

d. Provide specially drilled flanges when required for connection to existing piping or special equipment.

e. Factory assemble screwed on flanges shall be long-hub type screwed tightly on pipe by machine at the foundry prior to facing and drilling. Flange faces shall be coated with a rust inhibitor immediately after facing and drilling. Field assembled screwed on flanges are prohibited.

4. Push-on and mechanical joint (ANSI A21.11):

a. The plain ends of push-on pipe shall be factory, machined to a true circle and chamfered to facilitate fitting the gasket.

b. Provide gaskets manufactured from a composition material suitable for exposure to the liquid to be contained within the pipe.

c. Each joint shall be complete with rubber gasket, cast iron gland and all required bolts and nuts.

Thrust Restraint:

1. Thrust blocks: Shall not be permitted unless specifically indicated on the Drawings.

2. Restrained joints:

   a. Pipe joints shall be mechanically restrained type as accepted by the Engineer. Restrained joints that require field welding or requiring set screws will not be acceptable, except restrained joints for mechanical joints shall be Megalug by Ebba Iron, or Engineer approved equal. Standard retainer glands are not considered equal.

   b. Pipe joints shall be restrained on each side of the fitting for a continuous distance in accordance with DIPRA "Thrust Restraint Design for Ductile Iron Pipe". Distance restrained shall be based on sand-silt soil type, 3.0 feet of cover and Type 5 laying condition.

   c. Bolts and nuts for restrained joints shall be Corten, low alloy, high strength steel.

PART 3 EXECUTION

3.1 INSPECTION AND TESTING

All pipe shall be inspected and tested at the foundry.

The Owner shall have the right to have any or all piping, fittings or special castings Inspected and tested by an independent testing agency at the foundry. Such inspection and testingwill be at the Owner's expense.

Mark as rejected and immediately removed from the job site, all pipe lengths showing a crack, damaged lining, or receiving a severe blow that may cause an incipient fracture, even though no such fractures can be seen.

Removal of cracked portions:

1. Any pipe showing a distinct crack, but no incipient fracture beyond the limits of the visible crack, may be cut off and the sound portion installed. Cut the pipe at least 12 inches from the visible limits of the crack. Cutting of pipe shall be done by skilled workmen, and in such a manner as to not damage the pipe. Every cut shall be square and smooth, with no damage to the pipe lining. Cut surfaces, shall be recoated as specified for the pipe.

2. Cutting and installing cracked pipe shall only be performed when approved by the EOR and Owner and shall be at the expense of the Contractor.

Carefully inspect and hammer test all pipe and fittings prior to installation.

3.2 INSTALLATION

Assembling joints:

1. Push-on joints:

   a. Insert the gasket into the groove of the ball.

   b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.

   c. Insert the chamfered end of the plain pipe into the gasket and push untilit seats against the bottom of the socket.

2. Bolted joints:

   a. Remove rust preventative coatings from machined surfaces prior to assembly.

   b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings, and gaskets.

3. Grooved end joints:

   a. Install grooved end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following.

   b. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer's gasket lubricant to the gasket exterior, including lips, pipe ends, and housing interiors.

   c. Fasten coupling alternately and evenly until coupling halves are seated. Use torques as recommended by the coupling manufacturer.

4. Flanged Joints:

   a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate bolts with oil and graphite.

b. Insert the nuts and bolts (or studs) finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.

c. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.

d. If flanges leak under pressure testing, loosen, or remove the nuts and bolts, reset, or replace the gasket, reinstall, or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

5. Mechanical Joints:

a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.

b. Lubricate the gasket, bell, and spigot by washing with soapy water.

c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly sealed.

d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.

e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joints to the proper tension with a torque wrench.

6. Bell and spigot joints:

a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.

b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

Fabrication:

1 Tapped connections:

a. Make all tapped connections as shown on the Drawings or as directed by the Engineer.

b. Make all connections watertight and of adequate strength to prevent pullout.

c. Drill and tap normally to the longitudinal axis of the pipe.

2. Cutting:

a. Perform all cutting with machines having rolling wheel cutters or knives designed to cut ductile iron. The use of a hammer and chisel to cut pipeis prohibited.

b. After cutting, examine all cut ends for possible cracks.

c. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

Installing Buried Piping:

1. Inspect each pipe and fitting before lowering the buried pipe or fitting into the trench. Inspect the interior and exterior protective coatings. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

2. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.

3. When installing piping in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.

4. Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with allowance for pipe thickness. Remove hard spots that would prevent a uniform thickness of bedding. Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

5. At the location of each joint, dig bell (joint) holes of dimensions in the bottom of the trench and at the sides to permit visual inspection of the entire project.

6. Keep the trench in a dewatered condition during pipe laying in accordance with Section 02220; Excavating, Backfilling and Compacting.

7. When the pipe laying is not in progress, including the noon hours, close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.

Installing Interior Piping:

1. All piping and fittings shall be installed true to alignment and rigidly supported thrust anchors shall be provided where required. Any damage to linings shall be repaired to the satisfaction of the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before erection.

2. Sleeves shall be installed of proper size for all pipes passing through floors or walls as shown on the Drawings. Where indicated on the Drawings, or required for liquid or gas-tightness, the pipe shall be sealed with mechanical seal equal to Link-Seal as manufactured by GPT Industries., or Engineer approved equal.

3. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be, in accordance with the requirementsof the piping layout and jointing method and their locations shall be verified from approved piping layout drawings and the structural drawings.

4. Except as otherwise shown on the Construction Drawings either split type couplings or flange joints may be used. Prior to approval of jointing, method layouts for hanger and supports shall be submitted to the Engineer for approval.

5. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped.

6. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, a certification shall be submitted stating that such requirements have been complied with.

Pipe deflection:

1. Push-on and mechanical joints:

   a. The maximum permissible deflection of alignment at joints shall be 80% of the manufacturer’s allowable deflection.

Flexible joints: The maximum deflection in any direction shall not exceed 80% of the manufacturer's instructions and recommendations.

Hydrostatic Testing: Test in accordance with Section 15044: Pressure Testing of Pipe.

(END OF SECTION)

SECTION 15100
VALVES AND SPECIALTIES

PART 1 GENERAL

1.1 WORK INCLUDED

Scope of Work: Furnish, install, support, and test valves, gates, hydrants, cocks, stops, and faucets, when applicable, (hereinafter referred to as "valves") in the location(s) and of the size(s) and quantities shown on the Drawings and/or as directed by the JWSC. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and as described in this Section.

1.2 QUALITY ASSURANCE

Qualifications:

1. All equipment furnished under this Specification shall be new and unused and shall be a standard product which has a successful record of reliable service in similar installations for a minimum of five (5) years.

2. All valves of the same type and duty shall be furnished by a single manufacturer.

Standards:

1. ANSI.

2. AISI.

3. SSPC.

4. AWWA.

1.3 SUBMITTALS

Materials and Shop Drawings: Copies of all materials required to establish compliance with the Specification shall be submitted in accordance with the Special Conditions. Submittals shall include at least the following:

1. Certified shop drawings showing all important details of construction, dimensions (including laying length), and weight.

2. Descriptive literature, bulletins, and/or catalogs showing all valve parts, valve operator, and describing material of construction by material and specification (e.g., AISI).

3. Valve coatings and linings, as required.

4. A complete total bill of materials for all equipment.

Operating Instructions: Copies of operating and maintenance instructions shall be furnished in accordance with Section 01710 Operation and Maintenance Data. These shall include equipment lists, descriptions, and information necessary to instruct operating and maintenance personnel unfamiliar with the valves.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

Shipping:

1. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed.

2. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the EOR and Owner.

3. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built, and securely bolted thereto.

4. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

5. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.

6. Each box or package shall be properly marked to show its net weight in addition to its contents.

Storage:

1. Store valves and accessories in an area on the construction site protected from weather, moisture, or possible damage.

2. Do not store valves or accessories directly on the ground.

Handling:

1. Handle valves and accessories to prevent damage of any nature.

2. Carefully inspect all materials for:

a. Defects in workmanship and materials.

b. Removal of debris and foreign material in valve openings and seats.

c. Proper functioning of all operating mechanisms.

d. Tightness of all nuts and bolts.

PART 2 PRODUCTS

2.1 GENERAL

Materials shall be as indicated in JWSC Standards for Water and Sewer Design and Constructions, specific sections, or on the Drawings, and compatible with intended use.

Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached stainless steel plate.

Bolts, washers, nuts, and gaskets for flanged valves shall be as described in the JWSC Standards for Water and Sewer Design and Construction or the specific piping sections.

Coat metal valves located above ground or in vaults and structures the same as the adjacent piping. Apply the specified prime coat at the place of manufacture. Apply finish coat in field. The finish coat shall match the color of the adjacent piping.

2.2 PLUG VALVES – FORCEMAIN ISOLATION

All plug valves, unless specifically shown otherwise on the drawings, shall be of non-lubricated, eccentric plug type with resilient faced plugs and shall be furnished with end connections as shown on the Contract Drawings, unless otherwise approved. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall meet AWWA C111, Class B.

Valve bodies shall be ASTM A126, Class B cast iron with all exterior mounted bolts and nuts to be stainless steel. Valve shall have Buna “N” neoprene, epoxy, or fusion bonded, nylon faced plug. The interior of all plug valves shall be epoxy coated.

Port areas shall be 100% of full pipe area. The valve seat material shall consist of either a welded in 1/8-inch overlay of 90% pure nickel, or 316 stainless steel screwed into the cast iron body. Upper and lower plug stem bearings shall be sleeve-type of stainless steel or other non-corrosive bearing material. The packing shall be adjustable, and the bonnet shall be bolted. All bolts, nuts and washers shall be 316 stainless steel for buried, non-buried, and pit installed service. All buriedvalves on push-on joint pipe shall have mechanical joint ends and meet the requirements of ANSIA21.11. All exposed (non-buried) valves shall have flanged ends in accordance with American Standard B16.1, Class 125. The valves shall be rated for a minimum of 150 psi, non-shock cold W.O.G. and shall provide drip-tight shut off with this pressure in either direction. The operating nut or hand wheel shall have an arrow cast in the metal indicating direction of opening. The valve manufacturer shall furnish certified copies of performance, leakage and hydrostatic testing as outlined in AWWA C504.

All plug valves 8-inches and larger shall be equipped with totally enclosed worm gear actuators complying with AWWA C504. All gearing shall run in oil. The actuator housing shall be semi-steel with seals to prevent dirt or water from entering the housing. Shaft bearings shall be permanently lubricated bronze bushings. Appropriately sized hand wheel operators shall be provided for each non-buried, gear-actuated valve. Buried valves shall have seals on all shafts and gaskets on valve covers. Buried valves shall be provided with 2-inch square operating nut with extension stem with operating nut no more than 8-inches below finish grade.

Plug valves shall be as manufactured by DeZurik PEF Eccentric Plug Valves, Pratt Ballcentric Full Port Eccentric Plug Valve, or JWSC approved equal.

2.3 CHECK VALVES

Check valve shall be mounted horizontally unless approved otherwise by JWSC. Check valves shall conform to the requirements of AWWA C508.

All check valve interiors shall be fully coated with a liquid thermosetting epoxy suitable for use in wastewater applications.

Check valves shall be swing check type. Swing check valves larger than two (2) inch nominal size shall be cast iron body with stainless steel bolts and nuts, flanged ends, 316 stainless steel shaft connected to a steel outside lever and weight, swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber-faced disc.

Check valves larger than two (2) inches shall be 150 psi working pressure.

Check valves two (2) inch and smaller nominal size shall be all brass swing check valves, 200 psi working pressure.

Swing check valves larger than two (2) inch nominal size shall be Clow Valve Company Style 1106LW or Style 159-02 or JWSC approved equal.

2.4 VALVE BOXES

All buried valves shall have cast-iron three-piece adjustable valve boxes. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by the JWSC. The barrel shall be two-piece, sliding type, having 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with a cast iron cover. Covers shall have "WATER"or "SEWER" cast into the top for all such mains, as appropriate. The actuating nuts for deeper valves shall be extended to come up to within four (4) feet of the finished grade.

Care shall be taken installing valve boxes to ensure that valve stems are vertical, and the cast iron box has been placed over the stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Contractor shall remove any sand or undesirable fill from valve box prior to final inspection. Any valve box which has been moved from its original position by trench settlement or other causes, and which prevents the use of a valve wrench for opening and closing of the valve, shall be reset by the Contractor prior to final acceptance. The entire assembly shall be plumb.

In unpaved areas, a poured in place reinforced concrete valve pad shall be installed around all valve boxes. The concrete thickness shall be four (4) inches for poured in place collars. The top of the poured in place collar shall be level with the top of the cast iron valve box and **level with the final grade**.

PART 3 EXECUTION

3.1 PREPARATION

Apply coatings to valves and miscellaneous piping appurtenances as per JWSC Standards for Water and Sewer Design and Construction.

Apply coats of paint filler and enamel to parts customarily finished at the shop.

Apply a shop coat of grease or other suitable rust resistant coating to ferrous surfaces obviously not to be painted.

3.2 INSTALLATION

Install valves and accessories in strict accordance with manufacturer's instructions and recommendations, as shown on the Drawings and/or as directed by the JWSC.

Carefully erect all valves and support them in their respective positions free from distortion and strain.

Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.

Support all valves connected to pumps and equipment, and in piping systems that cannot support valves.

Repair any scratches, marks, and other types of surface damage, etc., with original coating as supplied by the factory.

3.3 INSPECTION AND TESTING

Check and adjust all valves and accessories for smooth operation.

Test valves for leakage at the same time that connecting pipelines are tested. See Section 15044: Pressure Testing of Piping for pressure testing requirements. Protect or isolate any parts of valves, operators, or control and instrument systems whose pressure rating is less than the pressure tests.

If flanges leak under pressure testing, loosen, or remove the nuts and bolts, reseat, or replace the gasket, reinstall, or retighten the bolts and nuts, and retest the joints.

(**END OF SECTION)**

APPENDICES

SECTION 3
GRAVITY SEWER SYSTEMS

3.1 GENERAL

This section provides the minimum guidelines for the design of gravity sanitary sewer collection systems. The method of design and/or construction shall be according to these Design and Construction Standards and Specifications and the following:

Recommended Standards for Sewage Works (Ten State Standards) Latest Edition

Georgia Environmental Protection Division State of Georgia Regulations for Water and Sewerage Works, Latest Edition

Applicable Federal, State and Local Requirements

In the event of conflicts among the various sources cited above, the most stringent criteria shall take precedence.

3.2 DESIGN FLOWS

Each system component shall be designed to meet certain flow requirements. The various flow requirements are described below.

3.2.1 Daily Average Dry Weather Flow (ADWF)

Daily Average Dry Weather Flow (ADWF) shall be 300 gallons per day per Residential Equivalent Unit (REU) or 115 gallons per day per capita. The basis for one (REU) shall be asingle-family unit occupied by an average of 2.6 persons. Where sewer service beyond the basis of the established REU is required, the Sewage Flow Table shown below(adapted from the Georgia Environmental Division Large Community Design Guidance Document, Pages 8 & 9, Appendix A) shall be used.

Figure GS-1
Sewage Flow
Table

FACILITY	Gallons/Day (GPD)
Assembly Hall	5 per seat
Barber Shop/Beauty Parlor	125 per chair + 20/employee
Boarding House*	100 per room
Bowling Alley	75 per lane + 20/employee
Church w/o Day Care or Kindergarten	5 per sanctuary seat
Correctional Institution/Prison	250 per inmate
Country Club, Recreation Facilities Only	25 per member
Day Care Center, No Meals	15 per person
Dental Office	100 per chair + 20/employee
Department Store	10 per 100 SF
Factory Without Showers With Showers	 25 per employee 35 per employee
Food Service Establishments* Restaurants (Up to 12 hours per day) Restaurants (12 hours per day to 18 hours perday) Restaurants (Above 18 hours per day)Bar and Cocktail Lounge Drive-in Restaurant Carry-out Only	 35 per seat + 20/employee 50 per seat + 20/employee 75 per seat + 20/employee 30 per seat + 20/employee 50 per space + 20/employee50 per 100 SF + 20/employee
Funeral Home	10 per 100 SF
Hospital Inpatient Outpatient	 300 per bed 275 per bed
Hotel*	100 per room
Kindergarten, No Meals	15 per person
Laundry, Commercial	1,000 per machine
Laundry, Coin	150 per machine
Lodges*	100 per room
Mobile Home Park	300 per site
Motel*	100 per room
Nursing Home*	150 per bed
Office	10 per 100 SF
Physician's Office	200 per exam room
Schools* Boarding Day, Restrooms Only Day, Restrooms and Cafeteria Day, Restrooms, Gym, and Cafeteria	 100 per person 12 per person 16 per person 20 per person
Service Stations, Interstate Locations	425 + 150 per pump
Service Stations, Other Locations	300 + 100 per pump
Service Station Car Wash	500 per stall
Shopping Center (Not including food service or laundry)	10 per 100 SF
Stadium	5 per seat
Supermarket/Grocery Store	20 per 100 SF
Theater	5 per seat

FACILITY	Gallons/Day (GPD)
Travel Trailer Park* With Independent Water & Sewer Connection Without Independent Water & Sewer Connection	 175 per site 35 per site
Warehouse	Ten per 100 SF
*Add three hundred gallons per machine to amount indicated iflaundry or dish washing machines are installed	

Note: Where historical data is available from flow monitoring or other approved devices as in the case of existing systems, ADWF shall be as averaged from seven (7) days within the monitoring period of flow with no rainfall event greater than .5 (5/10ths) inches of rain in any of the seven 24-hour periods being averaged.

3.2.2 Calculation of Peak Flow (PF)

For gravity systems, the Daily Average Dry Weather Flow (ADWF) to be conveyed must be adjusted to allow for the maximum diurnal or peak flow that is expected to occur as follows:

Peak Flow = PF x Average Dry Weather Flow (ADWF)

Where:

Peaking Factor = **PF** = $5 / P^{0.1667}$ as referenced in ASCE Manual and Reports of Engineering Practice #60 and WPCF Manual of Practice #FD-5, (Babbitt Equation);

Population = **P** = used as P/1,000 in the equation with each 300 GPD (REU) considered as serving 2.6 persons as follows:

For residential use, (i.e., 5 single family residences times 2.6 persons/residence = 13 and 13/1,000 = P = 0.013);

For Commercial Use, by dividing the total calculated GPD from the EPD Sewage Flow Table (Figure GS-1) by 300 GPD/REU and multiplying the REU's by 2.6, (i.e., 4,000 GPD/300 GPD = 13.3 REU's X 2.6 persons/REU = 35 and 35/1,000 = P = 0.035);

For Industrial Use, by employee count GPD from EPD Sewage Flow Table (Figure GS-1)divided by 300 GPD/REU and then multiplying the REU's by 2.6 persons/REU to approximate employee population, plus the maximum gallon per minute wastewater discharge capability, (as provided by the process design engineer), multiplied by 1,440 minutes/day and divided by 300 GPD to obtain REU's then multiplying the REU's by 2.6 to obtain an approximate equivalent population for process flow, (i.e. 25 factory employee @ 30 GPD = 900 GPD/300 GPD = 3 REU's X 2.6 persons/REU = 8 and peak process water discharge @ 150 GPM X 1,440min/day = 216,000 GPD/300 GPD per REU = 720 REU's X 2.6 persons/REU = 1,872, then 1,872 for process water population approximation + 8 factory employee population approximation = 1,880 and 1,880/1,000 = P = 1.88).

3.3 SIZING OF GRAVITY SEWER MAINS

3.3.1 Major Outfalls

The size of major outfall sewers or extensions to such mains, throughout the system shallbe in accordance with JWSC Water and Sewer Master Plan, latest revision. Contact the Planning and Construction Division for additional information and guidance with regard to this requirement.

3.3.2 Collector Sewers

All gravity sewer mains shall be designed to convey the Design Peak Flow at a flow depth not to exceed 94% of the pipe inside diameter or less than 0.6 inches, and at a self- cleansing velocity of between 1.99 FPS and 2.01 FPS. Gravity sewer mains intended for public use and JWSC operation and maintenance shall be sized to meet these hydraulic guidelines with the minimum pipe size being 8-inches in diameter, unless specifically allowed subject to the 6-inch pipe diameter exceptions cited in paragraph 3.4.2 below.

3.4 GRAVITY SEWER MAIN PIPE SLOPE REQUIREMENTS

3.4.1 Discussion

The major items for consideration in the regulation of gravity sewer pipe slopes are carrying capacity at peak flow and self-cleansing velocity. The inability to convey peak flow results in system surcharging and potential sanitary sewer overflows. The lack in the development of self-cleansing velocity, at least during the flows diurnal peak, results in solids deposition, system odors, and the eventual reduction in pipe capacity leading to blockages and overflows.

An additional consideration in the JWSC jurisdictional area, and numerous other coastal areas, is wastewater piping system detention time. Lengthy wastewater detention or travel time through gravity piping systems encourages the development of corrosive and odorous gases that damage piping infrastructure, cause odor complaints and increase thecost of system operation by requiring the addition of chemicals to inhibit or mitigate the effects of aging wastewater. Therefore, the design of gravity sewer systems in this standard shall stress the development of self-cleansing velocities as the most practical and effectivemethod of minimizing wastewater detention times in sewer mains.

Standardized slopes, as recommended by Ten States Standards in concert with the minimum pipe diameters and minimum flow depths suggested in these guidelines, often forces the designer to hold to a pipe grade that does not provide adequate velocities at "projected" flow rates and/or forces a pipe grade that shortens the potential reach of a proposed sewer main when projected flow rates would develop self-cleansing velocity at a lesser grade.

In an effort to address these aforementioned issues, the JWSC's pipe slope design requirements are developed to provide a range of acceptable pipe slopes based on good hydraulic engineering practice using "projected" pipe flow rates based on REU's and peaking factors as defined by appropriate engineering literature, organizational experience, policy, and regulatory guidelines.

3.4.2 Gravity Sewer Main Grades

Gravity sewer mains intended for public use and O&M by the JWSC or extensions to public systems which are to remain private shall be in accordance with the preferred slopes shown in Figure GS-2 for minimum pipe diameters. Where adherence to the minimum eight (8) inch pipe diameter will not develop self-cleansing velocities at "projected" ultimate contributory flows, six (6) inch diameter pipe may be used, if approved as an exception, defined as follows.

A six (6) inch diameter pipe exception shall only apply for limited reaches of gravity sewer where self-cleansing velocities can not be developed in eight (8) inch pipes by "projected" flow peaks during the 24-hour diurnal cycle; and when such gravity mains are strategically located such that system expansion from those lines is highly improbable, as in the case of limited boundary development subdivisions.

The use of the Manning Equation indicates that flows in excess of 12,000 gpd and peak flows of 61 gpm, using the Babbitt Peaking Equation, are needed to develop self-cleaning velocities at the diurnal peak in an eight (8) inch line on a grade of 0.40%. This equates to 39 single family residences or REU's. The six (6) inch pipe diameter exception shall be considered valid when this quantity of "projected" contributory flow for any gravity sewer reach is not available.

Grades for pipe diameters greater than the cited six (6) inch and eight (8) inch minimums shall be based on the same design criteria as stated above in article 3.3.2, and in consideration of "projected" flows. Alternatives to the six (6) inch exception include low pressure systems, step systems, vacuum systems, or on-site treatment systems.

The maximum slope for all pipe diameters shall be such that the velocity in the pipes does not exceed 5 fps at 94% of the pipe inside diameter when calculated using Manning's Equation and projected flow peaks.

Figure GS-2
Gravity Sewer Main Pipe Slope Table for six (6) inch and eight (8) inch PipesUsing Manning Flow and Babbitt PF Equations

Nominal Diameter	Pipe Material	Projected Flow (REU's)	Projected Populationn	Calculated Peaking Factor	Projected ADWF (GPD)	Projected Peak Flow (GPM)	Self-Cleansing Minimum Slope (%)	Flow Depth (Inches)	Maximum Capacity @ Minimum Slope (GPM)
6	PVC HDPE	4	10.4	10.7	1,200	9	1.75	0.61	467
6	PVC HDPE	5	13.0	10.3	1,500	11	1.53	0.68	437
6	PVC HDPE	6	15.6	10.0	1,800	13	1.35	0.75	410
6	PVC HDPE	7	18.2	9.7	2,100	14	1.25	0.80	395
6	PVC HDPE	8	20.8	9.5	2,400	16	1.11	0.88	372
6	PVC HDPE	9	23.4	9.3	2,700	18	1.02	0.94	357
6	PVC HDPE	10	26.0	9.2	3,000	19	0.95	1.00	344
6	PVC HDPE	11	28.6	9.0	3,300	21	0.89	1.05	333
6	PVC HDPE	12	31.2	8.9	3,600	22	0.86	1.09	328
6	PVC HDPE	13	33.8	8.8	3,900	24	0.80	1.15	316
6	PVC HDPE	14	36.4	8.7	4,200	25	0.76	1.20	308
6	PVC HDPE	15	39.0	8.6	4,500	27	0.72	1.26	300
6	PVC HDPE	16	41.6	8.5	4,800	28	0.69	1.30	293
6	PVC HDPE	17	44.2	8.4	5,100	30	0.66	1.35	287
6	PVC HDPE	18	46.8	8.3	5,400	31	0.64	1.39	283
Nominal Diameter	**Pipe Material**	**Projected Flow (REU's)**	**Projected Populationn**	**Calculated Peaking Factor**	**Projected ADWF (GPD)**	**Projected Peak Flow (GPM)**	**Self-Cleansing Minimum Slope (%)**	**Flow Depth (Inches)**	**Maximum Capacity@ Minimum Slope (GPM)**
6	PVC HDPE	19	49.4	8.3	5,700	33	0.62	1.44	278
6	PVC HDPE	20	52.0	8.2	6,000	34	0.59	1.49	271
6	PVC HDPE	21	54.6	8.1	6,300	36	0.57	1.54	267
6	PVC HDPE	22	57.2	8.1	6,600	37	0.55	1.59	262
6	PVC HDPE	23	59.8	8.0	6,900	38	0.54	1.62	260
6	PVC HDPE	24	62.4	7.9	7,200	40	0.52	1.67	255
6	PVC HDPE	25	65.0	7.9	7,500	41	0.51	1.70	252
6	PVC HDPE	26	67.6	7.8	7,800	42	0.50	1.73	250
6	PVC HDPE	27	70.2	7.8	8,100	44	0.48	1.79	245

6	PVC HDPE	28	72.8	7.7	8,400	45	0.48	1.80	245
6	PVC HDPE	29	75.4	7.7	8,700	46	0.47	1.83	242
6	PVC HDPE	30	78.0	7.6	9,000	48	0.45	1.90	237
6	PVC HDPE	31	80.6	7.6	9,300	49	0.44	1.94	234
6	PVC HDPE	32	73.2	7.6	9,600	50	0.44	1.96	234
6	PVC HDPE	33	85.8	7.5	9,900	52	0.42	2.03	229
6	PVC HDPE	34	88.4	7.5	10,200	53	0.42	2.04	229
6	PVC HDPE	35	91.0	7.5	10,500	54	0.41	2.07	226
6	PVC HDPE	36	93.6	7.4	10,800	56	0.40	2.12	223
6	PVC HDPE	37	96.2	7.4	11,100	57	0.39	2.17	221
6	PVC HDPE	38	98.8	7.4	11,400	58	0.39	2.19	221
6	PVC HDPE	39	101.4	7.3	11,700	59	0.38	2.22	218
6	PVC HDPE	40	104.0	7.3	12,000	61	0.38	2.25	218
8	PVC HDPE	40	104.0	7.3	12,000	61	0.40	2.00	481
8	PVC HDPE	41	106.6	7.3	12,300	62	0.40	2.01	481
8	PVC HDPE	42	109.2	7.2	12,600	63	0.39	2.04	475
8	PVC HDPE	43	111.8	7.2	12,900	65	0.39	2.07	475
8	PVC HDPE	44	114.4	7.2	13,200	66	0.38	2.10	469
8	PVC HDPE	45	117.0	7.1	13,500	67	0.38	2.12	469
8	PVC HDPE	46	119.6	7.1	13,800	68	0.37	2.15	463
8	PVC HDPE	47	122.2	7.1	14,100	69	0.37	2.17	463
8	PVC HDPE	48	124.8	7.1	14,400	71	0.36	2.21	456

Nominal Diameter	**Pipe Material**	**Projected Flow (REU's)**	**Projected Populationn**	**Calculated Peaking Factor**	**Projected ADWF (GPD)**	**Projected Peak Flow (GPM)**	**Self-Cleansing Minimum Slope (%)**	**Flow Depth (Inches)**	**Maximum Capacity@ Minimum Slope (GPM)**
8	PVC HDPE	49	127.4	7.0	14,700	72	0.35	2.25	450
8	PVC HDPE	50	130.0	7.0	15,000	73	0.34	2.28	444
8	PVC HDPE	51	132.6	7.0	15,300	74	0.34	2.30	444
8	PVC HDPE	52	135.2	7.0	15,600	76	0.34	2.32	444
8	PVC HDPE	53	137.8	7.0	15,900	77	0.34	2.34	444
8	PVC HDPE	54	140.4	6.9	16,200	78	0.33	2.38	437
8	PVC HDPE	55	143.0	6.9	16,500	79	0.33	2.39	437
8	PVC HDPE	56	145.6	6.9	16,800	80	0.32	2.43	430
8	PVC	57	148.2	6.9	17,100	82	0.32	2.45	430

	HDPE								
8	PVC HDPE	58	150.8	6.9	17,400	83	0.32	2.47	430
8	PVC HDPE	59	153.4	6.8	17,700	84	0.31	2.51	424
8	PVC HDPE	60	156.0	6.8	18,000	85	0.31	2.52	424
8	PVC HDPE	61	158.6	6.8	18,300	86	0.31	2.54	424
8	PVC HDPE	62	161.2	6.8	18,600	88	0.30	2.60	417
8	PVC HDPE	63	163.8	6.8	18,900	89	0.30	2.61	417
8	PVC HDPE	64	166.4	6.7	19,200	90	0.30	2.62	417
8	PVC HDPE	65	169.0	6.7	19,500	91	0.29	2.66	410
8	PVC HDPE	66	171.6	6.7	19,800	92	0.29	2.68	410
8	PVC HDPE	67	174.2	6.7	20,100	93	0.29	2.69	410
8	PVC HDPE	68	176.8	6.7	20,400	95	0.28	2.75	403
8	PVC HDPE	69	179.4	6.7	20,700	96	0.28	2.76	403
8	PVC HDPE	70	182.0	6.6	21,000	97	0.28	2.78	403
8	PVC HDPE	71	184.6	6.6	21,300	98	0.28	2.79	403
8	PVC HDPE	72	187.2	6.6	21,600	99	0.27	2.83	395
8	PVC HDPE	73	189.8	6.6	21,900	100	0.27	2.85	395
8	PVC HDPE	74	192.4	6.6	22,200	101	0.27	2.86	395
8	PVC HDPE	75	195.0	6.6	22,500	103	0.27	2.89	395
8	PVC HDPE	76	197.6	6.6	22,800	104	0.26	2.94	388
8	PVC HDPE	77	200.2	6.5	23,100	105	0.26	2.96	388
8	PVC HDPE	78	202.8	6.5	23,400	106	0.26	2.97	388
8	PVC HDPE	79	205.4	6.5	23,700	107	0.26	2.98	388
Nominal Diameter	**Pipe Material**	**Projected Flow (REU's)**	**Projected Populationn**	**Calculated Peaking Factor**	**Projected ADWF (GPD)**	**Projected Peak Flow (GPM)**	**Self-Cleansing Minimum Slope (%)**	**Flow Depth (Inches)**	**Maximum Capacity@ Minimum Slope (GPM)**
8	PVC HDPE	80	208.0	6.5	24,000	108	0.26	3.00	388
8	PVC HDPE	81	210.6	6.5	24,300	109	0.26	3.01	388
8	PVC HDPE	82	213.2	6.5	24,600	111	0.25	3.08	380
8	PVC HDPE	83	215.8	6.5	24,900	112	0.25	3.10	380
8	PVC HDPE	84	218.4	6.4	25,200	113	0.25	3.11	380
8	PVC HDPE	85	221.0	6.4	25,500	114	0.25	3.13	380
8	PVC HDPE	86	223.6	6.4	25,800	115	0.24	3.18	373
8	PVC HDPE	87	226.2	6.4	26,100	116	0.24	3.19	373

8	PVC HDPE	88	228.8	6.4	26,400	117	0.24	3.21	373
8	PVC HDPE	89	231.4	6.4	26,700	118	0.24	3.22	373
8	PVC HDPE	90	234.0	6.4	27,000	119	0.24	3.23	373
8	PVC HDPE	91	236.6	6.4	27,300	121	0.24	3.26	373
8	PVC HDPE	92	239.2	6.3	27,600	122	0.23	3.32	365
8	PVC HDPE	93	241.8	6.3	27,900	123	0.23	3.33	365
8	PVC HDPE	94	244.4	6.3	28,200	124	0.23	3.35	365
8	PVC HDPE	95	247.0	6.3	28,500	125	0.23	3.36	365
8	PVC HDPE	96	249.6	6.3	28,800	126	0.23	3.37	365
8	PVC HDPE	97	252.2	6.3	29,100	127	0.23	3.39	365
8	PVC HDPE	98	254.8	6.3	29,400	128	0.23	3.40	365
8	PVC HDPE	99	257.4	6.3	29,700	129	0.22	3.47	357
8	PVC HDPE	100	260.0	6.3	30,000	130	0.22	3.48	357
8	PVC HDPE	101	262.6	6.2	30,300	131	0.22	3.49	357
8	PVC HDPE	102	265.2	6.2	30,600	133	0.22	3.52	357
8	PVC HDPE	103	267.8	6.2	30,900	134	0.22	3.54	357
8	PVC HDPE	104	270.4	6.2	31,200	135	0.22	3.56	357
8	PVC HDPE	105	273.0	6.2	31,500	136	0.22	3.57	357
8	PVC HDPE	106	275.6	6.2	31,800	137	0.22	3.58	357
8	PVC HDPE	107	278.2	6.2	32,100	138	0.21	3.65	349
8	PVC HDPE	108	280.8	6.2	32,400	139	0.21	3.66	349
8	PVC HDPE	109	283.4	6.2	32,700	140	0.21	3.68	349
8	PVC HDPE	110	286.0	6.2	33,000	141	0.21	3.68	349
Nominal Diameter	**Pipe Material**	**Projected Flow (REU's)**	**Projected Populationn**	**Calculated Peaking Factor**	**Projected ADWF (GPD)**	**Projected Peak Flow (GPM)**	**Self-Cleansing Minimum Slope (%)**	**Flow Depth (Inches)**	**Maximum Capacity @ Minimum Slope(GPM)**
8	PVC HDPE	111	288.6	6.2	33,300	142	0.21	3.70	349
8	PVC HDPE	112	291.2	6.1	33,600	143	0.21	3.72	349
8	PVC HDPE	113	293.8	6.1	33,900	144	0.21	3.73	349
8	PVC HDPE	114	296.4	6.1	34,200	145	0.21	3.75	349
8	PVC HDPE	115	299.0	6.1	34,500	146	0.21	3.76	349
8	PVC HDPE	116	301.6	6.1	34,800	148	0.20	3.85	340
8	PVC HDPE	117	304.2	6.1	35,100	149	0.20	3.87	340
8	PVC	118	306.8	6.1	35,400	150	0.20	3.88	340

	HDPE								
8	PVC HDPE	119	309.4	6.1	35,700	151	0.20	3.90	340
8	PVC HDPE	120	312.0	6.1	36,000	152	0.20	3.91	340
8	PVC HDPE	121	314.6	6.1	36,300	153	0.20	3.92	340
8	PVC HDPE	122	317.2	6.1	36,600	154	0.20	3.94	340
8	PVC HDPE	123	319.8	6.0	36,900	155	0.20	3.95	340
8	PVC HDPE	124	322.4	6.0	37,200	156	0.20	3.97	340
8	PVC HDPE	125	325.0	6.0	37,500	157	0.20	3.98	340
8	PVC HDPE	126	327.6	6.0	37,800	158	0.20	4.00	340
8	PVC HDPE	127	330.2	6.0	38,100	159	0.20	4.01	340
8	PVC HDPE	128	332.8	6.0	38,400	160	0.19	4.09	332

Notes For Table GS-2:

1. REU (GPD) = 300
2. Plastic Pipe Manning "n" = 0.010 (For clean pipe with little deposits/debris
3. Metal Pipe Manning "n" = 0.013 (For clean pipe with little deposits/debris
4. Required Self-Cleansing Velocity = 1.99 to 2.01 feet per second
5. Minimum Pipe Flow Depth = 0.6 inches

3.5 MATERIAL SPECIFICATIONS

The contractor shall furnish gravity sewer piping systems in accordance with the material specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shallbe to the latest revision unless stated otherwise. All materials shall be new. These material specifications include a list of acceptable manufacturers for the various water system components. The contractor may choose freely from the manufacturers list and ***material submittals for such items are not required.*** Only products and materials from the acceptable manufacturer's lists herein may be used in the work.

Any item required but not specified herein, or any product or manufacturer other than those listed will be considered a substitution. ***Material submittals are required for such items.*** Substitutions will not be allowed without the prior written approval of the JWSC Planning and Construction Division. Substitutions, if allowed, shall meet all criteria of the detailed specifications. The burden of proof of compliance for any proposed substitution rests with the Contractor/Developer/Owner. The JWSC Planning and Construction Division will be the sole judgeas to the acceptance of a proposed substitution and such decisions will be final.

3.5.1 General Considerations

The type, class, grade, and alignment of sewer pipe may be changed only at manholes. The only exception to this being where a gravity sewer main crosses under a storm drainand the invert of the storm drain is less than 3 feet above the crown of the sewer main. In such cases, a full twenty (20) foot joint of ductile iron pipe shall be centered under the

storm drain and joined to PVC or HDPE pipe with a mechanical joint or stress resistant coupling.

Gravity sewer mains shall be ASTM 3034, SDR-26 heavy wall sewer pipe or DR-17 HDPE. Gravity sewer mains within steel casings or PVC DR18 casing pipes shall be ASTM 3034, SDR 26 heavy wall sewer pipe and shall be installed with approved skids or spacers to holdgrade and prevent flotation in accordance with these specifications.

Ductile iron pipe is only permitted for gravity sewer use where the mains or laterals are above ground as in ditch crossings. The only exception being storm drain crossings as cited above.

All material shall be free from defects impairing strength and durability, shall be of the best commercial quality for the purpose specified, shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

Pipe to be installed underground using open-cut methods shall be PVC push-on joint type as described in these specifications, or as accepted within these specifications for storm drain crossings. Pipe installed above ground shall be Sewer-Safe restrained joint ductile iron pipe or flanged ductile iron pipe as described in these specifications.

For pipe bursting or horizontal boring construction, the pipe shall be high density polyethylene (HDPE), or Fusible PVC of a suitable ASTM Standard, classification and pressure rating as described in these specifications. The "depth of cut" shall be defined as the vertical distance from pipe invert to finish grade.

3.5.2 Polyvinyl Chloride (PVC) Pipe and Fittings

Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter and length. All PVC sanitary sewer pipe shall be green. Storage and handling of PVC pipe shall be in accordance with Chapter 6 of AWWA Manual M23.

PVC 1120, Class 160, SDR 26 Pipe shall conform to ASTM D3034 for sizes four (4) inch through fifteen (15) inch diameter pipe and ASTM F679 for 18 inch through 36-inch diameter pipe.

The pipe material shall be clean, virgin, National Sanitation Foundation approved, Class 12454-B PVC compound conforming to ASTM resin specification D1784 with wall thickness T-1. Pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3212. Elastomeric seals shall meet ASTM F477 or ASTM F913. The pipe shall be designed to pass without failure a sustained pressure test of 340 psi in conformance with ASTM D1598 and a quick burst test of 400 psi in conformance with ASTM D1599.

Fittings shall meet the requirements of ASTM D3034 and ASTM F1336 for sizes four (4) inch through fifteen (15) inch in diameter and ASTM F679 and ASTM F1336 for eighteen

(18) inch through thirty-six (36) inch in diameter with minimum wall thickness of SDR 26. Fittings shall be gasket joint type meeting the requirements of ASTM D3212. Elastomeric gaskets shall conform to ASTM F477 or ASTM F913. PVC material shall have a cell classification of 12454-B in accordance with ASTM D1784.

PVC 1120, Pressure Class (PC) 235 of DR-18 for twenty-four (24) inch diameter or less andDR-21 for greater than twenty-four (24) inch diameter pipe (used as casing pipe for easements and allowed rights-of-way) shall conform to AWWA Standard C900 or C905, as appropriate for pipe diameter. All pipes shall be hydrostatically proof tested at the factory in conformance with UNI-B-11 standards. In case of conflict between standards specified herein, the requirements of AWWA Standard C900 and C905 shall prevail. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters. The pipe material shall be clean, virgin, National Sanitation Foundation approved, Class 12454-B PVC compound conforming to ASTM resin specification D1784.
Pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3139. Elastomeric seals shall meet ASTM F477. The pipe shall be designed to pass without failure a sustained pressure test of 500 psi in conformance with ASTM D1598 and a quick burst test of 755 psi in conformance with ASTM D1599. Where PVC Casing Pipes can be installed using horizontal directional drillingtechniques, equivalently rated fusible PVC pipe may be approved.

PVC Fittings six (6) inches through twelve (12) inches may be used with PVC C900 pipe. Fittings shall be PVC injection molded, made from materials meeting, or exceeding the requirements of cell class 12454-B material as defined in ASTM D1784. All PVC fittings must comply with or exceed, AWA C907. All fittings must be designed to the pressure class of the pipe used, with a pressure rating of 150 psi and a 2.5 to 1 factor of safety. Virgin materials only shall be used in the manufacture of PVC pressure fittings. These fittings must have UL-FM approval and shall comply with or exceed all ASTM Standards for PVC fittings. All fittings must have NSF-61 approval. The elastomeric gasket shall comply with the requirements specified in ASTM F477.

3.5.3 Ductile Iron (D.I.P.) Pipe and Fittings

D.I.P. wall thickness and pressure class shall conform to ANSI Specification A21.50 (AWWAC150) and ANSI A21.51 (AWWA C151) with pressure class 350 as a minimum. Pipe shall also be certified by ISO 9000 by an accredited registrar.

Pipe shall be clearly marked with the name of the manufacturer, location of the foundry, pressure rating, thickness or pressure class, nominal pipe diameter, weight of pipewithout lining, maximum depth of bury and length.

All pipe furnished by the manufacturer shall be cast and machined at one foundry locationto assure quality control and provide satisfactory test data. All ductile iron pipe shall be color coded green by field painting a green stripe, three (3) inches wide, along the crownof the pipe barrel.

All ductile iron pipes and fittings shall be externally coated with a bituminous coating as specified in ANSI A21.51 and be continuous smooth, neither brittle when cold or sticky when exposed to the sun and be strongly adherent to the fitting. If the pipe is installed in a corrosive soil, then all bolts, nuts, studs, and other uncoated parts of joints for underground installation shall be coated with asphalt or coal-tar prior to backfilling.

All ductile iron pipes and fittings shall be Sewer Safe internally lined with an approved amine cured novalac epoxy coating containing at least 20% by volume of ceramic quartz pigment. Ductile iron fittings shall have a minimum working pressure of 350 psi. Fittings shall conform to ANSI Specifications A21.10 (AWWA C110), A21.11 (AWWA C111), A21.15(AWWA C115) and/or A21.53 (AWWA C153). Fittings shall also be certified by ISO 9000 by an accredited registrar. Compact fittings shall normally be installed. Long body fittingsshall be used where the drawings specifically call for long body fittings, where compact fittings are not available, or at the option of the contractor when the laying length is not controlled by compact fittings patterns. All fittings shall be UL/FM approved and shall conform to NSF Standard 61 as applicable. All fittings furnished by the approved manufacturer shall be cast and machined at one foundry location to assure quality controland provide satisfactory test data. Fittings shall have cast on them the pressure rating, nominal diameter of openings, manufacturer's name, foundry location, plant code and degrees or fraction of the circle. Cast letters and figures shall be on the outside body of the fitting. All ductile iron fittings shall be externally coated and internally lined as specified in this specification.

3.5.4 High Density Polyethylene (HDPE) Pipe and Service Connections

For Horizontal Directional Drilling or Pipe Bursting, HDPE Pipe shall be ductile iron pipe size outside diameter, SDR 11 high performance, high molecular weight, high density polyethylene pipe, and shall conform to ASTM D 1248 (Type III C, Category 5, P34).

Minimum cell classification values shall be 345434C as referenced in ASTM D 3350. All pipe resin shall be manufactured by the same company that manufactures the pipe itselfin accordance with these specifications to insure complete resin compatibility and total product accountability.

Fittings for service connections shall be Inserta-Tee or electro-fusion type fittings only.

3.5.5 Fusible Polyvinyl Chloride (FPVC) Pipe and Service Connections

For Horizontal Directional Drilling or Pipe Bursting, Fusible C-900, C-905, DR-18 FPVC and1120, SDR-26 FPVC pipe shall be cast iron pipe size outside diameter, conforming to ASTM D3034. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784. Pipe shall be extruded with plain ends which shall be square to the pipe and free of any bevel or chamfer.

There shall be no bell or spigot gasket of any kind incorporated into the pipe. Pipe shall be manufactured in standard 40-foot nominal lengths, with other lengths available upon request. For gravity sewer use, pipe shall be green in color. The pipe shall be marked per

industry standards. The pipe shall be homogeneous throughout and be free of visiblecracks, holes, foreign material, blisters, or other visible deleterious faults.

Fittings for service connections shall be Inserta-Tee or watertight stainless steel saddle type fittings suitable for use on C-900 pipe.

3.5.6 Manholes

3.5.6.1 Manhole Diameter

The minimum manhole inside diameters for gravity sewer lines six (6) inch through sixteen (16) inch shall be four (4) feet; for lines eighteen (18) inches through thirty (30) inches – five (5) feet; for lines thirty-six (36) inch through forty-eight (48) inch – six (6) feet; and for lines greater than forty-eight (48) inches – eight (8) feet. Where the depth of a manhole, (from finished grade to lowest pipe invert), is fifteen (15) feet or greater, the minimum manhole diameter shall be five (5) feet.

3.5.6.2 Precast Concrete Manholes

Precast concrete manholes or calcium aluminate cement concrete manholes used shall conform to all requirements of ASTM Designation C478 at minimum and be provided with "O" ring gasket type joints, conforming to ASTM Designation C443-77, or flexible joint sealant roping of butyl rubber conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B-Butyl Rubber with a minimum cross section of 1 ¼ inches, and shall be:

(a) constructed using a top section cast monolithically and shaped as an eccentric cone, or for manhole depths five (5) feet or less be a concentric cone, joint systems must match associated riser or base sections; theclear opening for the manhole frame & cover shall not be less than twenty four (24) inches for main sewers six (6) inches through eighteen (18) inches in diameter, and not less than thirty-two (32) for main sewers greater than eighteen (18) inches in diameter;

(b) constructed using riser sections cast monolithically having a minimum lay length of sixteen (16) inches and of joint systems matching associated base and cone sections;

(c) constructed using a base section cast monolithically having a minimum lay length of sixteen (16) inches and a joint system matching associated riser and cone sections;

(d) constructed, where depth permits, using a precast eccentric transition section to reduce base section diameters of six (6) foot or greater, to five (5) foot diameter at finish grade. Such transitions shall not be made less than four (4) vertical feet above the invert bench;

(e) constructed, where manhole depth will not permit a diameter transition section, using a precast flat slab top section with centered thirty-two (32) diameter hole for the manhole frame & cover opening;

(f) constructed using precast inverts providing clearance for pipe projectinga minimum of two (2) inch inside the manhole wall, troughs formed and finished to provide a minimum slope of 1.25% from the pipe outlet to the inlets, minimum concrete thickness from the bottom of the lowest invertto the bottom of the base not less than eight (8) inches, invert benches with a uniform 2:1 slope from the high point at the manhole wall to the lip of the invert trough; trough depth from the lip of the invert trough tothe invert of the pipe to be 50% of the main pipe diameter; inverts shall be free from depressions, high spots, voids, chips or fractures over one fourth (¼) inch in diameter or depth;

(g) hand-formed inverts, when approved for use, shall meet, or exceed the durability, strength, configuration and hydraulic "smoothness" as required for precast inverts. Filler for inverts shall be holed burned brick;

(h) steps, on the vertical or straight wall of four (4) foot and five (5) foot diameter manholes shall be aligned vertically on sixteen (16) inch centers, secured to the wall with a compression fit in tapered holes or cast in place, coated with a copolymer polypropylene plastic coating, reinforced with one-half (½) inch diameter grade 60 bar with serrated treads and tallend lugs; step pullout strength shall be 2000 lbs. minimum when tested according to ASTM C497; steps shall begin no less than eighteen (18) inches from the manhole rim and end no closer than sixteen (16) inches above the manhole bench;

(i) steps shall not be used on manholes greater than five (5) foot in diameteror where a concentric cone or flat-slab top is the final section;

(j) lifting, devices for handling precast manhole section components shall comply with OSHA Standard 1926.704;

(k) manhole entrance couplings with the entry pipes greater than eighteen (18) inch in diameter shall be fitted with pipe entrance connectors conforming to ASTM C923, and for eighteen (18) inch pipes and smaller to ASTM C-425 using neoprene boot inserts tightened to the pipe using a stainless steel adjustable band, ("A-Loc" or approved equal), rigid cement or synthetic type grout collars are not acceptable as a seal between the manhole and entry pipe in new construction.

3.5.6.3 Fiberglass Manholes

Watertight fiberglass manholes shall be reinforced polyester manufactured fromcommercial grade polyester resin or other suitable polyester or vinyl ester resins with

fiberglass reinforcements. Manhole shall be a one-piece unit manufactured to meet or exceed all specifications of A.S.T.M. D-3753 latest edition or approved equal.

Fiberglass manholes shall be bedded and fully encased in a Class I gravel envelope from the base to the top of the fiberglass structure to insure lateral support; the thickness of the gravel envelope shall be no less than six (6) inches around the entire circumference of the structure.

(a) Resin: The resins used shall be a commercial grade unsaturated polyester resin or other suitable polyester or vinyl ester resin.

(b) Reinforcing Materials: The reinforcing materials shall be commercial Grade "E" type glass in the form of continuous roving and chop roving, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

(c) Interior Surfacing Material: The inner surface exposed to the chemical environment shall be a resin-rich layer of 0.010 to 0.020 inch thick. The inner surface layer exposed to the corrosive environment shall be followed with a minimum of two passes of chopped roving of minimum length 0.5 inch (13 mm) to maximum length of 2.0 inch (50.8 mm) and shall be applied uniformly to an equivalent weight of 3 oz/ft. Each pass ofchopped roving shall be well rolled prior to the application of additional reinforcement. The combined thickness of the inner surface and interior layer shall not be less than 0.10 inch (2.5 mm).

(d) Wall Construction Procedure: After the inner layer has been applied the manhole wall shall be constructed with chop and continuous strand filament wound manufacturing process, which insures continuous reinforcement and uniform strength and composition. The cone section,if produced separately, shall be affixed to the barrel section at the factory with resin-glass reinforced joint resulting in a one-piece unit. Seams shall be fiber-glassed on the inside and the outside using the same glass-resin jointing procedure. Field joints shall not be acceptable by anyone other than the manufacturer or approved equal.

(e) Exterior Surface: For a UV inhibitor the resin on the exterior surface of the manhole shall have gray pigment added to a minimum thickness 0.125 inches.

(f) Stub-outs and Connections: Upon request stub-outs may be installed. Installation of SDR, PVC, or sewer pipe must be performed by sanding, priming, and using resin fiber-reinforce hand lay-up. The resin and fiberglass shall be the same type and grade as used in the fabrication of the fiberglass manhole. Inserta-Tee fittings may be requested and installed per manufacturer’s instructions. Kor-N-Seal boots may be

installed by the manhole manufacturer using fiberglass reinforced pipe stub-outs for the Kor-N-Seal boot sealing surface.

(g) Manhole Bottom: Fiberglass manholes will be required to have resin fiber-reinforced bottom. Deeper manholes may require a minimum of two fiberglass channel stiffening ribs. All fiberglass manholes manufactured with a fiberglass bottom will have minimum three (3) inch wide anti-flotation rings as required based on the depth of the manhole,the weight of the gravel backfill, and the groundwater uplift forces anticipated at the site. The manhole bottom shall be a minimum of one-half (½) inch thick.

(h) Fiberglass enclosed invert and bench area: A fiberglass enclosed invert and bench area shall be installed in the manhole by the manufacturer. The invert will be formed using a non-corrosive material and completely enclosed in a minimum one-fourth (1/4) inch layer of fiberglass chop.

(i) Height Adjustment: Fiberglass manholes must have the ability to be height adjustable with the use of a height adjustment ring. Height adjustment can be made as a field operation without the use of uncuredresins or fiberglass lay-ups. Fiberglass manholes must maintain all load and soundness characteristics required by ASTM D3753 after height adjustment has occurred.

(j) Fillers and Additives: Fillers, when used, shall be inert to the environment and manhole construction. Sand shall not be accepted as approved filler. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific ASTMD-3753 standard. The resulting reinforced-plastic material must meet the requirements of this specification.

(k) Manufacture: Manhole cylinders, man-way reducers, and connectorsshall be produced from fiberglass-reinforced polyester resin using a combination of chop and continuous filament wound process.

(l) Interior Access: All manholes shall be designed so that a ladder or step system can be supported by the installed manhole.

(m) Man-way Reducer: Man-way reducers will be concentric with respect to the larger portion of the manhole diameters through 60 inches. Larger manholes may have concentric or eccentric man-way reducer openings.

(n) Cover and Ring Support: The manhole shall provide an area from which a grade ring or brick can be installed to accept a typical metal ring and cover and have the strength to support a traffic load without damage to the manhole.

(o) Exterior Surface: The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin ispresent to eliminate fiber show. The exterior surface shall be free of blisters larger than 0.5 inch in diameter, de-lamination, or fiber show.

(p) Interior Surface: The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, de-lamination, and blisters larger than 0.5 inch in diameter, and wrinkles of 0.125 inch or greater in depth. Surface pits shall be permitted if they are less than 0.75 inch in diameter and less than 0.0625 inches deep. Voids that cannot be broken with finger pressure and are entirely below the resin surface shall be permitted if they are less than 0.5 inch in diameter and less than 0.0625 inch thick.

(q) Wall Thickness: Fiberglass manholes forty-eight (48) inch in diameter and up to twenty (20) feet in depth will have a minimum wall thickness of .3125 inches. Fiberglass manholes forty-eight (48) inch in diameter and twenty (20) feet to thirty (30) feet in depth will have a minimum wall thickness of .5 inches.

(r) Repairs: Any manhole repairs are subject to meet all requirements of this specification.

(s) Manhole Length: Manhole lengths shall be in six (6) inch increments +/- two (2) inches.

(t) Diameter Tolerance: Tolerance of inside diameter shall be +/- 1% of required manhole diameter.

(u) Load Rating: The complete manhole shall have a minimum dynamic-load rating of 16,000 lbs. when tested in accordance with ASTM 3753 8.4 (note 1). To establish this rating the complete manhole shall not leak, crack, or suffer other damage when load tested to 40,000 lbs. and shall not deflect vertically downward more than 0.25 inch at the point of load application when loaded to 24,000 lbs.

(v) Stiffness: The manhole cylinder shall have the minimum pipe-stiffness values shown in the table below when tested in accordance with A.S.T.M. 3753 8.5 (note 1).

Figure GS-3
Pipe-Stiffness
Table

LENGTH (FT)	F/AY (PSI)
3.0 to 6.5	0.75
7.0 to 12.5	1.26
13.0 to 20.5	2.01

(w) Soundness: In order to determine soundness, the manufacturer shall apply an air or water pressure test to the manhole test sample. Test pressure shall not be less than 3 psig or greater than 5 psig. While holding at the established pressure, inspect the entire manhole for leaks. Any leakage through the laminate is cause for failure of the test. Refer to ASTM 3753 8.6.

(x) Chemical Resistance: The fiberglass manhole and all related components shall be fabricated from corrosion proof material suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with the wastewater collection system.

(y) PHYSICAL PROPERTIES:

	Hoop	**Axial**
Tensile Strength (PSI)	18,000	5,000
Tensile Modulus (PSI)	600,000	700,000
Flexural Strength (PSI)	26,000	4,500
Flexural Modulus (PSI)	1,400,000	700,000
Compressive (PSI)	18,000	10,000

(z) TEST METHODS/QC/CERTIFICATION: All tests shall be performed asspecified in ASTM 3753 latest edition, section 8. Test method D-790 (seenote 5) and test method D-695; each completed manhole shall be examined by the manufacturer for dimensional requirements, hardness, and workmanship. All required A.S.T.M. 3753 testing shall be completed and records of all testing shall be kept and copies of test records shall be presented to customer upon formal written request within a reasonable time period; and as a basis of acceptance the Manufacturer shall provide an independent certification which consists of a copy of the manufacturer's test report and accompanied by a copy of the test results stating the manhole has been sampled, tested, and inspected in accordance with the provisions of this specification and meets all requirements.

3.5.6.4 Manhole Frames and Covers

Manhole frames and covers shall be Gray Cast Iron conforming to specification ASTM-A48 Class 35B. Castings shall be of uniform quality, and free from blowholes, porosity, hard spots, shrinkage distortion and other defects. Frames and covers shall be smooth, well-cleaned by shot blasting and shall remain unpainted. All castings shall be manufactured true to pattern, and component parts shall fit together in a satisfactory manner. The frame and cover shall be designed to withstand an AASHTO H-20 wheel loading. The frame and cover shall have an "O" Ring type rubber seal or neoprene gasket designed toeliminate or significantly reduce surface water infiltration, have two non-penetrating pick-holes in the cover and four one (1) inch diameter anchor holes in the frame flange. The cover shall read "Sanitary Sewer"

(a) manhole frames and covers on four (4) foot diameter manholes shall have a minimum inside opening diameter of not less than twenty three (23) inches and no more than twenty-four (24) inches and considered a standard twenty-four (24) inch frame & cover;

(b) manhole frames and covers on five (5) foot diameter manholes and greater shall have a minimum inside opening diameter of not less than thirty (30) inches and not more than of thirty-one (31) inches and considered a standard thirty-two (32) inch frame & cover;

(c) manhole frames and covers within easements and in areas where security is an issue shall be equipped with manhole locking devices or boltdown covers.

3.6 INSTALLATION OF SEWER MAINS AND APPURTENANCES

The contractor shall install gravity sewer systems in accordance with the installation specifications detailed in this section. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be tothe latest revision unless stated otherwise.

3.6.1 Gravity Sewer Main Depth

Gravity sewer mains shall be designed meeting minimum depth requirements of thirty six (36) inches as measured from finished grade to pipe crown. This depth is based on the minimum height of standard precast manhole sections commonly available; however, where manholes are made of fiberglass or other approved materials where manhole depths can be manufactured to specified heights, this depth restriction may be waived and a minimum depth of thirty (30) inches approved.

Gravity sewer mains with service laterals shall not be constructed at any depth greater than fifteen (15) feet as measured from finished grade to pipe crown.

Gravity sewer mains without service laterals shall not be constructed at any depth greater than twenty (20) feet as measured from the finished grade to pipe invert. Where such deep lines must be constructed, a gravity sewer high-line with services connecting directlyinto the deep manholes will be allowed. Such high-lines must be off-set at least ten (10) foot laterally from the deep line. Major sanitary sewer transmission mains eighteen (18)inch diameter and greater may be excepted from depth restrictions upon approval by theJWSC.

3.6.2 Gravity Sewer Main Location and Alignment

Gravity sewer mains shall be designed for installation on the centerline of roadways as much as possible where landscaping, trees or other obstruction to manhole access is anticipated or probable.

At no time, shall gravity sewer mains or manholes be less than ten (10) feet inside of road rights-of-way lines. Gravity sewer manholes may not be designed or constructed to be less than four (4) feet off roadway curb & gutters. No gravity sewer manholes may be designed or constructed to lie within ditch lines.

Gravity sewer mains shall be installed with a straight alignment between manholes.

Gravity sewer mains up to twelve (12) feet in depth that are not in public rights-of-way shall be centered in a twenty (20) foot wide exclusive easement dedicated to the JWSC. The JWSC retains the right to require additional or less easement width where maintenance or access circumstances warrant.

Gravity sewer mains greater than twelve (12) feet in depth that are not in public rights- of-way shall be centered in a thirty (30) foot wide exclusive easement dedicated to the JWSC. The JWSC retains the right to require additional or less easement width where maintenance or access circumstances warrant.

All gravity sewer main easements shall be accessible and unobstructed to JWSC maintenance vehicle traffic with a stabilized twelve (12) foot wide access with a minimum Load Bearing Ratio (LBR) of 30. The access must be adequately graded for service vehicle use and provided with adequate drainage. The access travel area may, at minimum, be composed of a sturdy grassed surface to prevent erosion from storm runoff and maintainable by mowers or bush hogs.

Easements interrupted by wetlands, streams or ditches that would preclude the travel of maintenance equipment from end to end must be provided with auxiliary lateral ingress/egress easements to permit access to the sewer line easement so that each line segment and manhole is accessible to maintenance service vehicles. A truck turnaround area should be provided at the intersection of all ingress/egress and sanitary sewer line easements.

A horizontal distance of six (6) feet minimum shall be maintained from all gravity sewer mains or manholes to drainage structures, telephone duct banks, electrical transformers, signal relays, power poles and other structures in the right-of-way as well as any other parallel underground utilities. Gravity sewer mains crossing other underground utilities, (with the exception of water mains), shall have a minimum vertical separation of six (6) inches. All distances shall be measured from the outside edge of the pipes. Exceptions must be approved by JWSC.

Gravity sewer mains located adjacent to storm water retention, ponds, lakes, and water courses shall be designed with sufficient easement and spacing from bank crowns. The potential for side slope collapse shall be based on 3 to 1 side slopes and the pipe’s depthof bury. The JWSC reserves the right to require casing pipe in such situations where inadequate spacing can be demonstrated.

3.6.3 Gravity Sewer and Water Main Separation Requirements

There should be no physical connections between a public or private potable water supply system and a sanitary sewer, or appurtenances which would permit the passage of any sewage or polluted water into the potable supply. No water pipes shall pass through or come in contact with any part of a sewer manhole.

Sanitary sewers shall be laid at least ten (10) feet horizontally from an existing orproposed water main. On a case by case basis, when this separation is not possible or practical, a deviation may be allowed if the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so that the bottom of the water main is at least eighteen (18) inches above the top of the sanitary sewer.

At crossings, pipe joints shall be as far as possible and equidistant from the point of crossing. Water main preferred on top. Separation shall be measured from the outside edge of the pipe to the outside edge of the pipe. A full length of water main pipe must becentered at the crossing. Water pipe joints shall be arranged so that all water main jointsare at least six (6) feet from all gravity sewer line joints. Where a water main must crossunder a gravity sanitary sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main.

3.6.4 Encasements and Casing and Aerial Crossings

Reaches of gravity sewer located in easements that cross wetlands, which are to be restored as wetlands, shall be sub-aqueous, shall be encased in corrosion resistant coatedsteel or Fusible PVC casing and treated for leakage. Those runs which include manholes, located across wetlands, shall be accessible to maintenance vehicles. A stabilized access road, twelve (12) foot wide with a minimum Load Bearing Ratio (LBR) of 30 shall be provided and indicated on the Record Drawings for easements requiring multiple manholes. The access road should be designed to provide for adequate drainage and to prevent erosion from storm runoff. A truck turnaround area should be provided at the end of all access roads.

Reaches of gravity sewer located in easements that cross under streams or within three (3) vertical feet of the bottom of canals, ponds, lakes, or ditches that may be considered Waters of the State or otherwise environmentally sensitive due to local recreational use, shall be sub-aqueous, shall be encased in a corrosion resistant coated steel or Fusible PVC casing and tested for leakage.

Casing ends shall extend a minimum of twenty-five (25) feet beyond stream banks and be electronically marked using an approved method or signed to show the casing end points. Such crossings shall be limited in length as much as possible and no reach of gravity sewer across such water body shall exceed four hundred (400) linear feet between manholes.

Reaches of gravity sewer crossing public rights-of-way on State, County and City Primary Roads or railroads shall be encased in corrosion resistant coated steel or Fusible PVC

casing (if allowed by the Railroad or Department of Transportation Authority) and tested for leakage. Casing ends shall extend a minimum of ten (10) feet beyond the furthermost edge of pavement, curb and gutter, storm drain systems or sidewalks, whichever is greater, and be electronically marked using an approved method to allow the positive identification of casing end points. Such crossings shall be limited in length as much as possible and no reach of gravity sewer shall exceed four hundred (400) linear feet between manholes.

Reaches of gravity sewer crossing streams, ditches, and canals where sub-aqueous crossings are not practical by system design due to grade considerations may be aerial crossings. Where stream width allows, one pipe joint of Sewer Safe DIP shall be used with precast concrete pipe piers having saddle type top sections and anchored galvanized pipe straps. Such piers shall be set a minimum of ten (1) feet beyond the existing stream banks with bases set a minimum of two (2) feet below the existing stream bottom. Where the stream width dictates that more than one joint of Sewer Safe DIP be used, the crossing pipe shall be Sewer Safe DIP flanged joint with piers set adjacent to each pipe joint and end piers set and as specified for single joint crossings. Attachment to stream bridges andor other stream crossing structures will not be permitted.

3.6.5 Gravity Main Stub-outs

Gravity sewer main stub-outs shall be provided to all undeveloped property and/or future phases of the project in accordance with the sewer master plan for the collection system service area.

Where gravity stub-outs are required, they shall be extended to within four (4) feet of the property line, plat line or phase line and shall extend a minimum of ten (10) feet past the edge of pavement or a distance of 1.5 times the sewer depth whichever is greater. The stub-out shall be terminated with a "no-invert" manhole with the effluent line plugged by a mechanical plumber's plug. ***(See JWSC Standard Detail)***

Where gravity sewer extensions are made where there is no reasonable definition of undeveloped or un-subdivided property to be served with a stub-out, as specified above,the end of line manhole shall be set so as not to accept any wastewater contribution fromthe installed system and be constructed without an invert or any influent line wall core orhole.

3.6.6 Sewer Services

Single gravity services shall be provided to each lot or parcel provided that adequate and accessible utility corridors are also provided for maintenance.

Each residential lot shall have only one connection point to the public sanitary sewer system main.

Where commercial developments require multiple connection points to a sanitary sewer main, an internal privately owned piping system shall be installed that will drain to the public main at only one connection point.

Where services must be constructed through private property to access the publicsanitary sewer system, it is the property owner's responsibility to secure a private sewerutility easement with the owner of the property through which the line will be constructed and provide documentation of such filed easement with the JWSC.

Gravity sewer services shall be at least one nominal diameter less than the size of the gravity main to which it is connected. Where the size of the service must be the same sizeof the main a sanitary sewer manhole shall be installed. No sanitary sewer service that islarger than the diameter of the serving sewer main shall be permitted unless specific plansby the JWSC to upgrade the sewer main allow a temporary connection to be approved.

Gravity sewer services shall be a minimum of four (4) inches in diameter where serving a single unit or six (6) inches in diameter where serving two lots with a common connection to the main. All service laterals shall be constructed from the main to the lot to be servedat a one-eighth (1/8) inch per foot slope (1%).

Gravity sewer service stub-outs shall be marked with a two (2) inch diameter pressure treated pine post. The bottom of the post shall be set two (2) to three (3) inches above the top and directly over the end of the stub-out and protrude approximately two (2) feetabove finished grade. The post shall be painted green.

A service shall be designed to connect to the gravity main with an inline wye fitting rotated 45 degrees up. The invert elevation of the service at the wye connection shall be at or above the crown of the mainline pipe and the sewer flow shall enter the main through the wye positioned at 10 o'clock or 2 o'clock on the main. No service connections made at the 12 o'clock position on a main will be acceptable ***(See JWSC Standard Details).***

Single/Multiple Family Residential Gravity Sewer Services:

(a) Where a service is to serve a single lot or a lot on which an indivisible duplex, triplex or quadraplex unit is being constructed, the service shall be installed at the center of the lot and front the property being served. Such services shall be perpendicular to the main. All service stub-outs shall be properly marked as noted above and shall have a clean-out installed within one foot of the property or easement line and within private property, to separate private from public responsibility upon connection. The responsibility for the clean-out shall be the owners ***(SeeJWSC Standard Details).***

(b) Where adjacent residential properties can share a common service line the service wye that splits the discharge between the users must be constructed completely within the public rights-of-way corridor or easement using a six by four (6X4) inch double-wye fitting with the four

(4) inch branching service lines from the wye ending at a point at the property line that will not conflict with other utility components such as transformers, phone pedestals, water meters, light poles, etc. Each four (4) inch branch stub-out shall be properly marked as noted in this Section and shall have a clean-out installed within one foot of the property or easement line and within private property, to separate private from public responsibility upon connection. The responsibility for the clean- out shall be the owners. Such double services may be approved for light commercial properties upon approval of the JWSC ***(See JWSC Standard Details).***

Double services, as described above may be applicable for certain commercial properties upon approval by the JWSC.

Services shall be limited to 60' maximum length from either the sewer main or the manhole to the property line.

All services shall run perpendicular to the gravity sewer main line; no services shall be constructed parallel to the rights-of-way or easement line or run diagonally across rights-of-ways or easements with the exception of cul-de-sacs or where sharp curves in roadways or easements occur.

Services shall be marked with an "**S**" inscribed in the curb face, directly over the service line, and painted green.

Services shall terminate no less than thirty (30) inches deep and no greater than sixty (60) inch deep at the property line and where not expected to be in conflict with other crossing underground utilities.

Services that cross under storm drain structures or ditches, and do not have a minimum one and one half (1 1/2) foot vertical clearance between the invert of the storm drain pipe or the ditch bottom, shall be constructed with one joint of sewer safe D.I.P. centeredunder the storm pipe or ditch.

Private clean-outs shall not be installed in the Rights-of-way or easements. The responsibility for the protection and repair of clean-out shall be the owners.

Service connections are not permitted on trunk sewers larger than 15" in diameter.

Service Connections to manholes are allowed as follows:

(a) Inline manhole connections are limited to 2 services, one from each side of the rights-of-way or easement and installed perpendicular to the Rights-of-Way or easement.

(b) Terminal manholes located in residential cul-de-sacs are allowed 3 service connections. The invert of each service connection shall be a

minimum of five (5) inches above the invert of the manholes effluent (outgoing) main line.

Services shall not be connected to main line stub-outs without a manhole.

3.6.7 Sewer Manholes

3.6.7.1 Location

Manholes shall be installed at the end of each main and at all changes in grade, pipe size, pipe material, or alignment and at all pipe intersections. The only recognized exception shall be where pipe material changes are allowed on a particular reach of the main by this standard (i.e., D.I.P installed under storm drains, water mains, etc.).

Manholes where pipe diameter changes occur shall establish invert elevations by matching pipe crowns. Where the vertical difference in pipe inverts, caused by matching crowns occurs, are less than 1.5 feet in 4' diameter manholes and 2 feet in 5' or larger manholes between influent and effluent lines, transitional flow slides may be used so long as they do not interfere with the smooth flow through the primary manhole trough or other influent line flows.

Manholes shall be located on the centerline of roadways or out of the wheel lane and a minimum of four (4) feet from the edge of the manhole to the curb and gutter; but never installed in ditch lines.

Manholes shall not be installed in the flow line of inverted crown roads or within the design high water limits of gutters, swales, or retention/detention areas.

Manholes located within easements shall have the ring and cover set six (6) inches to eight (8) inches above final grade.

3.6.7.2 Spacing

The maximum spacing of manholes shall be four hundred (400) feet for sewer mains less than or equal to fifteen (15) inches diameter and five hundred (500) feet for sewer mains greater than fifteen (15) inches diameter. A gravity main exceeding the maximum length may be allowed where a practical and sufficient reason can be demonstrated; however, such additional length shall not exceed the allowed maximum distance by more than fifty (50) feet.

3.6.7.3 Clearance Requirements

Manholes shall have three (3) feet minimum clearance from outside edge to outside edge of other utility components, such as storm drains and storm drain boxes, utility poles, transformers, phone pedestals and cable systems.

3.6.7.4 Depth

The design depth for all manholes is to be at no less than thirty-six (36) inches from the top of the manhole to the pipe crown.

3.6.7.5 Drop Connections

Outside and Inside drop connections are only allowed within limited boundary subdivision developments to be dedicated as public infrastructure, where the potential for gravity system extensions from the manhole to adjacent properties is blocked or unanticipated by the sewer master plan, and the main line pipe size is eight (8) inches or greater. Where outside drops are acceptable, they shall be required where the vertical difference between inverts is greater than one and one-half (1 ½) feet in four (4) foot diameter manholes or two (2) feet in manholes greater than four (4) feet in diameter ***(See JWSC Standard Details).*** Inside drops will only be approved where connections are being made to an existing system where depth restraints preclude the practical installation of an outside drop.

Outside drops, where the vertical distance of the drop is ten (10) feet or less, shall be constructed of SDR-35 PVC pipe, bedded and backfilled along with the entire manhole structure to within ten (10) inches of the final grade with Class I material; where the vertical distance of the drop is greater than ten (10) feet, the drop shall be encased in a concrete column of a minimum two (2) inches thickness around all pipe walls, and pouredso as to provide a concrete base as a foundation for the drop bottom connection; the entire concrete structure shall be tied to the manhole wall with rebar studs for the full depth of the drop.

Inside drops, where approved, must enter the manhole with a PVC tee fitting with a gasketed cap cut to one-half (½) of the host pipe diameter attached to the branch following the slope of the pipe reach being drained, the down leg placed closely against the manhole wall fastened with (316) stainless steel anchor bolts and bands on two (2) foot centers, an angled fitting and invert trough at the base to direct the flow smoothly into the existing flow line; all PVC piping and fittings shall be SDR-35 ***(See JWSC StandardDetails).***

3.6.7.6 Grade Rings

Grade rings, where necessary to serve as spacers between the top cone of the manholesand the base of the manhole cover frame to bring the manhole design or finish grade, shall be hard rubber or approved equal to absorb vibration in paved areas and high-density polyethylene or cement rings in off road applications. Adjustments using clay or cement brick are not acceptable.
On new construction, an adjustment using metal riser rings to extend the manhole cover frame to grade is not permitted. No adjustment using grade rings between the top cone section and the manhole cover frame shall exceed sixteen (16) inches.

3.6.7.7 Corrosion Protection

Manhole corrosion protection shall be provided for manholes in accordance with the following schedule based on detention time of sewer flow from the uppermost region ofthe contributing pipe reach using an average velocity of two (2) feet/sec.

Vapor H2S	Corrosion Risk Level	Detention Time	Corrosion Protection
0-10 PPM	No or Low Risk	<2 Hours	None
11-50 PPM	Moderate Risk	2 - 4 Hours	Coal Tar Epoxies
>50 PPM	High Risk	>4 Hours	Calcium Aluminates Epoxy Coatings Approved Lining Systems
FM Discharge Manhole	High Risk	N.A.	Calcium Aluminates Epoxy Coatings Approved Lining Systems

(a) Corrosion protection for *High Risk* manholes shall be hydrogen sulfide resistant cementitious products containing calcium aluminates applied at a minimum of one-half (½) inch to three- fourths (¾) inch in thickness or epoxy coatings applied a minimum of 150 mil thickness onto all interior manhole surfaces, excluding the trough, after proper substrate preparation; or precast manholes manufactured of calcium aluminate cement concrete; or manholes manufactured of fiberglass. Alternatives that provide equal or better protection may be approved.

(b) Any manholes receiving the discharge from upstream lift stations shall be considered a *High-Risk* manhole and the 2nd and 3rd manholes downstream shall be considered *Moderate Risk* manholes and protected per this standard.

3.6.8 Pipe Trench Construction, Bedding, Backfill and Workmanship

At no time shall the bedding, haunching, initial backfill or final backfill be less than, or in contradiction to the pipe manufactures recommendations for the pipe materials being used.

3.6.8.1 Rigid Pipe

Rigid Pipe Materials (DIP) shall be laid in a Type 2 (flat bottomed) trench with a pipe bedding of Class I gravel or naturally occurring clean compacted sand, as necessary to provide a firm unyielding pipe foundation; or where the natural trench foundation is weak, on a Class I (#57 or #64 stone) gravel of sufficient depth to provide a firm and unyielding foundation, (in both cases, the compacted bedding shall extend across the entire width of the trench to undisturbed trench walls on either side of the pipe); initial backfill (from bedding to pipe crown) shall be hand tampered gravel or sand material freefrom cinders, ashes, refuse, vegetable, or organic material, boulders, rocks, or stones,

frozen soil or other materials that, in the opinion of the JWSC, is unsuitable. Final backfill in non-traffic areas, (from pipe crown to final grade), shall be Class IV material or better and free of boulders, rocks and stones greater than twelve (12) inches in their greatest dimension, tree trunks or limbs, brush from clearing, refuse or trash, frozen soil or any organic materials which may decompose and create voids. Final backfill in traffic areas shall be Class III material mechanically compacted in two (2) foot lifts to 95% modified proctor to within ten (10) inches of final grade, eight (8) inches of crusher run gravel compacted to 95% modified proctor, and two (2) inches of Type III asphalt pavement to final grade or other pavement type or dimension as required by the road authority on the encroachment permit.

3.6.8.2 Flexible Pipe

Flexible Pipe Materials (PVC, HDPE) shall be laid in a Type 2 trench with Class I gravel or naturally occurring clean compacted sand bedding material as necessary to provide a firm unyielding pipe foundation; or, where the naturally existing foundation is weak, on a ClassI gravel bedding of sufficient depth to provide a firm and unyielding foundation; initial backfill (from bedding to crown of the pipe) shall be Class I material placed with shovel slicing (hauching) or clean naturally occurring hand-tamped sand along the sides of the pipe to insure firm side support and that no voids exist along the pipe barrel or betweenthe pipe barrel and the undisturbed trench walls. Final backfill for traffic areas and non- traffic areas shall be as specified for rigid pipe materials.

3.6.8.3 Unsuitable Materials

Where rock or other unsuitable material is encountered at pipe grade, such rock or unsuitable material shall be removed to a minimum of six (6) inches below the proposed pipe grade line, refilled with Class I material to the correct pipe grade to protect the pipe from point loadings from below and provide base material for adjustment to grade and trench drainage; initial backfill and final backfill shall follow as per standards herein delineated.

3.6.9 Gravity Sewer System Testing and Inspection

All gravity sanitary sewer lines up to thirty (30) inches in diameter, to include connected services and/or main stub-outs shall be low pressure air tested in accordance with ASTM F1417 and conducted in substantial conformance with the procedures below.

a. air testing shall be performed as soon as possible after completing a reasonable length of gravity sewer installation, and before scheduling Preliminary Record Drawing Line Televising;

b. the system installer shall furnish all equipment, material, and personnel to conduct the test using low pressure air;

c. the test equipment shall be, and the test conducted in the presence of a JWSC Construction Inspector;

d. testing shall be conducted after backfilling has been completed but before finish grading or surface improvements;

e. all wye's, tees, and lateral stubs or other fittings shall be suitably capped to withstand the internal test pressures;

f. after a manhole-to-manhole section of line has been cleaned, it shall be plugged at each manhole with pneumatic plugs inflated to 25 psi internal pressure; plug bracingmay be used as necessary to keep plugs from being blown out of lines;

g. one of the test plugs shall have two factory equipped hole connections in addition tothe hose connection used to inflate the plug. One connection shall be used to continuously monitor the rising air pressure in the sealed line. The other connection shall be used only for introducing the low pressure air into the sealed line;

h. three and one-half (3 ½) inch diameter, 0-30 psi air gauge shall be supplied for reading the internal pressure of the line being tested. Calibrations from the 0-10 psi range shall be in tenths;

i. low pressure air shall be introduced into the sealed line until the internal pressure reaches 3.5 psi greater than the average back pressure of any ground water that maybe above the pipe, but not greater than 9.0 psi. At least two (2) minutes shall be allowed for the air pressure to stabilize.
After this period, the hose used to introduce the pressure shall be disconnected from the air source in such a manner as to retain the pressure in the sealed line and the compressor shut down;

j. the portion of the line being tested shall be accepted if it does not loose air at a rate greater than 0.0015 cfm per square foot of internal pipe surface when tested at an average pressure between 3.5 and 4.0 psi greater than any back pressure exerted by ground water that may be over the pipe at the time of the test;

k. time requirements for pressure drop of 1.0 psi or 0.5 psi 3.5 to 2.5 or 3.5-3.0 psi greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameter in the tables provided in the ASTM Standards;

l. where high ground water is known to exist, the height in feet of ground water above the invert of the sewer shall be divided by 2.31 and added to 3.5 psi to establish the amount of pressure to be used for the test;

m. if, the line fails to meet the requirements of the test, the source of leakage shall be identified and corrected and the line retested.

3.6.9.1 Low Pressure Air Test

Gravity sewer mains greater than thirty (30) diameter shall be low pressure air tested at the joints and/or noted defects using equipment capable of isolating each joint or defect from the rest of the pipe. Testing pressures and passing values shall be the same as cited above.

3.6.9.2 Infiltration Test

Where gravity sewer lines cannot be low pressure air tested in accordance with this Standard, the system shall be subjected to an infiltration test to establish leakage less than100 gallons per inch per day per mile (gal/in/day/mile) using a V-notch weir; however, where ground water conditions are not favorable for testing, (ground water levels less thaneight (8) feet over the pipe invert for any individual line segment), the end of the line to bechecked shall be plugged at the downstream manhole, the upstream manhole partially filledto place a 3.5 psi head on the subject line at the lowest end, and the change in water depthnoted during the test period converted to a volume; such volume and test time duration shall be compared against the 100 gal/in/day/mile Standard.

3.6.9.3 Vacuum Test

All sanitary sewer manholes shall be vacuum tested in accordance with ASTM C 1244-93and conducted in substantial conformance with the following procedures:

a. The entire manhole structure, to include the joint between the cast iron frame & cover and the top cone or adjustment ring, shall be tested as a unit;

b. All lift holes shall be plugged;

c. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole;

d. Place vacuum test head on the top of the manhole structure, setting the sealing faceso that the joint between the manhole frame & cover and the main structure is included in the area to be tested;

e. Draw a vacuum of ten (10) inches of mercury on the manhole, shut the valve on the vacuum line of the test head and turn off the vacuum pump;

f. Measure the time in seconds that it takes for the vacuum to drop to nine (9) inches of mercury;

g. Compare the time of the pressure drop from ten (10) inches to nine (9) inches of mercury with the allowable time value for the manhole diameter and depth as shownon the table in the Section appendix;

h. If the manhole fails the initial test, necessary repairs shall be made by an approved method and the manhole retested until a satisfactory test is obtained.

3.6.9.4 Visual Inspection

All sanitary sewer mains will be visually inspected using color CCTV provided equipment by a PACP (Pipeline Assessment Certification Program) certified operator using PACP certifiedsoftware. This service will be provided by the JWSC upon demonstration by the installer that the sewer lines and manholes have passed air and vacuum tests, the lines have been hydraulically cleaned using a combination cleaner and presentation of a Preliminary RecordDrawing of the sanitary sewer system as installed.
The CCTV equipment shall include inclinometer capabilities that capture the line grade values in percent as the camera proceeds along the line and also provides a chart showing the average line grade from pipe start to pipe end for verification of Record Drawing slopes.The system installer is responsible for providing adequate trafficable access to the system components to perform this work.

A CCTV re-inspection of any and all defects found in mains during any previous test shall be required prior to acceptance.

3.6.9.5 Deflection Testing

Deflection testing shall be performed on any flexible pipe reach installation where CCTV inspection observations indicate that the pipe may be deflected or ovalized in any dimension beyond allowable values. Where required, deflection testing shall be performedin substantial compliance with the following procedures:

a. Deflection testing shall be accomplished by pulling a five (5%) mandrel through the line if it has been installed for less than thirty days, or a seven and one-half (7 ½ %) mandrel on any line which has been installed longer than thirty days.

b. An approved mandrel, proving ring, pulling ropes and cables shall be provided by the installer for testing PVC pipe.

c. The mandrel shall be hand pulled through the pipe using no wenches or other mechanical devices except a pulley at the manhole invert. The pulley allows the mandrel to be pulled from ground level rather than from inside the manhole.

d. If, at any point in the pipe one (1) man is unable to hand pull the mandrel through the pipe, then the pipe will be deemed unacceptable.

e. The failed pipe shall be repaired by the installer, the mandrel re-pulled and the line re-televised at the Contractor's expense.

(END OF SECTION)

SECTION 4
SANITARY SEWER LIFT STATIONS AND FORCEMAINS

4.1 GENERAL

This section provides the minimum guidelines for the design of wastewater lift stations and their associated forcemains that are considered an integral component of the facility's pumpingsystem. The method of design and/or construction shall be according to, these Design and Construction Standards and Specifications and the following:

Recommended Standards for Sewage Works (Ten State Standards) Latest Edition

Georgia Environmental Protection Division State of Georgia Regulations for Water and Sewerage Works, Latest Edition

Applicable Federal, State and Local Requirements

In the event of conflicts among the various sources cited above, the most stringent criteria shall take precedence.

4.2 DESIGN FLOWS

Each system component shall be designed to meet certain flow requirements. The various flow requirements are described below.

4.2.1 Daily Average Dry Weather Flow (ADWF)

Daily Average Dry Weather Flow (ADWF) shall be 300 gallons per day per Residential Equivalent Unit (REU) or 115 gallons per day per capita. The basis for one (REU) shall be asingle-family unit occupied by an average of 2.6 persons. Where sewer service beyond the basis of the established REU is required, the Sewage Flow Table shown below(Adapted from the Georgia Environmental Division Large Community Design Guidance Document, Pages 8 & 9, Appendix A) shall be used.

ADWF estimates for existing facilities that are scheduled for **rehabilitation** shall be made using data obtained from flow monitoring the existing system over a period of not less than seven (7) days, from which an average daily flow is to be developed. If any rainfall event measuring more than .5 (5/10ths) inches of rain in any of the seven (7) twenty-four (24) hour periods occurs, the monitoring shall continue to provide at least seven (7) dayswithout rainfall. Flow monitored data shall be adjusted for other potential loadings as appropriate, (i.e., seasonal usages, tourist loading, etc.) as may be developed or estimated from water userecords, percentage of increased occupancy or other rational methods approved by the JWSC.

ADWF for existing facilities that may be scheduled for **upgrading to accommodate additional flows** from proposed developments shall be made using a combination of flow monitoring and REU calculations.

Figure LS-1
Sewage Flow Table

FACILITY	Gallons/Day (GPD)
Assembly Hall	5 per seat
Barber Shop/Beauty Parlor	125 per chair + 20/employee
Boarding House*	100 per room
Bowling Alley	75 per lane + 20/employee
Church w/o Day Care or Kindergarten	5 per sanctuary seat
Correctional Institution/Prison	250 per inmate
Country Club, Recreation Facilities Only	25 per member
Day Care Center, No Meals	15 per person
Dental Office	100 per chair + 20/employee
Department Store	10 per 100 SF
Factory Without Showers With Showers	 25 per employee 35 per employee
Food Service Establishments* Restaurants (Up to 12 hours per day) Restaurants (12 hours per day to 18 hours perday) Restaurants (Above 18 hours per day)Bar and Cocktail Lounge Drive-in Restaurant Carry-out Only	 35 per seat + 20/employee 50 per seat + 20/employee 75 per seat + 20/employee 30 per seat + 20/employee 50 per space + 20/employee50 per 100 SF + 20/employee
Funeral Home	10 per 100 SF
Hospital Inpatient Outpatient	 300 per bed 275 per bed
Hotel*	100 per room
Kindergarten, No Meals	15 per person
Laundry, Commercial	1,000 per machine
Laundry, Coin	150 per machine
Lodges*	100 per room
Mobile Home Park	300 per site
Motel*	100 per room
Nursing Home*	150 per bed
Office	10 per 100 SF
Physician's Office	200 per exam room
Schools* Boarding Day, Restrooms Only Day, Restrooms and Cafeteria Day, Restrooms, Gym, and Cafeteria	 100 per person 12 per person 16 per person 20 per person
FACILITY	**Gallons/Day (GPD)**
Service Stations, Interstate Locations	425 + 150 per pump
Service Stations, Other Locations	300 + 100 per pump
Service Station Car Wash	500 per stall
Shopping Center (Not including food service or	10 per 100 SF

laundry)	
Stadium	5 per seat
Supermarket/Grocery Store	20 per 100 SF
Theater	5 per seat
Travel Trailer Park* With Independent Water & Sewer Connection Without Independent Water & Sewer Connection	 175 per site 35 per site
Warehouse	10 per 100 SF
*Add 300 gallons per machine to amount indicated iflaundry or dish washing machines are installed	

Note: Where historical data is available from flow monitoring or other approved devicesas in the case of existing systems, ADWF shall be as averaged from seven (7) days within the monitoring period of flow with no rainfall event greater than .5 (5/10ths) inches of rain in any of the seven(7) twenty-four (24) hour periods beingaveraged.

4.2.2 Peaking Factors

Upon calculation of the anticipated ADWF in gallons per day for the basin that is to discharge to the pumping facility, a peaking factor of 2.0 shall be applied to the average daily flow expressed in gallons per minute, (ADWF in gpd / 1,440 minutes per day = ADWF in gpm), to account for the daily (diurnal) peak flow in gallons per minute. This gpm figure with the Peaking Factor being applied shall be the required pump rate for the facility; (i.e. 46,080 gpd/1,440 minutes per day = 32 gpm ADWF * 2.0 = 64 gpm = required pump rate). This factor has been determined adequate for pump sizing in the JWSC jurisdictional area and is based on a series of flow monitoring studies conducted on existing lift station basins ranging in size from 25 REU's to 200 REU's (per capita populations of 65 to 520, respectively).

4.3 SIZING OF FORCE MAINS

The discharge piping, to include valves, bends, and the force main is to be considered an integral part of the lift station pumping system whether the facility is new or being upgraded to handle additional flows.

Force mains and associated discharge piping for a single-family use lift station discharging to gravity shall be sized for peak flow (required pump rate) at a minimum velocity of 2.0 fps with one pump running and a maximum velocity of 5.0 fps with both pumps running in a duplex station.
For triplex or quadraplex facilities velocity shall not exceed 5.0 fps with two or three pumps running, respectively.

Common force mains for low pressure or STEP type systems shall be sized for the flow of the planned system based on the probability analysis of simultaneous pump operation in each pressure zone and line segments common to pressure zones. Line velocities, based on this analysis, shall be a minimum of 2.5 fps at least once during the 24-hr. diurnal cycle and no greaterthan that velocity necessary to discharge the highest head pump on the pressure zone at 11 gpm.

4.4 WETWELL DESIGN CRITERIA

4.4.1 Wetwell Volume

The minimum required wet well storage volume between the SCADA High Water Alarm Level and the all pumps "off" level (top of the submersible pump motor or the required submergence of a self-priming pump suction leg) shall be calculated as follows:

$$\textbf{Required Volume} = V_R = .25TQ + V_L + V_A$$

Where:

T = Minimum Cycle Time (see table below)Q = Required Pump Rate
V_L = Lag Level Volume
V_A = SCADA High Water Alarm Level Volume

Pump Hp	Minimum Cycle Time (T)
<20	15 Minutes
20 to 100	20 Minutes
>100	25 Minutes

The distance/volume between the pump "off" level, mid-motor pump housing elevation to the wet well bottom is subject to pump dimensions and is not considered useable volume. The designer shall be responsible for calculating this additional vertical distanceand adding this additional wet well depth.

4.4.2 Wetwell Level Control Settings

To reduce wetwell turbulence caused by cascading influent that results in odor/corrosion problems and air entrainment, and to provide wet well structures that are in large degreeself-cleaning, this Standard requires that the invert of the wet well influent line coming from the contributing system influent manhole be set at the mid-motor elevation of submersible pumps or at the required submergence elevation of suction lift pumps plus 0.5 feet. This vertical increment will ensure a reasonable time period of free flow through the gravity influent line and influent manhole at the design pump rate and thereby the full development of self-cleansing velocity, through these structures as required in this standard.

Based on this requirement, the design settings for level control in wet wells shall be as follows:

Low Water Level (LWL) Alarm : Top of submersible pump volute.

Pump "Off" Level (Pump Off): 50% immersion of submersible pump motor mid-point of pump motor housing or pump manufacturers minimum water level, whichever is greater.

Lead Pump "On" Level (Pump On): The vertical dimension in the design wetwell from the Pump "Off" level needed to store the volume required by V=0.25TQ.

Lag Pump "On" Level (Lag On): Pump On Level + 0.5 vertical feet (6 inches) Lag Pump On settings for triplex or quadraplex pump installations shall follow the same dimensional protocol of 6-inch increments and be labeled as **Lag2 On**, **Lag3 On**, etc.

SCADA High Water Level (SHW): Highest Lag On level + 0.5 vertical feet (6 inches). This elevation shall not exceed the influent manhole lowest invert elevation or lowest invert elevation in the wetwell if an influent manhole is not used.

Audio/Visual High-Water Level (AVHW): SCADA HW elevation + 0.5 feet (6 inches). This level setting is intended to mitigate neighborhood alarm noise complaints and the only setting that allows a surcharge of the lowest contributing gravity sewer system main entering the influent manhole.

Where primary level control is provided by a Level Transducer, the AVHW float ball and installation shall be as specified for all such devices in this Standard.

Note: Where flow matching pumping systems are approved for use, (either by VFD or mechanical flow matching technology using pre-rotation basin technology), level control settings shall be by specific facility design and as approved by the JWSC.

4.5 DEDICATED WASTEWATER LIFT STATIONS

Lift stations to be dedicated shall have a minimum required pumping rate of 22 gallons per minute (gpm) at peak diurnal flow and a minimum upstream contributory loading of 16,000 gallons per day (gpd) as calculated in Paragraph 4.2 of this Standard.

Lift stations not meeting this standard, shall be privately owned, operated, and maintained underthe supervision of a Licensed Georgia Wastewater Collections System Operator. Such privately owned facilities and their contributing gravity systems shall be considered Satellite Systems of theJWSC requiring an agreement with the JWSC to discharge to the Public System.

Any future consideration by the JWSC to accept Public ownership of a privately owned facility shall be precedent upon such facility's adherence to this Standard or upgrade to this Standard.

4.5.1 Lift Station Types

4.5.1.1 Low Flow Lift Stations

Low Flow Lift Stations shall be defined as those facilities whose loading requires pumping capacities between 22 gpm and 79 gpm. These facilities are intended to serve limited areas where the service area cannot be expanded, and wastewater service cannot be otherwise provided by on-site (septic) systems or low-pressure systems capable of

discharging to Public gravity. Such facilities, where approved, shall be grinder pump duplex stations meeting all criteria of this Standard.

4.5.1.2 Standard Lift Stations

Standard Duplex Lift Stations shall be defined as those facilities whose loading requires pumping rates between 80 gpm and 749 gpm.

Standard Triplex Lift Stations shall be defined as those facilities whose loading requires pumping rates between 750 gpm and 3,000 gpm. Triplex facilities shall be flow proportional and be equipped with an automatic standby power generator.

Standard Quadraplex Lift Stations shall be defined as those facilities whose loading requires pumping rates greater than 3,000 gpm. Quadraplex facilities shall be flow proportional and be equipped with an automatic standby power generator.

4.5.1.3 Initial/Ultimate Lift Stations

Initial/Ultimate Lift Stations shall be defined as those facilities whose initial loading requirement is significantly less than the ultimate loading requirement as determined bya submitted and approved build-out plan. Such facilities shall be designed to meet all criteria of this Standard with exceptions as noted herein.

4.5.2 Site Requirements

The property, on which the facility is constructed, is to include the influent manhole andall related lift station appurtenances.

4.5.2.1 Site Dimensions

Minimum site dimensions of the property shall be as follows:

a. Four (4) foot and five (5) foot diameter wet wells – minimum 30’ x 30’ (restricted to Low Flow Stations)

b. Six (6) foot and eight (8) foot diameter wet wells – minimum 50’ X 50’

c. Ten (10) foot diameter and greater – minimum 60’ X 60’

d. Rectangular structures – minimum 60’ X 60’

e. Irregular sites and site sizes may be considered by the JWSC where atypical conditions exist.

4.5.2.2 Fencing

Fencing is required on all sites and shall be placed a minimum of two (2) feet inside of all site property lines and constructed as follows:

a. The fence shall be six (6) feet high, consisting of two (2) inch mesh by nine (9) gauge aluminum coated steel fabric with green PVC coating, conforming to the latest revision of ASTM A-491. The fence shall have a seven (7) gauge aluminum coated steel coil spring tension wire along the bottom of the fence fabric.

   Three strands of twelve and one-half (12-½) gauge aluminum coated steel of barbed wire with four (4) point aluminum barb spaced five (5) inches apart mounted on the barbed wire support arms shall be installed along the top of the fence fabric.

b. The posts shall be galvanized line posts, two and a half (2 ½) inch O.D. (3.65 lbs. per ft); galvanized corner posts, three (3) inches O.D. (2.27 lbs. per ft) with extra-long pressed steel sleeves. Corner and gate post shall have necessary struts and tie bracing. Provide watertight closure caps on all posts.

c. Gate shall be a pair of 8'-0" long (sixteen (16) foot total width) six (6) feet high sections and shall be equipped with a prop post center latch and hasp assembly. A ground anchor cast in concrete shall be provided. Gates shall be factory fabricated, green PVC coated conforming to the latest revision of ASTM A-429 and equipped with gate holders. Duckbill backstops shall be provided for the swing side of both gate sections.

d. The gate entrance shall be set back at least twenty feet from a public or private road in order to allow vehicles to pull off the road before opening the gate.

e. Where aesthetics are a concern, the fencing cloth may be interwoven with vinyl stripping to obscure the site from public view. The color of stripping shall be dark green.

4.5.2.3 Site Access, Ground Cover and Drainage

a. The entire site shall be covered with a geotextile filter fabric covered with six (6) inches of compacted crusher run (GAB) stone. Stone shall be clean with no soil or foreign material present.

b. The graveled area shall be treated with a high quality, long lasting, EPA environmentally approved weed killer.

c. Site shall be serviced by a twelve (12) foot wide all-weather road with top of road above the two (2) year flood elevation.

d. Drainage structures and conveyances shall not be allowed and no catch basin shall be located within the pumping station site. The entire site shall be graded such that storm water runoff sheet flows outwards and away from structures and other appurtenances and into proper drainage channels.

e. No site shall be located within the backwater of any lake, pond, ditch, canal, or other water body without such flood level being taken into consideration by raising the site

grade, the structure openings or providing watertight structure hatches abovesuch backwater levels. The twenty-five-year flood elevation shall be the governingfactor if backwater levels are not historically available or known.

f. Pump stations shall be designed and located on the site so as to minimize the effects resulting from odor, noise, and lighting.

g. Where the location of the facility would require backing onto a public road to leave the site an area along the access or at the facility gate shall be wide enough to provide a service vehicle turnaround.

h. Any proposed on-site landscaping or specialized ground cover being considered to improve the aesthetics of the site or block the site from view shall be approved by the JWSC. No trees will be permitted within the property boundary.

4.5.2.4 Site Electrical Power

a. All power lines within the site shall be underground. No overhead power line will be allowed to cross the site.

b. All facilities shall be served with three-phase power. If three-phase power is not available, the Design Engineer shall submit a copy of written communication from the commercial power provider stating at what cost three-phase power would be available. In cases where pump station location has been optimized for both elevation and power supply and providing three-phase power costs are disproportionally high, variable frequency drives (VFD's) will be considered to operate the three phase motors. Prior written approval will be required from the JWSC to utilize single-phase power. Add-a-phase units are not allowed.

c. A facility yard light and pole shall be provided for night operations and security purposes. The light shall be a 120V 500W Quartz or Halogen floodlight pointed at the control panel. The light shall be placed on a switch with a 24-hour timer capableof illuminating the facility on a selectable periodic basis. The switch and timer shallbe housed in a weatherproof enclosure on the light pole. The light pole shall extend a minimum of twelve (12) feet from grade with the light fixture mounted within one (1) foot of its top for maximum coverage.

4.5.2.5 Facility Water Supply

a. The facility shall be provided with a one (1) inch water service line for clean-up useand testing.

b. The water service line shall be protected with the installation of a reduced pressure backflow assembly installed within the fenced enclosure. The RPZ shall be in accordance with Paragraph 2.4.6.2 of these Standards and Specifications.
Where requested by the JWSC, the backflow preventer piping shall be provided with a 4-20 milli-amp pressure transducer to sense area potable water pressures.

c. The water service line shall incorporate a frost-proof yard hydrant. Yard hydrants are to be stainless steel and have locking capability. No water meter will be requiredfor water use at lift stations.

4.5.2.6 Facility Bypass Pumping Connection

A facility bypass pumping connection shall be provided in accordance with the ***JWSC Standard Details.***

a. The facility shall be provided with an external connection to the force main serving the station for use during emergency and maintenance situations.

b. The bypass connection shall be sized to the diameter of the main pump's discharge line and be set downstream from the isolation valves of the main pump piping header.

c. The bypass connection shall be provided with a plug valve, set on the underground horizontal run to the bypass connection, and a check valve and CAM Lock with cap set on the aboveground horizontal run to the pump connection point.

d. The bypass connection shall be placed and oriented on the site to facilitate the setting of a bypass pump between the influent manhole and the bypass connection.

e. The bypass connection shall be provided with a 3'x3'x6" concrete slab base.

f. The point of attachment to the bypass connection shall be oriented horizontal andnot protrude above its concrete slab more than 1 foot.

g. The bypass connection piping and fittings shall be epoxy lined "Sewer-Safe" D.I.P. with exterior coating the same as the lift station discharge header piping.

4.5.2.7 Facility Elevation Benchmark

A Standard Brass Benchmark shall be set into the wet well slab top with the NAVD88 Mean Sea Level Elevation stamped on the face of the benchmark by a Georgia Registered Land Surveyor. An alternate location for the benchmark may be approved where structure configuration is atypical.

4.5.3 Wetwell Configuration

4.5.3.1 Size and Depth

a. The maximum wetwell depth, as measured from the wet well rim to the lowest pointof the sump, shall not exceed 20 feet.

b. The minimum circular wetwell diameter shall be 6 feet; (surface area 28ft^2), for all but low flow stations for which wet well diameters of five (5) feet shall be used.

c. The minimum rectangular wetwell dimensions, where approved for special applications where wetwell depth is critical, shall be 6 feet by 6 feet or any other dimension providing an equal or larger surface area; (surface area 36ft^2).

d. Where the JWSC has approved a facility having an initial and an ultimate flow design, the wetwell shall be sized for the ultimate pump rate whereas the storage height (and consequent level control settings) shall be established on the initial pump rate. The level settings shall be as stipulated in Paragraph 4.4.2 of this Standard.

4.5.3.2 Piping and Equipment Layout

a. All wetwell inverts and pump intake sumps shall be configured to provide self-cleaning characteristics. Water surface levels at low water level shall be minimized to allow the removal of debris before the pump loses prime during a manual maintenance pump-down by operators.

b. The wetwell shall have only one (1) influent line with its invert set 0.5 feet above the "Pump-Off" (mid-point of pump motor housing elevation), and it shall enter the wetwell coplanar, (aligned parallel and in-line), with the pump discharge lines in accordance with the ***JWSC Standard Details.***

c. The wetwell inverts shall be sloped downward from the top of the submersible pump motor toward the wet well pump sump at a 60-degree angle from the vertical. Flat areas for pump connection discharge elbows shall be eliminated or sloped with coated grout materials as much as possible to shed debris **(*See the JWSC Standard Details).***

d. The wetwell pump sump geometry shall provide for the required spacing between pumps, sump walls and floor as required by the manufacturer while simultaneously minimizing the water surface area at the "lowest" water level (top of pump) to allowthe vortex to engulf floating solids quickly before the pump loses prime during periodic cleaning cycles in manual operation.

e. The wetwell shall be provided with appropriately placed adjacent sleeves, 24 inches below finished grade, for access of the power and control conduits. The sleeves shall be of the proper size to accommodate all necessary power and control conduits.

f. Where the design flow of the station requires a pressure transducer for level control,an additional sleeve shall be required. It shall be placed 24" below finished grade and

centered between the discharge legs. The sleeve shall be 2" in diameter. A slotted 6" PVC/HDPE joint of pipe shall be installed within the wet well, between the discharge legs, to serve as the housing and stilling well for the transducer. The stilling well shall terminate at the level of the pump intakes and be securely fastened to the discharge piping. The transducer shall be set within the stilling well at the low water level elevation of the station **(*See JWSC Standard Details).***

4.5.3.3 Ventilation

The ventilation for the wet well shall be designed as a passive gravity ventilation system where the air volume in the wet well is either increased or decreased as the wastewaterlevel fluctuates due to inflow and outflow. The passive ventilation shall be sized to vent at a rate equal to the maximum pumping rate of the station, not to exceed maximum permissible design airflow through the vent pipe of 600 feet per minute (fpm). Passive "gooseneck" vents shall be turned down so that the opening faces the top slab of the wetwell.
The minimum allowable passive vent diameter shall be 6 inches. Stainless steel screens shall be required to prevent birds and/or insects' entry into the wet well. The vent shall be placed diametrically opposite the control panel. Vent piping shall be 304 stainless steel.

4.5.3.4 Access Hatches

Access hatches shall provide the required clear opening for pump removal and be set in the concrete top so as to allow the pump to be removed through the approximate centerof the hatch. The hatch material shall be Aluminum Alloy 6063-T5 & T6, one-fourth (¼) inch plate, with flush type lock and inside spoon handle having a live load capacity of 300pounds per square foot. The frame shall be equipped with a stainless steel hinged and hasp-equipped cover, two (2) upper guide bar holders and stainless-steel chain holders. The door shall be torsion bar loaded for ease of lifting, shall have a safety locking handle in the open position and safety grate. All fastening hardware used inside the wet well shall be stainless steel.

a. Pump access covers shall be suitably sized to provide adequate clearances for installation and removal of the pumping units.

b. Hatches should be sized for the ultimate pump design. The access hatch should be designed for a minimum width of 36" or 6" beyond the manufacturer's minimum required width, whichever is greater.

c. The minimum hatch length should be forty-eight (48) inches for standard duplex stations and ninety-six (96) inches for triplex stations or the sum of the pump width, centerline pump separation, plus twelve (12) inches, whichever is greater.

d. Low Flow Station hatches shall be sized to adequately remove the pumps and shall not be required to adhere to the minimum requirements.

4.5.4 Precast Concrete Structures

4.5.4.1 Materials

Precast wet well bases, sections and related structures shall conform to the requirementsof ASTM C478 (specification for precast concrete manhole sections and structures) exceptas modified herein. Cement shall be minimum 4,000 psi concrete meeting the requirements of ASTM C150 (specification for Portland cement, type II).

Minimum wall thickness shall be $1/12^{th}$ the inside diameter in inches plus one (1) inch. Ring reinforcement shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. Bases for wet wells shall be cast integrally with the bottom section.

A Flexible Neoprene-EPDM pipe connector, conforming to ASTM C443 shall be used to connect the sewer influent pipe to the precast concrete wet well. The connector shall bea minimum of three-eighths (3/8) inches thick or greater and resistant to ozone, weathering, aging, chemicals, and petroleum products. The securing bands shall be stainless steel and screw assembly and totally non-magnetic Series 304 stainless steel. The connector shall be of a size specifically designed for the specified pipe material and size. The interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II lean cement grout. The exterior (below grade) of precast concrete wet wells shall be given two coats of an approved bituminous water proofing materials.

4.5.4.2 Corrosion Protection

The interior corrosion protection for precast concrete wet wells shall be in accordance with the following schedule based on detention time of sewer flow from the uppermost region of the contributing pipe reach using an average velocity of two (2) feet/sec.

Figure LS-1
Interior Corrosion Protection Table

Vapor H2S	Corrosion Risk Level	Detention Time	Corrosion Protection
0-10 PPM	No or Low Risk	<2 Hours	None
11-50 PPM	Moderate Risk	2 - 4 Hours	Coal Tar Epoxies
>50 PPM	High Risk	>4 Hours	Calcium Aluminates Epoxy Coatings Approved Coating Systems

a. Corrosion protection for *High Risk Wet Wells* shall be hydrogen sulfide resistant cementitious products containing calcium aluminates applied one-half (½) inch to three-fourths (¾) inches of thickness onto all interior surfaces after proper substrate preparation; precast wet well structures manufactured of calcium aluminate cement concrete or precast structures with approved epoxy coatings applied a minimum of 150 mil thickness.

Alternatives that provide equal or better protection may be approved. A(ten 10) year warranty will be required.

b. All wet wells designed with the intention of being used as a receiving wet well from upstream lift stations, or considered by the JWSC to be Regional Lift Stations, shall be considered *High Risk Wet Wells.*

4.5.4.3 Installation

The base section shall be set in a twelve (12) inch (minimum) leveling course of granular material (57 stone). Precast concrete sections shall be set so the wet well will be vertical and with sections in true alignment.

All holes in sections used for their handling and the annular space between the wall and entering pipes shall be thoroughly plugged with an approved, non-shrinking mortar or grout, applied, and cured in strict conformance with the manufacturer's recommendations, so that there will be zero leakage through openings and around pipes.The mortar shall be finished smooth and flush with the adjoining interior and exterior wallsurfaces.

Joint contact surfaces shall be formed with machined castings and shall be exactly parallel and sealed with a joint sealer over the entire joint surface. Joints shall be watertight. Excess joint sealer shall be trimmed flush with the inside and outside surface of the structure.

All exterior joints of precast concrete wet well shall be sealed with one twelve (12) inch wide exterior joint sealant membrane centered on the joint. The tape shall be capable of sealing joints against groundwater infiltration. The installation of the membrane shall bein conformance with the recommendations of the manufacturer. The concrete surface must be smooth, clean, dry, and free of voids, loose aggregate, dirt or other matter that will hinder the adhesion of the membrane. A primer shall be used in accordance with the recommendations of the membrane manufacturer.

4.5.5 Fiberglass Structures (Alternate Construction Material)

Fiberglass wet wells, when approved for use by the JWSC, shall meet the following requirements.

4.5.5.1 Materials

Unless otherwise noted by the JWSC, a circular fiberglass wet well may be used in lieu of a precast concrete wetwell. The fiberglass wet well shall be designed (signed and sealed) by a Georgia Professional Engineer and meet all applicable configuration criteria as shown in Paragraph 4.5.3 of this Standard.

The wet well shall include a twenty-four (24) inch (minimum) thick twelve (12) inch thick inside the wet well and twelve (12) inch thick outside the wet well reinforced concrete hold-down base which extends twenty-four (24) inches beyond the outside of the wetwell, a six (6) inch (minimum) thick reinforced concrete top slab, pump access frame andcover and other standard wet well features. Pumps shall be anchored to a one (1) inch thick steel plate.

Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade polyester resin or vinyl ester resin, with fiberglass reinforcements. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as

other gases associated with the wastewater collection systems. The wetwell shall be a one-piece unit unless otherwise approved by the JWSC.

The resins used shall be a commercial grade unsaturated polyester resin.

The reinforcing materials shall be commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

If reinforcing materials are used on the surface exposed to the contained substance, they shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.

Fillers, when used, shall be inert to the environment and wetwell construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.

The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than one-half (1/2) inch in diameter, delamination, and fiber show.

The interior surface shall be resin rich with no exposed fibers. The surface shall be free of grazing, delamination, and blisters larger than one-half (1/2) inch in diameter, andwrinkles of one-eighth (1/8) inch or greater in depth. Surface pits shall be permitted up to six (6) square feet if they are less than three-fourths (3/4) inch in diameter and less than one-sixteenth (1/16) inch deep.

The bottom to be fabricated using fiberglass material as stated in Paragraph 4.5.5.1 with material and installation to meet all physical requirements of Paragraph 4.5.5.4 below. The Bottom shall be attached to wetwell pipe with fiberglass layup to comply with ASTM D3299 specifications. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to wet well bottom.

The fiberglass wet well top shall be fabricated using fiberglass material as stated in Paragraph 4.5.5.1 with material and installation to meet all physical requirements of Paragraph 4.5.5.4 below. The top is to be attached to a wetwell pipe with fiberglass layup to comply with ASTM D3299 specifications. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to wetwell top.

4.5.5.2 Pipe Connections

Effluent, service, or discharge lines may be factory installed. Approved methods are PVC sewer pipe, Inserta-Tee fittings, or Kor-N-Seal boots. The installation of stub outs shall be fiberglass layup to comply with ASTM D3299 specifications.

4.5.5.3 Defects Not Permitted

Any of the following defects observed or present in the finished structure shall be cause for rejection.

a. Exposed fibers: glass fibers not wet out with resin.

b. Resin runs: runs of resin and sand on the surface.

c. Dry areas: areas with glass not wet out with resin.

d. Delamination: separation in the laminate.

e. Blisters: light colored areas larger than one-half (1/2) inch in diameter.

f. Crazing: cracks caused by sharp objects.

g. Pits or Voids: air pockets.

h. Wrinkles: smooth irregularities in the surface.

i. Sharp projection: fiber or resin projections necessitating gloves for handling.

4.5.5.4 Physical Requirements

LOAD RATING: The complete wet well shall have a minimum dynamic-load rating of 16,000 ft-lbs. To establish this rating, the complete wetwell shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs. and shall not deflect vertically downward more than one-fourth (1/4) inch at the point of load application when loaded to 24,000 lbs.

STIFFNESS: The wet well cylinder shall have a minimum pipe-stiffness value shown in thefollowing table when tested in accordance with this Article of the Standard:

LENGTH (FT)	F/AY (PSI)
0 TO 10	1.26
10 TO 20	2.01

PHYSICAL PROPERTIES:

	HOOP	AXIAL
Tensile Strength (PSI)	18,000	5,000
Tensile Modulus (PSI)	800,000	700,000
Flexural Strength (PSI)	26,000	4,500
Flexural Modulus (PSI) Without Ribs 48",60", 72" With Ribs 96", 144"	 1,400,000 700,000	 700,000 700,000

TEST METHODS: Tests shall be performed as specified in ASTM D3753, Section 8

4.5.5.5 Backfill Material

Unless shown otherwise in the drawings, sand or crushed stone shall be used for backfill around the wetwell for a distance of two feet from the outside surface and extending from the bottom of the excavation to the bottom of the top slab. Suitable material chosenfrom the excavation may be used for the remainder of the backfill.
The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the JWSC. Backfill material shall be free of vegetation or other extraneous material. Excavated materials which are to be used for fill or backfill may be stockpiled on the site. Topsoil should be stockpiled separately and used for finish grading around the structure.

a. Backfill operations shall not begin until the concrete has been allowed to cure and the forms removed.

b. Backfill shall be placed in layers of not more than twelve (12) loose measure inches and mechanically tamped to at least 95% Standard Proctor Density. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

4.5.5.6 Documentation

Each wetwell shall be marked with the following information.

a. Manufacturer's name or trademark

b. Manufacturing special number

c. Total length and nominal diameter

Marking shall be placed on the interior wall of the wetwell near the top so as to be readable after installation.

4.5.6 Influent Manhole and Wetwell Influent Line

All lift stations shall be equipped with only one influent line to the wetwell to serve as an approach pipe to the self-cleaning wet well pump sump, and one influent manhole to facilitate bypass pumping.

4.5.6.1 Influent Manhole

The influent manhole shall be located within the fenced lift station enclosure area or extension thereof and placed on the same side of the wetwell as the bypass pump connection. The horizontal distance between the wet well and the influent manhole shallbe the greatest possible horizontal distance within the confines of the site; however, at a minimum the horizontal distance shall be one (1) foot of horizontal separation for every one (1) foot of vertical wet well depth to avoid taking both structures out if construction work on either is necessary in the future.

All influent manholes shall be outside drop manholes with the influent line being a minimum of two (2) vertical feet above the manhole invert to provide a nominal pumping range during bypass operations. The influent manhole shall be five (5) foot in diameter minimum. Where a wetwell diameter less than the 6-foot minimum is approved, the influent manhole may be four (4) foot in diameter.

The corrosion protection on the influent manhole shall be the same as that required on the wetwell at the site. The manhole frame & cover on the influent manhole shall be a JWSC Standard thirty-two (32) inch frame & cover.

4.5.6.2 Wet Well - Influent Line

The effluent line from the influent manhole to the wet well shall enter the wet well 0.5 feet above the "Pump-Off" (mid-point of pump motor housing) elevation, be at least one nominal diameter larger than the largest diameter influent line coming from the basin gravity sewer system and be sloped no greater than 2% and no less than needed to provide self-cleansing velocity at the facility design pump rate. Larger diameter lines between the influent manhole and wet well may be considered where pump range volume is an issue so long as self-cleaning velocity at the pump-off level is obtained.

4.5.7 Wetwell and Discharge Header Piping

4.5.7.1 Interior Piping

All interior wet well discharge piping shall be epoxy lined/exterior coated Class 53 Flange by Flange Ductile Iron Pipe (DIP) with 316 Stainless Steel nuts, bolts, and washers; or, IPS DR 11.0 (160 psi) Flange by Flange High Density Polyethylene (HDPE) with 316 Stainless Steel backup rings, nuts, bolts and washers. Each discharge leg shall be one continuous pipe joint. All nuts, bolts and accessories within the wet well shall be 316 Stainless Steel.

4.5.7.2 Exterior Piping

All pipe and fittings outside of the wet well and above ground shall be epoxy lined "Sewer-Safe" Class 53 Flange by Flange Ductile Iron Pipe (DIP). All bolts, washers and nuts shall be 316 Stainless Steel. Bolt threads shall be coated with "Never Seize" type coating. All above ground pipe, fittings and valves shall receive two coats of an exterior coating of "moisture cured aluminized urethane" or epoxy paint with surface preparation in accordance with the paint manufacturer's recommendation. The paint color shall be tan.

All header discharge piping, fittings and valves shall be constructed approximately three (3) feet above grade and horizontal to the top of the wet well.

Adjustable pipe stands constructed of 304 Stainless Steel – one and one-half (1 ½) inch all thread into a two and one-half (2 ½) inch SCH 40 pipe w/ nine (9) inch by nine (9) inch by a quarter (¼) inch base plate fixed with four (4) seven-sixteenth (7/16) inch X three (3) inch lag bolts at the corners shall be provided as support. The strength and number of pipe stands may vary depending on header length and weight.

4.5.8 Valves and Appurtenances

All lift station pumps shall be equipped with an isolation valve, check valve and discharge gauge fitting on its discharge header. The common manifold header for the pumps shallbe equipped with combination air/vacuum air release valve and an isolation valve to isolate the entire pumping system from the serving force main.

4.5.8.1 Isolation (Plug) Valves

Lift Station Isolation valves on submersible pump installations shall be Plug Valves mounted horizontally on the discharge header.

a. All plug valves shall be of non-lubricated, eccentric plug type with Buna "N" neoprene, epoxy or fusion bonded, nylon faced plugs. Valve bodies shall be ASTM A126, Class B cast iron with all exterior mounted bolts and nuts to be stainless steel.

b. Port areas of four (4) inch through twelve (12) inch valves shall be 100% of full pipe area.

c. The valve seat material shall consist of either a welded in one-eighth (1/8) inch overlay of 90% pure nickel, or 316 Stainless Steel screwed into the cast iron body.

d. Upper and lower plug stem bearings shall be sleeve-type of a stainless steel or other non-corrosive bearing material.

e. The packing shall be adjustable, and the bonnet shall be bolted.

f. All bolts, nuts and washers shall be 316 Stainless Steel.

g. The valves shall be rated for a minimum of 150 psi and shall provide drip-tight shut off with this pressure in either direction.

h. The interior of all plug valves shall be epoxy coated.

i. All plug valves eight (8) inches and larger shall be equipped with totally enclosed worm gear actuators complying with AWWA C504. All gearing shall run in oil. The actuator housing shall be semi-steel with seals to prevent dirt or water from entering the housing. Shaft bearings shall be permanently lubricated bronze bushings. Appropriately sized hand wheel operators shall be provided for each gear-actuated valve.

4.5.8.2 Check Valves

Lift Station Check Valves on submersible pump installations shall be swing check valves mounted horizontally on the discharge header.

a. All check valve interiors shall be fully coated with a liquid thermosetting epoxy suitable for use in wastewater applications.

b. Swing Check valves shall conform to the requirements of AWWA C508.

c. Swing Check valves larger than two (2) inch nominal size shall be cast iron body with stainless steel bolts and nuts, flanged ends, 316 Stainless Steel shaft connected to a steel outside lever and stainless-steel spring, swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber-faced disc.

d. Swing Check valves larger than two (2) inches shall be 150 psi working pressure.

e. Swing Check valves two (2) inches and smaller nominal size shall be all brass swing check valves, 200 psi working pressure.

f. All check valves shall be placed upstream of the pump isolation valve.

4.5.8.3 Air Release Valves

Lift Station Air Release Valves on submersible pump installation discharge headers shall be combination (air release and vacuum release) type valves placed on the discharge header manifold piping upstream of the manifolds station isolation valve on the commonheader.

a. Combination air release valves shall be two (2) inch inlet (minimum), stainless steel internal trim (including float, lever arm, leakage, etc.), stainless steel assembly bolts, stainless steel backwash accessories including quick disconnects and stainless-steel ball valves (gate valve are also acceptable). The body of the air valve shall be 316 Stainless Steel or iron or steel body with fusion bonded

epoxy (twelve (12) Mils thickness, minimum) or ceramic coating (inside and outside surfaces) or nylon plastic.

4.5.8.4 Discharge Gauge Fittings

Discharge Gauge fittings shall be installed on the discharge header pipe of each submersible pump.

a. The gauge fitting shall be installed on discharge header pipe a minimum of six (6) inches upstream from each pump's check valve.

b. The gauge fitting shall be installed by drilling and tapping a one-fourth (¼) inch NPT hole, installing a 316 Stainless Steel nipple (approximate two (2) inches in length), attaching a one-fourth (¼) inch Stainless Steel ball valve, another 316 Stainless Steel nipple (approximately two (2) inches in length) to the ball valve, and attaching a one-fourth (¼) inch NPT Quick Connect coupler to the nipple.

c. One (1) four and one-half (4 ½) inch diameter face glycerin filled Wika discharge gauge, graduated in 1 psi increments (0 – 60 psi) and one (1) foot increments of H_2O (0 – 140 feet H_2O) scale range, with quick-disconnect, shall be provided for each submersible pump. Gauges shall be provided in plastic protective cases and equipped with quick disconnects.

4.5.9 Pumping Equipment

Lift station pumps shall be submersible pumps and shall meet the following requirements.

4.5.9.1 General Requirements

All pumps designed and selected shall be within +/- 20% of the pump's best efficiency point. When possible, the pump selection shall be made in the center of the family of curves.

Where the JWSC has approved the station to be designed as an initial/ultimate facility, the pump's base elbow should be sized for the ultimate pumps. The pump manufacturershall provide an adapter plate for the initial pumps.

4.5.9.2 Submersible Pumps

Submersible Pumps and installation shall be in accordance with the follow minimum standards:

a. Pumping equipment shall be premium quality submersible non-clog pumps for sewage service. Wet-pit pumps shall be complete with a submersible electric motor, floor-mounted discharge base and elbow, guide rails, motor electrical cable (minimum forty (40) feet in length) to connect at the demarcation box (no splicing allowed) and all other appurtenances specified or otherwise required forproper operation.

b. Equipment furnished and installed shall be fabricated, assembled, erected, and placed in proper operating condition in full accordance with drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer, unless exceptions are noted and approved by the JWSC.

c. Pump performance shall be stable and free from cavitations and noise throughout the specified operating head range at minimum suction submergence. Pump shall be designed so that reverse rotation at the rated head willnot cause damage to any component.

d. Major pump components shall be of gray cast iron. All exposed nuts, bolts, washers, anchor bolts and other fastening devices coming in contact with sewage shall be 316 Stainless Steel.

e. The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The impeller shall be semi-open or enclosed one-piece casting with no more than twonon-clog passages and must pass a minimum three (3) inch solid. The interior water passages shall have uniform sections and smooth surfaces and shall be freefrom cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft. All interior water passages and impeller shall be coated with an approved epoxy coating to increase efficiency and resist wear.

f. Pumps shall have mechanical seals, which shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pump is run un-submerged for extended periods while pumping under load. Mechanical seals shall be solid hard faced, (not laminated type). The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be carbon-ceramic, tungsten carbide or silicon carbide material. Replaceable or adjustable wear rings shall be provided for all pumps.

g. All mating surfaces (pump assembly), of major components shall be machined and fitted with o-rings where watertight sealing is required.

h. The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The base shall be sufficiently rigid to firmly support the guiderails, discharge piping and pump under all operating conditions. The base shall besuitable for bolting to the floor, (bolting to a standard one (1) thick metal plate), of the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a "quick disconnect" type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need for unbolting any flange, lowering the liquid level, or requiring operating personnel to enter the wet well. The pump shall be provided witha sealing flange and guide rail sliding bracket. The bracket shall be designed to

obtain a leak proof seal between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact anda suitably sealed connection between flange faces under all operating conditions. Metal to metal mating surfaces are acceptable, if machined finished.

i. The pump shall be driven by a totally submersible electric motor. Pump motor shall be of sufficient horsepower as to be non-overloading over the entire lengthof the pump curve. The stator housing shall be a watertight casing. Motorinsulation shall be moisture resistant, Class F, 155-degree C. at a minimum. Motors 25 HP and larger shall be VFD rated including Class H winding insulation. Motor shall be NEMA Design B for continuous duty at 40 degree C ambient temperature and designed for at least 10 starts per hour.

All motors shall be 3 phase. Motor bearings shall be anti-friction, permanently lubricated type. Motor shall be designed to operate in a totally, partially, or non-submerged condition without damage to the motor. Pump cable assembly shall bear a permanently embossed code or legend indicating the cable is suitable for submerged use. Cable sizing shall conform to NEC requirements. The cable shall enter the pump(s) through a heavy-duty stainless steel assemble with grommet.The system used shall ensure a watertight submersible seal. Cable shall terminate in a junction chamber. The junction chamber shall be sealed from the motor by a compression seal.

j. All rotating parts shall be machined and in near perfect rotational balance as possible. Excessive vibration shall be sufficient cause for rejection of the equipment. The pump impellers shall be re-balanced after being trimmed.

k. The pump shall be equipped with two guide rails (no cable wire assembly). Guide railsshall be a minimum of two (2) inches in diameter and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to theaccess hatch cover at the top of the wet well. Intermediate rail braces shall be supplied and solidly secured to the wet well wall. Braces secured to the discharge piping shall not be accepted. Guide rails and brackets shall be 316 Stainless Steel.

l. A heavy-duty chain and shackle appropriately sized (3/8” minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. Unless approved otherwise by the JWSC, the lift chains shall be shackled to a heavy duty 316 Stainless Steel lifting bail attached to the pump/motor housing for removal and reinstallation. Three feet of excess chain above the top of the wet well shall be provided to expedite removal. A chain/motor electric cable holder shall be provided and appropriately sized to accommodate the lift chains and motor electrical cables provided without deformation. Chain/electric cable holder shall include extra heavy duty three- eighths (3/8) inch rod hooks for attaching control floats, lifting chains, and otherwet well accessories (6 hooks minimum) and be located on the side of the wet well hatch opening opposite to the discharge piping. The chain, shackles, lifting bail, and cable holder shall be 316 Stainless Steel.

m. The exterior of the pump shall be coated with manufacturer's standard finish.

n. The pump discharge base shall be leveled, plumbed, and aligned into a position to fit connecting piping. The discharge base shall be solidly secured to the wet well floor using a one (1) inch thick steel hold-down plate and appropriately sized 316 Stainless Steel anchors then grouted after initial fitting and alignment and before final bolting of the discharge piping. This work shall be inspected by the JWSC prior to any liquid being allowed into the wet well. After final alignment and bolting, the pump discharge base and all connections shall be inspected. If any movement or opening of any joints is observed, any and all piping, including pump discharge base, shall be corrected.

4.5.9.3 Grinder Pumps

Grinder Pumps and installation (for Low Flow Stations only) shall be in accordance withthe follow minimum standards:

a. Pump shall be of the centrifugal type with an integrally built grinder unit and submersible motor. The grinder unit shall be capable of macerating all material in normal domestic and sewage including reasonable amounts of foreign objectssuch as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers, and the like into fine slurry that will pass freely through the pump and two (2) inch discharge pipe connection.

b. Stator winding shall be of the open type with Class F insulation rated for 130°C (266°F) maximum operating temperature. All motors shall be 3 phase. Motors shall have two heavy duty ball bearings to support the pump shaft and take the radial and thrust loads. Ball bearings shall be designed for 50,000 hours L-10 life.Stator shall be heat shrunk into the motor housing.

c. The common motor, pump and grinder shaft shall be of 416 Stainless Steel, threaded, on the pump end, to accept the impeller and grinder assembly.

d. The motor shall be protected by two mechanical seals mounted in tandem in a seal chamber. The seal chamber shall be oil filled to lubricate the seal faces and transmit the heat from the shaft to the outer motor shell. The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be carbon- ceramic, tungsten carbide or silicon carbide material. Seal faces shall be carbon ceramic and lapped to a flatness of one light band. An electrode shall be mountedin the seal chamber to detect any water entering the chamber through the lowerseal.

   Water in the chamber shall create an alarm condition. The alarm condition signal shall not stop the motor but act as a warning only, indicating that service is required.

e. The pump impeller shall be of the recessed type to provide an open and unobstructed passage through the volute for the ground solids. The impeller shall

be constructed of cast iron and shall be threaded onto a stainless-steel shaft. The grinder assembly shall consist of a grinder, an impeller and a shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto a stainless-steel shaft and shall be locked to the shaft with a screwand a washer. The shredding ring shall be pressed into an iron holding flange foreasy removal and replacement. Shredding ring shall be reversible for double lifewithout disassembly of the pump unit. The holding flange shall be provided withtapped holes such that screws can be used to push the shredding ring from the housing. All grinding of solids shall be from the action of the impeller against theshredding ring. Both the grinder and the shredding ring shall be constructed of 440C stainless steel hardened to 58 to 60 on the Rockwell C scale.

f. All iron casting shall be pre-treated with a phosphate and chromic rinse and shall be painted before machining. All machined surfaces exposed to sewage shall be repainted. All pump and motor fasteners shall be 316 Stainless Steel.

g. All mating surfaces of the pump's major components shall be machined and fitted with o-rings where seating is required.

h. The motor power cord shall be rubber coasted wire and shall be fastened by means of a cord grip at the top of the pump. The motor shall contain a waterproofjunction box, which will provide space to connect the power cord to the motor leads. The motor leads shall seal between the motor housing and the junction box by means of a rubber compression fitting around each wire. The power cordshall have a green carrier ground conductor that attaches to the motor flange.

i. The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The bases shall be sufficiently rigid to firmly support the guiderails, discharge pipe and pump assembly under all pumping conditions. The baseshall be bolted to the well floor and sealed on the wet well exterior to prohibit any intrusion or leakage from the wet well. The face of the discharge elbow inletflange shall make contact with the face of the pump discharge nozzle flange.

   The pump and motor assembly shall be a quick disconnect type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need of unbolting any flange,lowering the liquid level, or requiring operating personnel to enter the wet well. The pump shall be provided with a sealing flange and a guide rail sliding bracket. Thebracket shall be designed to obtain a leak proof seal between the flange faces as final alignment of the pump occurs on the connected position. The bracket shall maintain proper contact and suitably sealed connection between flange faces under all operating conditions.

j. All rotating parts shall be machined and in near perfect rotational balance. Excessive vibration shall be sufficient for rejection of the equipment. The impellers shall be rebalanced after being trimmed.

k. The pump shall be equipped with two (2) guide rails. Guide rails shall be a minimum of one (1) inch diameter and sized to fit the discharge base and the sliding bracketand shall extend upwards from the discharge base to the access hatch cover at the top of the wet well. Guide rails and brackets shall be 316 Stainless Steel.

l. A heavy-duty chain and shackle appropriately sized (one-fourth (1/4) inch minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. The chain shall be 316 Stainless Steel and attached.

4.5.9.4 Pump Warranty

PUMP WARRANTY (Solids Handling and Grinder Pumps):

a. The manufacturer shall warrant to the JWSC, for permanent installation in municipal sewage service, submersible pump, and motor against defects in materials and workmanship including normal wear and tear to the following parts:

i. mechanical seals
ii. bearings, shafts
iii. motor electrical cables
iv. motor stators.

The warranty shall include no less than 100% coverage for original equipment manufactured (OEM) parts and in-shop labor for pump/motor repairs for a minimum of eighteen (18) months at NO COST to the JWSC. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God. The warranty period shall commence upon the date of final acceptance for use of the pumping station and/or of a replacement pump by the JWSC and upon completion of manufacturers startup.

b. During the warranty period, the pump distributor shall, at no cost to the JWSC, transport and repair the defective pump/motor within forty-eight (48) hours or provide a loaner capable of maintaining the operation of the JWSC site. Where, due to the size of the pump/motor a forty-eight (48) hour repair is not feasible and/or a loaner is not available, the distributer shall cover the cost of an appropriately sized engine driven back-up pump to be installed at the site to maintain the station until the pump is repaired and reinstalled or until a loaner is provided. This clause shall only be invoked where the lift station site is considered critical and the availability of only one operating pump at the facility would createa high liability situation. This judgment call shall be at the sole discretion of the JWSC.

4.5.10 Site Electrical Work

4.5.10.1 General

All wiring shall meet the requirements of the National Electrical Code. All wiring outside the control panels shall be enclosed in rigid PVC conduit sized for 40% fill unless indicated otherwise. A separate conduit shall be used for each pump power cable sized for not more than 40% fill. Each conduit shall be sealed gas tight with duct seal putty at motor control panel entry.

4.5.10.2 Electrical Service

The pumping station incoming service shall consist of type THW or XHHW copper conductors in rigid PVC conduit installed a minimum of forty-eight (48) inches below final grade. Electric service shall be sized as required by ultimate station electrical loadings.

Electric service shall be routed within public rights-of-way, or if approved due to special considerations, within dedicated easements. As-Built documentation shall include a diagram indicating actual routing from utility transformer/s to station meter and to control panel.
If overhead service, an electrical pole shall be set outside of the pump station fencing then installed underground within the pump station's fenced enclosure.

4.5.10.3 Control Panel Connections

The power line and each motor line shall enter the bottom of the motor control panel separately and each in SCH 40 PVC sized as per National Electric Code. Each line shall travel directly from motor control panel to the pump motors and contain only one pulling 90-degree elbow at the base of each panel/box.

The motor control panel and service shall be grounded per NEC Article 250 and utilize a minimum of two grounding electrodes at least six (6) feet apart and eight (8) feet deep. The neutral conductor shall not serve as the grounding conductor to the main breaker panel. A separate conductor shall be used for this purpose. Grounding system shall be zinc coated and buried so as not to present a trip hazard above vapor barrier andbelow gravel.

4.5.11 Electrical Equipment and Controls

Controls shall be compatible with pumps supplied meeting both pump manufacturer requirements and the minimum standard below pump supplier shall assume sole source responsibility for pumps and controls.

4.5.11.1 General Requirements

Pump motors greater than or equal to 20 Hp shall require a 480-volt service. If a pump motor is less than 20 Hp, but the kilo-volt-amps (kVA) as determined by the equation:

kVA = (Total Load) x (Voltage) x (1.73/1000) is greater than 150, a 480-volt service shall be used. Otherwise, a 230-volt service may be used.

If the pump motor is less than 25 Hp, across the line starters can be used. Therefore, pump breakers are sized by multiplying the full load amperage (FLA) for the specific motorat the appropriate voltage by 300% and rounding up to the nearest breaker size.

If the pump motor is over 25 Hp, VFD's are required. Therefore, pump breakers are sized by multiplying the full load amperage (FLA) for the specific motor at the appropriate voltage by 200% and rounding up to the nearest breaker size.
If the JWSC has approved the station to be designed as an initial/ultimate station, the pump breakers shall be sized for the initial pumps. The dimensions of the control panel shall accommodate the ultimate size components.

The Main and Emergency breaker sizes shall be determined by adding the pump breaker size, the FLA of additional pump motors (beyond the one), and any auxiliary loads and rounding down to the nearest breaker size. If the total load for a 240-volt service is less than or equal to 100 Amps, 100 Amp emergency and main breakers should be used. If the total is greater than 100 and less than 200 Amps, round down to the nearest available breaker size, but, set the service size to 200 Amps. If the total is greater than 200 Amps, the service size shall be the same as the emergency and main breaker size. Where the JWSC has approved an initial/ultimate station, the main and emergency breakers, as wellas service size shall be designed for ultimate design conditions.

Starters shall be sized corresponding to the NEMA ratings.

If the JWSC has approved the station to be designed as an initial/ultimate station, the starters shall be sized for the ultimate pumps with a note added to the drawings stating: "***Heater coil sized to protect the initial pumps".***

4.5.11.2 Submersible Lift Station Motor Control Center

Submersible Lift Station Motor Control Center (MCC) shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels and shall bear the UL508A serialized label.

A. *Enclosure*

i. The minimum submersible lift station enclosure size for Motor Control Panel shall beforty-eight (48) inches high, thirty-six (36) inches wide and twelve (12) inches deep.

ii. The minimum low flow submersible lift station enclosure size for Motor control Panelshall be thirty-six (36) inches high, thirty (30) inches wide and twelve (12) inches deep.

iii. All control components hall be housed in a NEMA 12/4x316 stainless steel enclosures rated NEMA 12 with dip shield resulting in a NEMA 12/4 x rating. The

enclosure shall have a single handle and a 3-point latch system with padlock feature (no keyed locking handles will be accepted.)

iv. The enclosure shall have a brushed finish and collar studs. The enclosure shall also have 90-degree flanged lip all around where the outer door makes contact with enclosure to make a more efficient seal.

v. The enclosure shall have a hinged inner door(s) (dead front) fabricated from 0.125-inch thick marine alloy grained aluminum. The inner door shall have an adjustable latching mechanism to keep door firmly closed and shall be comprisedof captive hardware. The inner door(s) shall have stainless steel hardware to be secured open for service.

vi. The enclosure shall have a twelve-gauge steel, formed, removable sub panel. The sub-panel shall be degreased, cleaned, treated with phosphate process, then primed and painted with white industrial grade baking enamel.

vii. The enclosure and mounting system shall be devices to keep them open when service is being rendered. Mounting system to be as shown in the JWSC Standard Detail.

viii. Enclosures shall be sized to enable all breakers and controls to be located not more than five (5) feet zero (0) inches above grade or the walkway.

ix. Construction of MCC III type panels shall have VFD manufacturer recommendedcooling as part of overall panel construction.

B. *Panel Components*

At a minimum, the panel shall consist of the following components:

i. Motor Starter/Controller - one per pump

ii. Thermal Magnetic Circuit Breakers - one per pump

iii. Circuit breaker operators (thru inner door type) - one per pump

iv. Power Monitor - one

v. Alarm Light - one

vi. Duplex GFI Receptacle – two (2)

vii. Generator Receptacle and Manual Transfer - one (if not equipped with a generator set and automatic transfer switch

viii. Hand-Off-Automatic Selector Switch - one per pump

ix. Moisture Sensors - one per pump

x. Heat Sensors - one per pump

xi. Audible Alarm Device

xii. Relays - six (11 pin 120 VAC with matching sockets)

xiii. Indicator Lights (LED Type) for "Run", "Seal Fail", and "Over Temperature" - oneset for each pump

xiv. RTU Circuit Breaker

xv. Power Distribution Block

xvi. Lightning Arrestor - one

xvii. Elapsed Time Meter - one per pump

xviii. Thermostatically Controlled Panel Heater

xix. Control Transformer when 480 Volt, 3-phase power is used

C. *Motor Starter/Controller*

To extend the useful life of the pump station components including the pump and motors, one of the following two (2) starter/controllers is required for each pump/motor based upon the motor horsepower. A minimum eighteen (18) month warranty is required on all starters/controllers (including VFD equipment). The warranty shall include materials or workmanship which does not conform to these specifications.

i. **Type "one" (MCC I):** 0-25 HP 208/230 VAC started across the line shall be protected at 300% of nameplate FLA (full load amperage), using NEMA motor starters.

ii. **Type "two" (MCC II):** 26 HP and above 460/480 VAC, requires a variable frequency drive with an internal bypass protected at 200 % of motor nameplate FLA.

Motor Starters (MCC-I Only)**:** Motor Starters shall be NEMA rated Magnetic Motor Starter with solid state overload relay with lifetime coil warranty.
Overload relay includes phase loss and phase unbalance. Device must be manufactured to ensure full voltage is applied to coil even at 85% of nominal eliminating contact chatterand premature contact failure. When lower than acceptable voltages are applied the motor starter will not start or will break the circuit to prevent contact chatter. Starters shall be mounted twelve (12) inches (minimum) from the bottom of the cabinet.

Variable Frequency Drive (VFD) Controllers (MCC II Only): The Variable Frequency Drive shall be rated for input voltage. The variable frequency drive shall be microprocessor-based control for three phase induction motors. The VFD's shall be Pulse Width

Modulated (PWM) design. Adjustable current source VFD's are not acceptable. Insulated Gate Bipolar Transistors shall be used in inverter section. Bipolar Junction Transistors, GTOs or SCRs are not acceptable. The VFD's shall have efficiency at full load speed that exceeds 97% for motors over 40HP. The VFD's shall limit harmonic distortion onto the utility system to a voltage and current level as defined by IEEE 519 for general systems applications, by using the standard 3% nominal impedance integral ac three phase line reactor.

The system containing the VFD's shall comply with the 5% level of total harmonic distortion of line voltage and the line current limits as defined in IEEE 519-1992. If the system cannot meet the harmonic levels with the VFD provided with standard input line re actor or optional input isolation transformer, the VFD manufacturer shall supply a multiple bridge rectifier AC to DC conversion section with phase shifting transformers for all drives above 100 horsepower. The multiple rectifier converters shall cause multiple pulse current waveforms that will more neatly approximate a true sine wave to reduce voltage harmonic content on utility line. Harmonic filters are not acceptable above 100HP. The device shall be capable of communicating with JWSC approved programmable logic controller with optional Profibus communication capability. The VFD's shall be mounted a minimum of twelve (12) inch from bottom of cabinet.

D. *Thermal Magnetic Circuit Breakers*

i. Protector operators are to be quick make, quick break, and trip free. The thermal and magnetic elements shall operate independently, and multiple pole breakers be designed with common trip bar breaking all poles when a fault is received on any pole.

ii. All "Normal Main" breakers shall be minimum "E" frame. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device and shall be rated a minimum of a 460 Volt @ 14 KAIC for 240 Volt systems and 600 Volt @ 18KAIC for 460/480 Voltsystems. The use of Q-frame breakers is not acceptable.

iii. All "Emergency Main" breakers shall be minimum "E" frame. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device and shall be rated a minimum of 460Volt @ 14KAIC for 240 Volt systems and 600 Volt @ 18 KAIC for 460/480 Voltsystems. The "Emergency Main" breaker current rating must be equal to or less than the current rating of the generator receptacle. The use of Q-frame breakers is not acceptable.

iv. All "Pump" breakers shall be minimum "E" frame. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device and shall be rated a minimum of 460 Volt @ 14 KAIC for 240 Volt systems and 600 Volt @ 18 KAIC for 460/480 Volt systems. The use of "MCP," Motor Circuit Protectors or Q-frame breakers is not acceptable.

v. All "Control" breakers shall be rated for 120/240 @ 20 KAIC (Q Frame).

E. *Circuit Breaker*

Each circuit breaker shall be mounted with breaker handles extending through the dead front panel door.

F. *Audible Alarm*

A horn shall be provided on the left-hand upper side of enclosure and shall sound upon high level at 90db at ten (10) feet. A silenced push button shall be mounted on exterior bottom left of cabinet to energize a relay to disconnect the horn when pressed. Horn willbe wired to allow remote silencing via the local RTU and radio link.

G. *Alarm Light*

A red alarm light shall be provided and shall be mounted using threaded stainless-steel pipe to top of panel.

H. *Duplex GFI Receptacle*

Two GFI duplex receptacles shall be provided, one to be mounted on the appropriate weatherproof enclosure and the other to be mounted on the outside bottom right handside of the cabinet. The receptacle face shall be flush with front of cabinet and be supported as required by NEC. The receptacles shall be rated 20 amps, 125vac.

I. *Generator Receptacle*

A generator receptacle shall be mounted in accordance with the standard detail. A 30° panel mounting adapter and flip cover shall be supplied. The generator receptacle must be sized equal to or greater than the current rating of the Emergency Main breaker. Thegenerator receptacle shall not be required if a generator set is installed on the site.

J. *Manual Transfer Switch*

If the Automatic Generator is not specified, a manual transfer switch shall be provided with one normal power circuit breaker and one emergency power circuit breaker interlocked mechanically to prevent both breakers from being closed at the same time. The emergency breaker will be fed from the generator receptacle. Panel manufacturer is to size breaker and receptacle per facility requirements.

K. *Hand-Off-Automatic Selector Switches*

A three-position selector switch shall be provided for each pump and be mounted on the inner door. The switches shall be heavy duty 30mm devices.

L. *Moisture Sensors*

The panel shall be equipped with moisture sensing relays for each pump energizing red status indicator lights mounted on the dead front and send a signal to the PLC. Relays shall not disconnect control power to the pumps. Indicator lights shall remain energizeduntil manually reset.

M. *Heat Sensors*

The panel shall be equipped with heat sensing relays for each pump energizing red status indicator lights, mounted on the dead front and send a signal to the PLC. Relays shall not disconnect control power to the pumps. Indicator lights shall remain energized until manually reset.

N. *Power Monitor*

A power monitor relay shall be installed and connected to the control circuits. When the power to the RTU is deactivated, it shall disconnect control power from the motor starters and open the 24vdc monitor circuit to the RTU and shall have a dedicated set of contactsto provide input for the RTU. The power monitor relay shall be deactivated in the event that any of the following two (2) conditions occur and shall have a dedicated set of contacts to provide input to RTU.

i. Phase loss (single Phasing) when one of any three lines drops to 83% of nominal voltage.

ii. Low voltage (brown out) when all three-line voltages drop to 85% or less ofnominal voltage.

O. *Relays*

All relays shall be large ice cube style case and be 3 poles double throw octal type relays for all 120-volt applications. Relays must be standard 11 pin octal type relays with contacts rated 10 amps @ 120VAC. Relays are to have internal LEDs and test push button as standard. Matching 11 pin sockets shall be supplied.

P. *Indicator Lights*

Lights shall be provided to indicate Pump Run, Seal Fail, (each pump) and motor over temperature (each pump). Indicator lights shall be LED type heavy duty 30mm.

Q. *RTU Circuit Breaker*

RTU shall be powered through a 20-ampere circuit breaker “Q” Frame.

R. *Power Distribution Block*

Power distribution block with touch safe cover shall be provided, sized for 600 volt, 175 amps minimum. The power distribution block shall have a flammability rating of UL 94V-0 and shall be based upon NEC. Power block shall be Bussmann 16 series.

S. *Lightning Arrestor*

A secondary arrestor, complying with ANSI 62.2 shall be installed in accordance with manufacturer's instructions on the outside bottom of the cabinet.

T. *Elapsed Time Meters*

Elapsed Time Meters shall be five digits non-resetting interfaced with appropriate motor starter and shall be mounted on the dead front door. One will be required for each pump.

U. *Level Control Systems*

Lift station level control systems shall be either floats or Level Transducer in accordance with the following guidelines:

i. All Low Flow Lift Station with a design pump rate between 22 gpm and 79 gpm shall be float controlled;

ii. All Standard Duplex Lift Stations with a design pump rate between 80 gpm and 349 gpm shall be float controlled;

iii. All Standard Duplex Lift Stations with a design pump rate between 350 gpm and 749 gpm shall be Level Transducer controlled, with the exception of the Audio/Visual High Water Alarm system, which shall be by float;

iv. All Triplex, Quadraplex and Initial/Ultimate Lift Stations shall be Level Transducer controlled, with the exception of the Audio/Visual High Water Alarm system, which shall be by float.

v. **Where a Level Transducer level control system is required**, the transducer shall be installed within a slotted six (6) inch DR-11 HDPE casing pipe installed within the wet well as follows:

   a. The transducer casing pipe shall be placed between the pump intakes on submersible installations, to serve as the housing and stilling well for the transducer assembly;

   b. The stilling well pipe shall be open on both ends and slotted between six (6) inches from the bottom and twenty-four (24) inches from the bottom with slots approximately three (3) inches center to center; slots shall be one-half (½) inch wide by four (4) inches long and cut on opposite sides of the pipe.

c. The stilling well shall terminate on the "wet" end at the level of the pump intakes in the pump sump or in a sloped recessed area constructed in the sump invert that provides the same elevation relative to the pumpintakes.

d. On submersible installations, the stilling well pipe on the dry end shall terminate approximately two (2) feet below the access hatch and on the same side of the wet well as the guide rails.

e. Stilling well pipe shall be vertical and plumb to facilitate removal for cleaning and maintenance of the transducer.

f. On submersible pump installations the casing shall be securely fastened to guide rail brackets with 316 Stainless Steel brackets and off-set so as not to interfere with the installation/removal of pumps.

g. The transducer shall be set within the stilling well casing at the **Low Water Level** elevation. At the Low Water Level (LWL) elevation in the wet well the transducer calibration setting shall correlate with the "zero" depth of water level.

Level Transducer**:** The submersible level sensor, where required, shall be a solid-state instrument designed to continuously measure and transmit liquid level data. The transducer shall have a 4-20ma output with 24 VDC supply. The transducer shall be calibrated for 0 – 24 feet of water. Transducer shall have a conduit adapter, and cable length as required by the installation. The transducer shall not have a breathing (vent line) or boxes. Transducers shall be capable of field calibration and shall have a manufacturer's one-year warranty from the date of installation. The transducer shall be in stainless steel housing. The transducer shall be installed in a stilling well as described in this article of the Standard. The electrical connections shall be (two) 2 wire, shielded waterproof cable attached to a terminal strip with screwed connections.

Level Control**:** Floats, where required, shall activate when switch is horizontal and deactivate when liquid level drops below the activation elevation. The float shall have a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. One end of the cable shall be permanently connected to the switch with theentire assembly encapsulated to form a completely watertight unit. The float shall be mounted from above on a 316 Stainless Steel hanger.

***V.** Control Transformer*

The control transformer shall be 480 Volt Primary, 120 Volt Secondary sized as necessary to carry all connected loads.

W. *Control Wiring Identification*

All wiring shall be color coded sized as follows:

120 VAC (Un-switched Hot) #12 AWG
Black120 VAC (Dry Contacts) # 12 AWG
Red
120 VAC (Neutral) # 12 AWG White
120 VAC (Switched Hot) # 12 AWG
Red24 VDC + # 16 AWG Orange
24VDC - # 16 AWG Brown

Control Wiring shall be numbered or lettered at each end. Wire numbers/letters shallbe Pass & Seymore "Legrande" or JWSC P&CD equal.

X. *Wire Duct*

All wiring shall be routed through a wiring duct system to provide protection and an organized appearance.

Y. *Terminals*

Terminals shall be provided for interface with field installed equipment. The terminal blocks shall be mounted on a 30-degree angle for ease of field connection.

Z. *Nameplates*

All components shall be labeled using a laser screen Mylar nameplate. The nameplate shall be a laminated two-part system using black letters on a white background providing protection against fading, pealing, or warping. The labeling system shall be computer controlled to provide logos, postscript type or custom designs. The use of laminate or plastic engraved legend plates will not be accepted.

AA*. Mounting Hardware*

All components shall be mounted using stainless steel machine screws. All mounting holes shall be drilled and tapped. The use of self-tapping screws shall not be acceptable.

Note: UL Labels: The entire control system shall bear a UL 508 serialized label "Enclosed Industrial Control Panel". The use of the label "Industrial Control Panel Enclosure" without the UL508 serialized label is not acceptable.

4.5.12 Remote Terminal Unit (RTU) - System and Panel

An approved manufacturer as listed in the Approved Materials Section of this Standard shall manufacture the remote terminal unit (RTU). The panel shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels.

4.5.12.1 General

The manufacturer shall be responsible for all efforts necessary to select, furnish, supervise installation and connections, calibrate and to place into operation all SCADA system instrumentation and controls along with all other associated equipment and accessories.

The manufacturer shall furnish all materials necessary for a complete operational radio-based SCADA System as described herein. The system shall include all materials necessary tointerface field instruments and devices with the various control panels and SCADA system and shall provide for surge protection of the units.

The base function of the RTU shall be to monitor the status of and provide control of lift station pumps, and to provide historic data of facility operations.

4.5.12.2 Warranty

The warranty on system function and equipment shall be two (2) years from the date of start-up. The warranty shall include any problems (to include lightning and other surges) which prevent satisfactory operation of the system. Warranty shall include, but not be limited to parts, labor, and travel expenses.

4.5.12.3 System Requirements

RTU's shall meet or exceed the following requirements:

a. Each RTU shall incorporate the power supply, logic, memory, communications interface, and input/output circuitry.

b. The unit must be microprocessor based, use a 16-bit processor as a minimum and include the following capabilities:

    i. Fused, user configurable, digital, and input/output

    ii. User configurable digitally scaled analog inputs

    iii. On-board trickle type battery charger and battery

    iv. Bounceless changeover circuitry for primary to battery power transfer

c. Each digital input/output shall be user configurable through either the host computer or local terminal; each must use a standard input/output module. The selected modules must provide the ability to use input signals up to 140VAC and 30VDC and provide output signals to the interface with control voltages up to 280VAC/60VDC.

d. Configuration of the digital inputs/outputs shall include the following as a minimum:

   i. Normally closed/open point type

   ii. Accumulation of time on the transitions

   iii. Accumulation of pulse counts (up to 20 per second)

   iv. Manual/Automatic mode

   v. Analog point type

   vi. Enable/disable of selected features

   vii. Run time accumulation

   viii. Number of starts

   ix. Time between starts

e. Each analog input/output shall be digitally scaled to assure accuracy. Analog conversion method shall, at a minimum, use dual slope integration techniques withat least two (2) processor samples per second. Analog inputs shall have twelve (12)bit minimum accuracy available. Either voltage or current mode shall be jumper selectable on the unit for each input. Analog outputs shall have twelve (12) bit accuracy. Configuration of the analog inputs/outputs shall have the following features as a minimum:

   i. Point type

   ii. Communication to the host computer on set point violation

   iii. Local alarm output interface for set point deviation

   iv. Value range

   v. Filter constant

   vi. Low and high gain

   vii. Low and high set point

   viii. Set point dead band

   ix. Set point delay time

   x. Scaling

xi. Enabling/disabling of selected features

f. RTU shall be Driver and MODBUS programmable to existing SCADA or approvedequivalent.

g. Communication Modem:

i. The modem supplied shall be MODBUS Protocol Modem or approved equivalent.

ii. VHF Transceiver Radio installations shall include FCC license amendmentto include operations at new locations. FCC licensing shall be the approved manufacturer's responsibility to provide radio frequency and radio testing each site.

iii. Antenna and cable shall be selected to be compatible with the transceiver and be installed to deliver clear and reliable signals by an approved manufacturer.

h. Contact points for all SCADA systems shall at a minimum provide Input/outputfunctionality and relays for the following settings:

i. Off level

ii. Low level

iii. Lead level

iv. Lag level(s)

v. High level

vi. Power fail (phase failure)

vii. Pump run status (all pumps)

viii. Pump fail status (all pumps)

ix. Pump enable/disable

x. Wet Well Water level (transducer facilities only)

xi. Water pressure (where required to monitor local water pressure on public mains)

4.5.13 Combination MCC/RTU Panel

The combination MCC/RTU panel shall include all of the components listed above for the MCC panel and for the RTU panel. The MCC portion of the panel shall include the motor starter/controller as noted in Article 4.5.11.2 of this Standard (MCC-I, MCC-II). All exceptions to the above requirements are provided below. The MCC/RTU shall incorporate all low voltage control and automation components being mounted behind the left hand dead front door. The enclosure shall have a full-length aluminum barrier separating the low voltage side from the high voltage power devices. The high-power components will be located behind the right-hand dead front door. All pilot devices displays etc. shall be on the left hand dead front door. The main, emergency and pump breaker handles reset buttons etc. shall be on the right hand dead front door.
The battery, charger and associated equipment shall be mounted near the bottom left-hand side of the enclosure and the terminal blocks shall be placed approximately where the battery and charger shelf are located.

Minimum enclosure size for MCC/RTU shall be sixty (60) inches tall forty-eight (48) inches wide and twelve (12) inches deep.

All control components listed herein shall be housed in a NEMA 12/4X 316 stainless steel enclosures and shall have inner door separating control and automation components from power related equipment.

4.5.14 Low Flow Station (Only) Remote Terminal Unit (RTU) System

The approved material section of this standard will provide a list of approved parts to be installed inside the enclosure.

4.5.14.1 General

Low flow site RTU's minimum shall be monitor only.

The manufacturer shall be responsible for all efforts necessary to select, furnish, supervise installation and connections, calibrate and to place into operation all required system instrumentation and controls along will all other associated equipment and accessories.

The enclosure shall be 14"x12"x6" weatherproof NEMA 4X polycarbonate enclosure.

The parts list shall consist of the minimum parts herein:

a. Modular Backplane

b. Digital monitoring module card (DMM)

c. Broadband DC block protector

d. Radio interface module

e. Internal coax connector (pig tail)

4.5.14.2 Warranty

Warranty on system function and equipment shall be one (1) year from the date of start-up. The warranty shall include any problems (to include lightning and other surges) which prevent satisfactory operation of the system. Warranty shall include, but not be limited to parts, labor, and travel expenses.

4.5.14.3 System Requirements

RTU's shall meet or exceed the following requirements:

a. Programming:

   i. The device shall be configured, programmed, and set up using any standard Internet web browser software.

   ii. All connected equipment can be monitored and configured from aninternet connection to the world-wide-web.

   iii. Screens shall be Password protected to provide secure access.

   iv. Operational programming software or user skills shall not be proprietary.

b. Radio Communication:

   i. Communication shall be via Radio wave using DFS primary protocol or equivalent MODBUS protocol and shall communicate through the data transmission services using existing licensed frequencies.

   ii. A factory approved antenna and mast shall be provided as part of the onsite communication structure in accordance with manufacturers communication height.

   iii. N-Series coax cable shall be installed between broadband DC block protector and the antenna.

   iv. Antenna masts shall be anchored According to the manufactures specifications unless other inspection conflicts are noted.

   v. All Grounding of communications shall be grounded by one (1) - eight (8) foot copper ground rod and bonded to GA Powers grounding strap.

   vi. All antenna connections shall be protected by heat shrink.

   vii. All mast connections shall be brass, or bronze coated with galvanized coating or spray.

viii. FCC Licensing shall be the approved manufacturer's responsibility toprovide radio frequency and radio testing of each site.

c. Alarming and Monitoring: The device shall monitor connected alarms and analyze and report the following information with alarm notifications sent immediately, orat user selectable time delays:

i. High water alarm (From level controller)

ii. Lag float alarm

iii. Float sequence failures

iv. Power failure alarm

v. Phase monitor

vi. Pump 1,2 On/Off Cycles

vii. Starter failures

viii. Pump 1,2 Runtimes

ix. Hand / Off / Auto switch position

x. High pump temperature alarm, Pump #1 & #2

d. Power Supply:

i. Incoming electrical service shall be 115 VAC, 60 Hz, single-phase power.

ii. Fuse protected 12 VDC power supply shall be powered from the 120-volt incoming power and shall include tapered charge type battery circuitry to maximize battery life. The power supply shall be rated at minimum 2.0 Amps @ 12 VDC.

iii. A 12-volt battery charging power supply and battery backup with a 2- hour minimum operation time shall be provided.

e. Protection: A single-phase lightning arrestor shall be connected to each line of the incoming side of the power input terminals. The installation shall include a good (minimum eight (8) foot deep) copper ground rod bonded to GA Power grounding strap.

4.5.15 Emergency Power

Lift Stations with a design capacity of 1,500 gpm or greater shall be provided with a permanently mounted on-site generator set and automatic transfer switch. Pump stations with a design capacity of less than 1,500 gpm shall be equipped with a generator receptacle for use with a portable generator. Generator receptacles, where applicable, shall be matched to accommodate the use of JWSC portable generators.

4.5.16 On-site Standby Generators & Automatic Transfer Controls

On-Site generators shall be installed in accordance with NEC Article 702, Optional Standby Systems.

4.5.16.1 General

On-Site generators shall be sized by the manufacturer based upon the lift stations running electrical load and motor-starting requirements as specified by a Georgia Licensed Engineer, taking into consideration the characteristics of the generator and engine.

On-Site generators shall be sized, designed and capable of operating two pumps simultaneously on duplex and triplex facilities and three pumps simultaneously on quadraplex facilities taking into account the pump motor starting sequence delay interval. The design shall allow for a maximum 20% voltage dip at the motor start of the second or third pump while the originally started pump is in full operation. Where the facility includes differing motor sizes, the largest motor shall always be started first.

The generator shall be equipped with field-forcing equipment to sustain the rated excitation and current up to three times the generator's rated output. Downstream andgenerator circuit breakers shall be coordinated so that the branch circuit breaker trips first. An under-voltage relay shall be provided to trip breakers and shut down the engineif over current at less than full voltage occurs for a predetermined length of time.

On-Site generators shall be powered by a diesel fueled engine capable of supplying the shaft power required by the actual/required maximum load applied to the generator. The diesel fueled generator shall be provided with a UL 142 compliant above ground fuel storage tank or integral belly tank sized to provide a minimum of 24 hours of continuous run time based on full facility power requirements and loadings.

4.5.16.2 Engine-Generator Controls

Controls shall meet or exceed the following requirements:

a. General controls shall include:

    i. Manual start/stop

    ii. Auto/remote start

iii. Emergency stop

iv. Fault reset

v. Remote start input active

vi. Fuel gauge

vii. Exercise function

viii. 3-Phase voltage regulator

ix. Fault history

x. Output circuit breaker

b. Instruments for the engine shall include:

i. Oil Pressure

ii. Coolant temperature

iii. Engine speed

iv. Engine running hours

v. Number of starts

vi. Battery voltage

c. Safety controls for engine shutdown shall only be manually reset and shall include:

i. Low oil pressure

ii. High engine coolant temperature

iii. Failure to crank shutdown

iv. Over crank (failure to start)

v. High/low battery voltage/weak battery

vi. Over-speed

vii. Low fuel

d. Instruments for generator shall include:

   i. 3-Phase L-L and L-N voltage

   ii. Frequency

   iii. 3 Phase current

   iv. Kilowatt hour

   v. Total kilovolt-amps

e. Safety control for generator shutdown shall only be manually reset and shall include:

   i. Under and over voltage

   ii. Under and over frequency

   iii. Over current and short circuit

   iv. Reverse power

f. Instruments and controls shall be mounted on the generator control panel.

g. Actuating the safety devices shall shut down the generator set, indicate the cause of the shut-down by lighting the appropriate indicating light, and provide separate outputs for the remote alarm indication panel and the computer.

4.5.16.3 Automatic Transfer Controls/Switches

Automatic Transfer Controls/Switches shall be provided and shall conform to all of the requirements of UL 1008 and be so listed and labeled; Bypass isolation switches that allow the ATS to be removed for repairs shall be provided.

a. Automatic transfer switches shall be Double-throw type switches having the following ratings:

   i. Continuous rating.

   ii. Inrush rating

   iii. Load interrupting

   iv. Thermal and Magnetic

b. Automatic transfer switches shall include a pause-in-neutral position with an adjustable time delay that causes the motor to be disconnected from the power

source during transfer and allows the motor voltage to collapse to a safe level priorto re-energization. Automatic transfer switch position indicating panel shall include:

4.5.16.4 Starting Batteries and Charging Systems

Starting batteries for the standby generator shall be wet cell lead-acid batteries having a cranking capacity adequately sized for the specific application.

4.5.16.5 Generator Set Enclosure

Generator Set enclosure shall be an aluminum sound attenuated weather protective enclosure with the following features:

a. Stainless Steel hardware

b. Compact footprint

c. Package listed to UL 2200

d. Fuel and electrical stub-up area within enclosure perimeter

e. Two or more recessed doors per side, depending on dimensions.

f. Pad-lockable doors with weather protective seals

g. Enclosed exhaust silencer

h. Rain collar and rain cap

i. Access lifting points for spreader bars or forklift

j. Window for control viewing

k. Exterior oil and coolant drains with interior valves for ease of service

l. Sound attenuated 70 dB(A) at twenty-three (23) feet (non-residential)

4.5.17 Lift Station Testing

Each Lift Station shall be subjected to testing in accordance with JWSC Water and Wastewater Developmental Standards and Procedures.

4.6 PRIVATE LIFT STATIONS

This section delineates the minimum standards for wastewater lift stations intended for private ownership, operation and maintenance that will discharge to the publicly owned and operated gravity sewer systems or low-pressure system force mains of the JWSC.

These Standards shall encompass individual residential, single property service commercial, multi-service/multi-lot facilities that require less than 22 gpm falling below the threshold for public ownership, and those facilities discharging greater than 22 gpm not "intended" for dedication bya documented "Notice of Intent" from the property owner to the JWSC.

4.6.1 General Requirements

No Publicly owned and operated sanitary sewer system or lift station shall be permittedto discharge, directly or indirectly, to a privately owned and operated lift station.

All piping systems contributing flow to a private lift station shall be privately owned and operated by the facility owner and/or allowed by a documented agreement between the owners of contributing systems and the lift station owner. Such agreements shallestablish the rights and responsibilities for the operation and maintenance of the lift station and of the individual piping systems between the parties. The JWSC shall be provided with a copy of such agreement(s) prior to the payment of connection fees.

With the exception of individual residential and single property commercial lift stations, private lift station and sanitary sewer system owners shall be required to enter into a Satellite System Working Agreement with the JWSC prior to payment of connection fees to discharge to the public system.

Private Lift Stations of capacities suitable for dedication to the JWSC that have not been designed and constructed in accordance with the Dedicated Lift Station Standards herein stated shall not be considered for public ownership until such facility is brought to the minimum current Standards for Dedicated Lift Stations. Exempted from this policy will be lift stations designed and constructed in accordance with City of Brunswick or Glynn County Standards at the time of installation and that are functioning properly.

The served property for a low-pressure connection to the public force main shall be adjacent or contiguous to the publicly owned low-pressure force main; the acquisition of an easement through private property to access a low-pressure system force main that isnot adjacent or contiguous to the property is the responsibility of the owner.

With the exception of Single Family Residential and Single Lot Commercial Lift Stations serving only one (1), water account customer, all private lift stations shall display a sign in a prominent location at the facility fitted to a post or enclosing fence. The sign shall identify the facility as a wastewater lift station, identify the owner and provide an emergency contact phone number after the phrase **"In Case of Emergency Call."** The signlettering shall be large enough to be easily read from fifty (50) feet away with the letteringand sign made of durable weather resistant material.

4.6.2 Single Family Residential & Single Lot Commercial Lift Stations

4.6.2.1 Owner Responsibilities

The individual property owner shall be responsible for the selection, purchase and installation of the on-site wastewater collection and transmission system to the approved point of connection to the public facilities.

Where an existing septic system is on the property, it shall be abandoned in accordance with Environmental Health Department Standards.

All on-site pumping systems shall be installed by a Georgia Licensed Master Plumber or Utility Contractor and permitted through the appropriate local Code Enforcement Department.

The property owner shall remain responsible for the operation, maintenance, repair, and replacement of all on-site systems up to the point of connection to the public system.

4.6.2.2 System Components

The lift station (pumping system) shall include a holding tank, anti-floatation collars, grinder pump and electrical and controls. An alarm system that provides a light and/or audible signal when the water in the holding tank is above the normal operating range shall be provided.

The grinder pump shall be designed to handle the required flow rate (gpm) at the estimated backflow pressure (pressure head) for the individual application being considered.

The pump line (force main) from the lift station to the point of connection to the public low pressure system force main or gravity sewer system service line shall be, at minimum,one and one-fourth (1¼) inch diameter PVC or HDPE pressure pipe. At no time shall a force main from a private pumping system lay within a public right-of-way without obtaining a road encroachment permit from the proper authorizing authority with a copy of which submitted to the JWSC with the connection application

When discharging to a public gravity sewer system, the pump line (force main) shall discharge to a gravity sewer system manhole if the force main is connected to a public gravity main within a road right-of-way. If connecting to a gravity main from private property or through an easement, the private force main shall be connected to a sanitary sewer service line in accordance with JWSC Standards for Gravity Sewer Service connections. Requirements for corrosion protection as specified in Section 3 for manholesdo not apply for discharge rates of 22 gpm or less.

When connecting to a publicly owned and operated Low Pressure Force Main, the pressure line from the lift station shall connect to the Low-Pressure System Force Main stub-out provided for the property in accordance with the JWSC Force Main Connection Standards.

A force main crossing of property not owned by the owner of the lift station to reach a public sewer system connection point shall require an easement from the owner of the property being crossed. Such documentation shall be filed with the JWSC along with the connection permit application.

All on-site systems shall be inspected by a JWSC inspector prior to being placed in service.

4.6.3 Multi-Family, Multi-Lot and/or Multi-User Commercial Stations

4.6.3.1 Owner Responsibilities

The system owner shall be responsible for the selection, purchase and installation of the on-site wastewater collection and transmission system to the approved point of connection to the public facilities.

The system owner shall remain responsible for the operation, maintenance, repair, and replacement of all components up to the point of connection to the public system.
The system owner shall be required to enter into a Satellite System Working Agreement with the JWSC prior to payment of connection fees to discharge to the public system.

4.6.3.2 System Components

System shall be designed by a Licensed Georgia Professional Engineer to pump the design peak hourly flow with one pump out of service.

System shall be designed and constructed in accordance with all applicable regulations and guidelines of the Georgia Environmental Protection Division.

The system shall have a minimum of 2 pumps with each pump being of the same capacity with the rated flow of each pump being as required for the estimated daily flow in gpm +a 2.0 peaking factor.

The pump line (force main) from the lift station to the point of connection to the public low pressure system force main or gravity sewer system service line shall be, at minimum,one and one-fourth (1 ¼) inch diameter PVC or HDPE pressure pipe. At no time shall a force main from a private pumping system lay within a public right-of-way. Where a publicgravity sewer main or manhole or low-pressure force main is not available contiguous to the property, the owner shall acquire easements through adjoining property or propertiesto the point of connection approved by the JWSC.

When discharging to a public gravity sewer system, the pump line 9force main) shall connect to a gravity sewer system service line draining to a manhole or gravity main in accordance with JWSC Standards for Gravity Sewer Service connections. Requirements for corrosion protection as specified in Section 3 for manholes do not apply for discharge rates of 22 gpm or less.

When connecting to a publicly owned and operated Low Pressure Force Main, the pressure line from the lift station shall connect to the Low-Pressure System Force Main stub-out provided for the property in accordance with JWSC Force Main Connection Standards.

A force main crossing of property not owned by the owner of the lift station to reach a public sewer system connection point shall require an easement from the owner of the property being crossed. Such documentation shall be filled in with JWSC along with the connection permit application.

All on-site systems shall be inspected by a JWSC inspector prior to being placed in service.

4.7 FORCE MAINS

4.7.1 General

Force mains shall discharge to sanitary sewer gravity system manholes at the manhole invert level in such a manner as to minimize turbulence and join the normal flow of wastewater through the manhole without disrupting or impeding other flow or flows entering or passing through the manhole. Where the discharge manhole has no other flows entering it, the force main discharge shall be directed straight through the manhole,through a properly constructed invert, into the manhole effluent line.

No force main, with the exception as noted in section 4.6.2.2, System Components for Single Family Residential and Single Lot Commercial Lift Station and stations discharging less than 22 gpm), shall connect to a sanitary sewer manhole that does not meet the requirements for corrosion protection as cited in the Section 3 of these standards for the discharge manhole and downstream manholes.

No force main shall be discharged to a sanitary sewer system unless such downstream gravity system has been verified by the JWSC to have adequate capacity to accept the discharge.

Force mains shall have isolation valves installed at two thousand (2,000) foot intervals beginning at the isolation valve installed at the lift station. Lift stations with force mains less than two thousand (2,000) feet to the point of discharge do not require isolation valves beyond the lift station.

4.7.2 Force Main Manifolds

Other than in low pressure systems, force mains from proposed public or private lift stations may not generally be manifolded with existing publicly owned force mains. Where manifolding is recommended for a proposed lift station by the developer's or owner's engineer for consideration by the JWSC, hydraulic modeling will be required. Such modeling shall demonstrate velocities for all interconnected pipes within standard parameters as described in Section 4.7.3 to be considered.

No force main from a private lift station shall be allowed to manifold with a public force main without documented agreement shown on the approved record drawing, or by written legally binding documentation submitted to the JWSC with the connection application by the owner, accepting responsibility for any private pumping system upgrades that may become necessary if the private lift station's ability to discharge into the public force main, due to changing flow conditions in the public force main were to occur, and/or for any damage or associated liabilities that may result as a failure of such public force main to accept the discharge from the private lift station.

Force mains from single-family residential or single lot commercial users shall only connect to publicly owned Low Pressure System force mains at service connections provided at the property line or public right-of-way in accordance with these Standards.

4.7.3 Force Main Size

The minimum size pressure sewer service laterally for single-family residential or single lot commercial shall be one and one-fourth (1 ¼) inch in diameter.

Force mains for a single facility use lift station discharging to gravity shall be sized for peak flow (required pump rate) at a minimum velocity of 2.5 fps with one pump running and a maximum velocity of 5.0 fps with both pumps running in a duplex station. For triplex or quadraplex facilities velocities shall not exceed 5.0 fps with two or three pumps running, respectively.

Force mains in manifolded systems, where approved, shall be sized as demonstrated by hydraulic modeling to provide a minimum velocity of 2.0 fps with the minimum of pumps operating as needed to handle the required pump rates of all connected facilities, (i.e. one pump in each duplex facility, two pumps in each triplex facility, three pumps in each quadraplex facility), and to provide a maximum velocity of 5.0 fps with the maximum of pumps operating in each facility, (i.e. two pumps operating in a duplex facility, three pumps operating in a triplex facility, four pumps operating in a quadraplex facility).

With the exception of single-family residential or single lot commercial, no public force main shall be smaller than two (2) inches in diameter while still meeting the minimum and maximum velocities in this standard.

Where the JWSC has approved an Initial/Ultimate Lift Station design concept and the parameters outlined above cannot be achieved with one force main, dual interconnected parallel force mains shall be used. The interconnection of such dual force main systems shall be designed and constructed with valving to provide the use of either force main individually or together simultaneously within required velocity and flow parameters.

4.7.4 Force Main Depth

Force mains shall be designed to meet minimum cover requirements of thirty-six (36) inches with a maximum of 60 inches. Cover shall be measured from finished grade.

Force main depths shall be designed so as to reduce or minimize the number of high points in the pipeline by varying the depth along the route as is reasonable to maintain aconsistent pipe elevation. Changes in elevation which exceed two feet will require an air/vacuum release valve.

4.7.5 Force Main Location

Force mains shall be designed and constructed along the shoulder or within public rights-of-way on the opposite side from water mains.

Force mains shall be designed and constructed within appropriately sized easements dedicated to the JWSC. Easements provided shall be maintenance vehicle and equipment trafficable all-weather easements.

A horizontal distance of three (3) foot minimum shall be maintained from all force mains to drainage structures, telephone duct banks, electrical transformers, signal relays, power poles, and other structures in the right-of-way as well as any other parallel underground utility with the exception of water mains.

Where force mains cross other underground utilities, with the exception of water mains,a minimum vertical separation of six (6) inch shall be maintained. All distances shall be measured from the outside edge of the pipes. The vertical separation between force mains and other crossing utilities shall be filled with a suitable pipe bedding material and compacted or filled with flowable fill to prevent settlement, contact and potential pipe to pipe abrasion caused by the vibration of flow through the force main.

Force main connections to manholes shall be cored and booted connections in accordance with Paragraph 4.7.1 of this Standard.

Force mains shall not be constructed within or below open ditch bottoms unless crossingon a perpendicular. Where crossing open ditch bottoms, the forcemain shall be a minimum of sixteen (16) inches below the bottom of the ditch and encased in concrete for the full width of the ditch as measured across the top of ditch banks.

Force mains shall be located outside of paved areas except at roadway crossings.

Sewer force main and water main separations shall be in accordance with Georgia EPD requirements and as follows:

a. At crossings, pipe joints shall be as far as possible and equidistant from the point of crossing with the water main on top. Separation shall be measured from the outside edge of the pipe to the outside edge of the pipe. A full length of pipe mustbe centered at the crossing.

b. Alternatively, at such crossings, the pipes shall be arranged so that all water main joints are at least 6’ from all joints in the sewer force main.

Sewer force mains crossing major ditches, canals, streams, creeks, and rivers shall be sub-aqueous crossings installed by horizontal directional drilling or other boring/tunneling method approved by the JWSC. Such crossings shall be provided with isolation valves on both sides of the crossing. Both sides of the crossing shall be treated as high points in the force main and have air release/vacuum valves installed. The placement of isolation valves and air valves shall be a minimum of fifteen (15) feet horizontally away from streambank tops. The crossing pipe shall be perpendicular to the stream. Aerial crossings and bridge attachments shall not be permitted. No sewer force main shall be designed or constructed under ponds, lakes, retention ponds or other bodies of water other than in crossings as described above. No sewer force main shall be designed or constructed to lay closer than twenty (20) horizontal feet from the top of the bank of any body of waternoted in this article.

Tracer Wire shall be provided on all installed force mains; tracer wire shall be continuous or properly spliced single strand No. 10 solid plastic coated (30 mil) copper wire from iron fitting to iron fitting.

Detection Tape shall be provided on all force mains; detection tape shall be two (2) inches wide Mylar encased metal marking tape and shall be buried eight (8) inches – twelve (12) inches below plan-finished grades.

4.7.6 Materials

4.7.6.1 Pipe

Force main piping shall be color coded green. Force main piping shall be fused joint DR 17.0 HDPE meeting the requirements of ASTM D3035 - DIP size with butt fused joints; or, SDR 21 Class 200 PVC meeting the requirement of ASTM D2241, with elastomeric integral bell gasketed joints meeting the requirements of ASTM D-3036; or, AWWA C-900 and C-905 DR-18 PVC. Where specifically approved by the JWSC for special conditions on short runs, interior coated CL52 DIP meeting the requirements of ASTM A-746, with elastomeric push-on joints, mechanical joints conforming to ANSI A-21.11, or flange joints conforming to ANSI 21.1. All bolts and bolt studs associated with flange joint pipe connections shall conform to ANSI B-16.1.

4.7.6.2 Joints

Force mains shall have mechanically restrained joints at changes in direction. The restrainer shall be manufactured of ductile iron and shall meet or exceed all the requirements of ANSI A21.11 (AWWA C111) and ASTM A536. The restrainer system shallprovide anchoring ductile iron pipe and fittings, valves and PVC pipe to mechanical joint pipe or fittings, or bell to spigot PVC pipe joints. The restrainer shall accommodate the full working pressure rating of the pipe plus surge allowance. In the assembly of the restraint device, all bolts shall be tightened to the correct torque range as recommendedby the restraint manufacturer. Concrete thrust blocking will not be permitted.

4.7.6.3 Fittings

Horizontal and vertical directional changes in force mains shall be accomplished with bends of 45 degrees or less and properly restrained; no 90-degree bends will be permitted.

All fittings on pvc force mains shall be inside coated "sewer safe" mechanical joint cast iron or ductile iron fittings properly restrained.

4.7.6.4 Valves

Force Main isolation valves shall be interior coated plug valves. Plug valves eight (8) inchesand greater shall be provided with worm gear actuators, and extension stems with operating nut no more than eight (8) inches below finish grade.

Isolation valve/check valve connections by a new or replacement force main to an existing force main shall be by cutting-in a mechanical joint wye fitting to discharge in the direction of normal flow. Wet tapping with a "T" connection will not be permitted.

Air release valves shall be two (2) inch air release valve assemblies installed within sealed manholes. Air release valves shall be provided at all force main high points. On force mains discharging to gravity systems combination valves (air release and vacuum valves)shall be utilized in the place of air-only release. The size, depth and configuration of the sealed Air Release/Vacuum vault shall be such as to allow the entry and work of maintenance personnel ***(See JWSC Standards Details).***

4.7.6.5 Force Main Casings

Force mains crossings under major roads, railroads or other major obstructions shall be installed within a casing.

Where Steel Pipe is to be used as a casing it shall conform to either ASTM Standard A139 for "Electric Fusion (arc) Welded Steel Pipe" with minimum yield strength of 35,000 psi or "API Specification API-5LX, Grade X-42 Welded Steel Pipe". Wall thickness shall meet therequirements of the latest Revision of the American Railway Engineering Association Manual of Recommended Practice or the Georgia Department of Transportation Standard Specification for Road and Bridge construction, as applicable. For street uses which are not GDOT or railroad, use GDOT casing thickness. All pipe furnished by the manufacturer shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data. Full pipe length shall be provided. No short pipe lengths less than eight (8) feet long will be allowed unless approved by the JWSC. The pipe ends shall be tapered where welding is required.

Where HDPE pipe is to be used, it shall be DR 9 HDPE meeting the requirements of ASTM D3035 and butt-fusion welded.

The casing pipe interior diameter shall, at a minimum, be twice the outside diameter of theforce main being encased.

4.7.7 Force Main Testing

Force mains shall be hydrostatically tested to 1.5 times the working pressure of the associated lift stations, or 100 psi, whichever is greater in accordance with the proceduresof AWWA C600. Testing shall be observed and approved by a JWSC inspector.

All installed isolation, air release and check valves shall be tested for proper operation, set, and marking.

The force main tracer wire shall be checked for continuity along the pipe run and checked atterminus points for proper connection.

(END OF SECTION)