Bidding/Contract Documents and Specifications
for
CITY OF BUNNELL, FLORIDA

WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS

Bid No. 05-0-2018

April 2018

Prepared by:
QLH
A Mead & Hunt Company
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CITY OF BUNNELL

WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS

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CITY OF BUNNELL

INVITATION TO BID NO. ITB-05-0-2018
WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS

NOTICE IS HEREBY GIVEN THAT THE CITY OF BUNNELL IS ISSUING THIS INVITATION TO BID (ITB) TO SOLICIT COMPETITIVE SEALED BIDS FROM CONTRACTORS THAT ARE INTERESTED IN PROVIDING THE LABOR, MATERIALS, TOOLS AND EQUIPMENT NECESSARY FOR THE CITY OF BUNNELL WWTP EQUALIZATION BASIN AND EFFLUENT POND IMPROVEMENTS.

IT IS THE INTENT AND PURPOSE OF THE CITY OF BUNNELL THAT THIS INVITATION TO BID PROMOTES COMPETITIVE SELECTION. IT IS THE BIDDER’S RESPONSIBILITY TO ADVISE THE FINANCE DIRECTOR IF ANY LANGUAGE, REQUIREMENTS, ETC., OR ANY COMBINATION THEREOF, INADVERTENTLY RESTRICTS OR LIMITS THE REQUIREMENTS STATED IN THIS ITB.

NOTICE SHALL BE POSTED IN THE LOCAL NEWSPAPER, CITY OF BUNNELL WEBSITE AND LISTED ON DEMAND STAR. ALL BIDS ARE SOLICITED AND SHALL BE MADE PURSUANT TO ORDINANCE 2012-07, AND ALL BIDS WILL BE EVALUATED IN ACCORDANCE WITH THE PROVISIONS THEREOF. ORDINANCE 2012-07 IS ON FILE IN THE OFFICE OF THE CITY CLERK OF THE CITY OF BUNNELL, 201 WEST EAST MOODY BLVD., BUNNELL, FL 32110. YOU ARE HEREBY INVITED TO SUBMIT A SEALED PROPOSAL TO PROVIDE ALL INFORMATION REQUESTED IN THE ATTACHED SPECIFICATIONS TO THE CITY CLERK, BUNNELL, FLORIDA.

SUBMIT BIDS TO: KIRSTEN BATES – CITY CLERK

MAILING ADDRESS: WALK-IN DELIVERY ADDRESS:
Bunnell City Clerk Bunnell City Clerk
P. O. Box 756 201 West Moody Blvd.

TIMETABLE: Date of Distribution: 05/02/2018
Pre-Bid Meeting (non-mandatory) 05/9/18 9:00 am
Last Date of Inquiries: 05/16/18 10:30 am

LOCATION: MUNICIPAL COMPLEX, 201 W Moody Blvd., Bunnell, Florida 32110

BIDS DUE BY: WEDNESDAY MAY 23, 2018 AT 2:00 PM EST after which time they will be publicly opened and read aloud.

Bidders must indicate on the sealed envelope the following:

A. Title of Proposal – WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS
B. Invitation to Bid Number – ITB-05-0-2018
C. Hour and Date of Opening – 2:00 pm 5/23/2018
D. Name of Bidder
SECTION 00100
INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 PROJECT DESCRIPTION

A. The work of this project consists of furnishing all labor, materials, equipment, tools, transportation, services, and incidentals and performing all work necessary to construct

WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS
BID NO. 05-0-2018

1. All above referenced work shall be complete, in place, and ready for service in accordance with the drawings and specifications prepared by QLH, A Mead & Hunt Company, and entitled: WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS, BID NO. 05-0-2018.

B. The location of the project is Bunnell, Florida.

1.02 DEFINED TERMS

A. Terms used in the Instructions to Bidders are defined and have the meanings assigned to them in the General Conditions.

1.03 COPIES OF BIDDING DOCUMENTS

A. Only complete sets of Bidding Documents will be issued and shall be used in preparing bids. Neither the OWNER nor the ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets.

B. Complete sets of Bidding Documents may be obtained in the manner and at the location stated in the Invitation to Bid.

1.04 RECEIPT OF BIDS

A. The Place to which proposal must be delivered, the amount of Proposal Security required and the date, time and place of opening of proposals, are stated in the Invitation to Bid. The Proposal form amplifies the Advertisement in indicating the location and description of the project to be constructed and shows the approximate quantities of work to be performed and materials to be furnished, if a unit price contract, any special requirements which may vary from or are not contained in the specifications. The bid documents as listed in Paragraph 1.08, Preparation of
Proposal, shall be submitted as described in Section 00300, Supplemental Requirements.

1.05 BIDDER'S QUALIFICATIONS

A. The Bidder will be required to show that he/she is capable of performing the work contemplated and shall furnish, if requested, in duplicate the following:

1. A sworn statement showing the equipment definitely controlled by the Bidder and available to him for performing the work;

2. A sworn statement of his/her experience in performing work of the character for which his bid is submitted; and,

3. A sworn statement showing his current assets and liabilities as of a date not more than ninetieth (90) days prior to the date of submission.

B. If the Owner approves the above required statements and the Proposal is accompanied by the specified security, the person, firm or corporation submitting such Proposal shall be considered as a qualified Bidder.

1.06 BIDDER'S RESPONSIBILITY

A. The Bidder is required to carefully examine the site of the project, the Proposal Form, Drawings, Specifications, Agreement Form, and all other forms pertinent to the work contemplated. It will be assumed that he has satisfied himself as to the conditions to be encountered, the character, quality, and quantities of work to be performed and materials to be furnished, and the requirements of the Contract and specifications. No allowance or concession will be made for lack of such information on the part of the Contractor.

B. Whenever such information concerning subsurface materials or conditions is given on the drawings, it is understood, in the absence of any qualifying notation, that it was obtained in the usual manner and the location, depths, and character of the material have been recorded in good faith. There is no expressed or implied agreement that the depths or the character of the material have been correctly indicated and Bidders should take into account the possibility that conditions affecting the cost or quantities of work to be done may differ from those indicated.
1.07 APPROXIMATE ESTIMATE OF QUANTITIES

A. The Bidder's attention is directed to the fact that in contracts based on unit prices the estimate of quantities of work to be done and materials to be furnished under these specifications, as shown on the Proposal Form and in the Contract, is approximate and is given only as a basis of calculation upon which to determine the lowest Bidder. The Owner does not assume any responsibility that the quantities shall obtain strictly in the construction of the Project, nor shall the Contractor plead misunderstanding or deception because of such estimate of quantities, or of the character of the work or location, or other conditions pertaining thereto. The Owner reserves the right to increase or diminish any or all of the above mentioned quantities of work or to omit any of them, as it may deem necessary, and such increase or decrease of the quantities given for any of the items shall not be considered as sufficient grounds for granting an increase in the unit prices bid, except as set forth in the General Conditions.

1.08 PREPARATION OF PROPOSAL

A. In preparing Proposals in the manner prescribed under Paragraph 1.14, the Proposal Form, the preparation of required documents shall be submitted as described in Section 00300 under Supplemental Requirements and must be properly executed in ink.

B. Upon the prescribed Schedule of Unit Prices, all bid prices shall be written in ink, in both words and numerals, in the blank spaces for each item, with the amounts extended if a unit price bid and all amounts totaled. In the event of any discrepancy between the written amounts and the numerals, the written amounts shall govern and will be considered as the price bid. The sum of the Total Bid as calculated from the individual items in Section 00310, Schedule of Unit Prices, shall equal the Total Price as listed in Section 00300, Proposal.

C. Except as provided below, bids containing substitutions or combinations of alternates will not be considered unless such substitutions or combinations are specifically authorized by the Proposal.

D. In unit price bids, the extensions, if any, and the total are for informational purposes only, and the determination of the lowest bid will be based solely on the total results of computations of the estimated quantities and the prices bid. The Bidder shall submit a completed Schedule of Unit Prices, Section 00310 with each bid. The bid may be considered non-responsive without this form.

E. The Bidder shall sign his/her name and give his/her business address in the spaces provided therefore. If the Proposal is made as a partnership, it shall be signed by all partners; if made by a corporation, it shall be signed in the name of the corporation by one of the officers thereof and shall have affixed the seal of the corporation.
1.09 PROPOSAL SECURITY

A. Each Proposal shall be accompanied by a security in the form of a certified check or, when specifically permitted, a Bid Bond, payable to the Owner, in the amount indicated in the Invitation to Bid and, in either case, with properly executed Agreement of Surety. Such proposal security of the successful Bidder shall be forfeited to the Owner as liquidated damages if the successful Bidder fails to execute and deliver the Contract in conformity with the Form of Agreement, and furnish bonds and insurance certificates as specified within ten (10) days after notification by the Owner of the acceptance of his bid, Within three (3) days after formal opening of bids, if requested by the Contractor, the securities therefore will be returned excepting those which the Owner elects to hold until the award is made and the successful Bidder qualified and executes the Contract. Thereafter, Proposal Securities, other than that of the qualified low Bidder, will be returned at once. The security of the successful Bidder will be returned to him when the Contract is executed by both parties hereto and the Performance and Payment Bonds have been recorded. If all Proposals are rejected, the securities therefore will be returned immediately after the determination of such rejection.

1.10 WITHDRAWAL OF PROPOSALS

A. All Bidders specifically waive any right to withdraw a Proposal after it has been submitted to the Owner, except as hereinafter provided. A Bidder may withdraw a Proposal provided the Bidder makes a request to do so by telephone, telegraph, or in writing to the Owner, and provided that such requests reach the office of the Owner not later than the day previous to the date set for opening thereof. Requests by telephone or telegraph must be confirmed in writing, by the Bidder in person, or by an accredited representative of the Bidder before the time set for the opening of the Proposals. No bids may be withdrawn for a period of SIXTY (60) DAYS after the date and time designated for the opening thereof.

1.11 RIGHT TO REJECT PROPOSALS

A. The unqualified right is reserved by the Owner to waive any informalities in, or reject any or all Proposals as may be deemed to the best interest of the Owner. Proposals which contain any omissions, erasures, alterations, additions not called for, conditional bids, or irregularities of any kind, or Proposals otherwise regular which are not accompanied by Proposal Security, may be rejected as informal. Proposals in which the bid prices are obviously unbalanced may be rejected.
1.12 CHANGES PRIOR TO THE OPENING OF BIDS

A. During the period allowed for preparation of bids, the Bidders may be furnished addenda or bulletins for additions to or alterations of the Drawings or Specifications, which shall be included in the work covered by the Proposal and become a part of the Contract Documents, Bidders may submit to the Engineer a written request for an interpretation thereof. The Bidder submitting the request will be responsible for its prompt delivery. Any interpretation of the Contract Documents will be made only by addendum duly issued and a copy of such addendum will be mailed or delivered to each prospective Bidder of Record. The Owner will not be responsible for any other explanations or interpretations of the proposed Contract Documents.

1.13 SCOPE OF WORK

A. Unless otherwise provided in the Construction Specifications or the Proposal, it is the intent of the Contract Documents to prescribe a complete project which the Bidder proposes to construct, by furnishing all labor, materials, equipment, tools, necessary utilities and other facilities, and performing all work necessary to incidental to such construction, in full compliance with the Drawings, Specifications, Proposal, and Contract, and any special requirements contained therein or supplements attached thereto.

B. Should any construction or condition be anticipated which is not covered by these Specifications, the special requirements thereof will be stated in the Proposal, and any such special requirements shall be considered a part of these specifications as though they were fully contained herein. If any special requirements stated in the Proposal conflicts with any of the provisions of these Specifications, the former shall govern.

1.14 SUBMITTING PROPOSAL

A. Five (5) copies and 1 electronic copy (USB or CD) of the Proposal, accompanied by the Proposal Security, and all addenda, if any, and all other required supporting documentation shall be submitted in an opaque, sealed envelope, addressed to the Owner. The name of the Bidder shall appear in the upper left-hand corner of the envelope and the following notation and Bid number shall appear in the lower left-hand corner.

WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS
BID NO. 05-0-2018
1.15 AWARD AND EXECUTION OF CONTRACT

A. When a Proposal received has been determined to be satisfactory, a Contract will be awarded to the lowest responsible Bidder within the time designated in the Contract Documents.

B. The Bidder to whom the award is made shall execute the Contract and return it, together with the properly executed bonds and insurance certificates, to the office of the Owner, within the time specified in Paragraph 1.09 of Section 00100.

C. If the Contractor executes his Contract as herein provided and the Contract is not executed by the Owner within thirty (30) days after the receipt thereof from the Contractor, the Owner upon written request of the Contractor will return the Proposal Security. In such event, the award of the Contract shall be considered as annulled.

D. The Contract, Surety Bonds, and insurance certificates shall be executed in quintuplicate, or in as many copies as the Owner may require.

1.16 CANCELLATION OF AWARD

A. The Owner reserves the right to cancel the award of any contract at any time prior to its execution by the Owner.

1.17 SURETY BONDS

A. With the execution and delivery of the Contract, the successful bidder receiving the Contract award will be required to furnish within the time specified in Paragraph 1.09 of Section 00100, a Payment and Performance Bond, covering faithful and satisfactory performance of the work contracted, in an amount not less than one hundred percent (100%) of the total contract price, and a Public Construction Bond in an amount not less than one hundred percent (100%) of the Contract amount, covering payment in full for all services rendered, materials furnished and labor supplied or performed. The same Surety must execute both bonds each of which shall be in the form provided in the Contract Documents.

B. Should any Surety upon any Bond furnished in connection with this Contract become unacceptable or be deemed unsatisfactory to the Owner at any time, the Contractor shall upon written notice from the Owner, promptly furnish acceptable or substitute security as may be required to protect the interests of the Owners or of persons supplying services, labor and materials in the prosecution of the work under Contract. No further payment shall be deemed due or shall be made under this Contract, until the new Surety or Sureties will qualify and be accepted by the Owner.

C. IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department’s most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.
1.18 INDEMNITY AND INSURANCE

A. The Contractor shall not commence work under this Contract until he has obtained all insurance required under by these Specifications and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on a subcontract until all similar insurance required of the subcontractor has been so obtained and approved by the Contractor.

1. Certificates. The Contractor shall submit certificates or other documentary evidences to the Owner for approval, covering Workmen's Compensation Insurance; and Public Liability and Property Damage Insurance as well as any other insurance required by the Contract Documents.

2. Each certificate or other documentary evidence presented shall contain therein or have contained in a rider attached thereto and made a part thereof, a clause to the effect that the insurer will notify the insured and the Owner in writing thirty (30) days prior to the cancellation of the policy. The certificate for each policy shall be executed in quintuplicate, or in as many copies as the Owner may require.

B. Accidents and Claims. The Contractor shall be held responsible for all accidents and shall indemnify to the extent permitted by law and protect the Owner from all suits, claims and actions brought against it, and all cost or liability, including attorneys fees, to which the Owner may be put for any injury or alleged injury to the person or property of another resulting from negligence or carelessness in the performance of the work, or from any improper or inferior workmanship, or from inferior materials used in the work.

C. Mutual Responsibility of Contractors. Should a Contractor in the performance of his/her Contract cause damage to any person, any property, or work of another Owner or other party to the damage, arrange for an amicable settlement thereon. It is agreed by all parties herein that such disputes shall not delay completion of the work, nor be cause for claim against the Owner. Work shall be continued by the party claiming damages at his expense, subject to such damages as may be obtained by due course of law.

D. Contractor's Liability. The status of the Contractor in the work to be performed by him/her under this Contract is that of an independent Contractor and that, as such, he shall properly safeguard against any and all injury or damage to the public, to public and private property, materials and things; and that, as such, he/she alone shall be responsible for any and all damage, loss or injury to persons or property that may arise, or be incurred, in or during the conduct or progress of said work without regard to whether or not the Contractor, his/her subcontractors, agents, or employees have been negligent; and that the Contractor shall keep the Owner free, and discharge of,
and from any and all responsibility for risks or casualties of every description, for any or all damage, loss or injury to persons or property arising out of the nature of the work, from the action of the elements, or from any unforeseen or unusual difficulty, the Contractor shall assume and be liable for all blame and loss of whatsoever nature by reason of neglect or violation of any federal, state, county, or local laws, regulations or ordinances; that Contractor shall indemnify and save harmless the Owner and all its officers, agents and employees from all suits or actions at law caused by the negligence, recklessness or intentional wrongful misconduct of the Contractor and persons employed or utilized by the Contractor in the performance of the construction contract and shall, if required by the Owner, produce evidence of settlement of any such action before final payment shall be made by the Owner.

1.19 CANCELLATION OF CONTRACT

A. As soon as practicable after the satisfactory execution of the Contract by both parties, written notice to proceed with the work will be given to the Contractor. If such notice is not given within thirty (30) days after contract execution, and the delay is not caused by the Contractor or accepted by him/her in writing, the Contract may be declared null and void by either party.

B. If the Contractor incurs any expense in furtherance of the Contract prior to receipt of the Notice to Proceed, he/she does so, on his own responsibility.

1.20 COMPLETION TIME AND LIQUIDATED DAMAGES

A. The Bidder shall understand that the time limit indicated for completion of this Contract, and the amount of liquidated damages to be charged against the Contractor shall be declared in default in accordance with the provisions of the Specifications, shall be as stated in Article II of the Form of Agreement which is a part of these Contract Documents.

1.21 PAYMENT OF TAXES

A. The Contractor will be responsible for payment of all Excise, Sales and Use Taxes, and all other taxes required by law on all materials, tools, apparatus, equipment, fixtures, and incidentals which he purchases or uses for the purpose of fulfilling the work of this Contract, and he/she shall include all amounts required for such taxes with the item prices bid in his Proposal. No additional payment will be made to cover such taxes. Each Bidder shall thoroughly familiarize himself before submitting a Proposal, with all laws requiring the payment of taxes.

1.22 PUBLIC ENTITY CRIMES INFORMATION STATEMENT

A. A person or affiliate who has been place on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any
goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount, provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list.

END OF SECTION
The following terms and conditions are from the City of Bunnell. In the event of a conflict between any terms and conditions contained in these bidding/contract documents and/or technical specifications, the terms and conditions in this Section 00100A prevail.

**GOVERNING LAWS/RULES/REGULATIONS** – All Bidders shall hold all State, Federal, and City licenses required to perform the scope of work as described within the ITB documents. The Bidder shall ensure compliance with all laws, rules, codes, ordinances, and licensing requirements that are applicable to the conduct of its business, including those of Federal, State, and local agencies having jurisdiction and City.

**RESERVATION OF RIGHTS** – The City reserves the right to accept or reject any or all bids, with or without cause, to waive technicalities, or to accept the bid which, in its sole judgment, best serves the interest of the City, or to award a contract to the next most qualified Bidder if the successful Bidders do not execute a contract within thirty (30) days after approval of the selection by the City Commissioners.

City of Bunnell reserves the right, and the City Manager has absolute and sole discretion, to cancel a solicitation at any time prior to approval of the award by the City Commissioners when such approval is required. The decision to cancel a solicitation cannot be the basis for a protest pursuant to the City of Bunnell. City of Bunnell reserves the right to request clarification of information submitted and to request additional information of one or more applicants.

**UNIFORM COMMERCIAL CODE (APPLICABLE ONLY FOR THE PURCHASE OF GOODS)** – The Uniform Commercial Code (Florida Statutes, Chapter 672) shall prevail as the basis for contractual obligations between the awarded bidder/contractor and the City of Bunnell for any terms and conditions not specifically stated in this Invitation for Bid.

**PRICE/DELIVERY** – Price(s) quoted must be the price(s) for new merchandise unless otherwise specified. Any bids containing modifying or “escalator” clauses will not be considered unless specifically requested in the bid specifications.

“Acceptance” as herein used means the acceptance by City of Bunnell City Manager or Finance Director, by inspection or test of such items, determined that they fully comply with specifications.

**Deliveries resulting from this bid are to be made during the normal working hours of the City.** Time is of the essence and the bidder’s delivery date must be specified and adhered to. Should the bidder, to whom the order or contract is awarded, fail to deliver on or before his/her stated date, the City reserves the right to CANCEL the order or contract and make the purchase elsewhere. The successful bidder(s) shall be responsible for making any and all claims against carriers for missing or damage items. Partial shipments will be acceptable unless otherwise stated.

**FEDERAL AND STATE TAX** – City of Bunnell is exempt from Federal and State Sales and Use Taxes for tangible personal property (Certificate of Registry for tax transactions under Chapter...
32, Internal Revenue Code and Florida Sales/Use Tax Exemption Certificate). The Finance Department will provide an exemption certificate to the successful bidders. Vendors or contractors doing business with City of Bunnell City shall not be exempted from paying sales tax to their suppliers for materials to fulfill contractual obligations with the City, nor shall any vendor/contractor be authorized to use the City’s Tax Exemption Number in securing such materials.

AVAILABILITY OF PERSONNEL – Personnel described in the bid shall be available to perform the services as described. All personnel shall be considered to be, at all times, the employees, or agents of the Bidder, and not employees or agents of the City of Bunnell.

ASSIGNMENT OF CONTRACT – The selected Bidder may not make any assignments of their obligations resulting from this ITB without the prior written authorization of the City of Bunnell.

NON-EXCLUSIVITY OF CONTRACT – The selected Bidder understands and agrees that any resulting contractual relationship is non-exclusive and City of Bunnell reserves the right to seek similar or identical services elsewhere if deemed in the best interest of the City.

CANCELLATION – The contract with the successful Bidder may be terminated by the City without cause by giving a minimum of thirty (30) days written notice of intent to terminate. Contract prices must be maintained until the end of the thirty (30) day period. The City may terminate the contract at any time as a result of the Contractor’s failure to perform in accordance with these specifications and applicable contract. The City may retain/withhold payment for nonperformance if deemed appropriate to do so by the City.

AGREEMENT – The selected Bidder shall be expected to execute an agreement containing the terms and conditions herein. Any exceptions to the terms and conditions contained herein must be identified and agreed upon as outlined herein before consideration of proposal.

This Invitation for Bid shall be included and incorporated in the final contract or purchase order. The order of contract precedence will be the contract (purchase order), bid document and response. Any and all legal actions associated with this Invitation for Bids and/or the resultant contract (purchase order) shall be governed by the laws of the State of Florida. Venue for any litigation involving this contract shall be the Seventh Circuit Court in Flagler County, Florida for the City of Bunnell.

FLORIDA PROMPT PAYMENT ACT – Payments shall be in accordance with the Florida Prompt Payment Act applicable to local governments.

AVAILABILITY OF FUNDS – City of Bunnell is obligated only to the extent that funds are included in the City’s fiscal year budget. Should the City not include funds for this expense the Contract is null and void.

ADDITIONAL REQUIREMENTS – The City reserves the right to request additional services relating to this Agreement from the Contractor. When approved by the City as an amendment to this Agreement and authorized in writing, the Contractor shall provide such additional
requirements as may become necessary.

**NON-PERFORMANCE** – Failure to meet the expected quality of workmanship, schedule, or other criteria agreed upon, shall be considered a default. In case of default, the City may procure the required services from other sources.

**PATENT/COPYRIGHT/TRADE SECRET (INDEMNIFY, DEFEND, HOLD HARMLESS)**
- The Bidder shall pay all royalties and assume all costs arising from the use of any invention, design, process materials, equipment, product or device which is the subject of patent rights or copyrights. The Bidder shall indemnify, hold harmless, and defend the City of Bunnell Commissioners, their agents and employees, and anyone directly or indirectly employed by either of them, from and against all liabilities, damages, claims, demands, or actions at law or in equity, including court costs and attorneys’ fees that may hereafter at any time be made or brought by anyone arising out of any infringement of patent rights or copyrights held by others or for the disclosure or improper utilization of any trade secrets by the Bidder while providing services under this agreement.

**PUBLIC RECORDS/NON-CONFIDENTIALITY OF BIDS AND/OR PROPOSALS:** The City of Bunnell cannot and does not warrant the confidentiality of any information submitted in response to this solicitation. Florida law provides that municipal records shall, at all times, be open for personal inspection by any person, Section 119.01, F.S., The Public Records Law. Information and materials received by the City of Bunnell in connection with all Proposers’ response shall be deemed public records subject to public inspection upon award, recommendation of award, or 10 days after bid/proposal opening, whichever occurs first. Section 119.071, F.S.

**FINANCIAL ABILITY** – Every Bidder may be required to demonstrate financial stability as evaluated at the sole discretion of the City of Bunnell.

**BINDING OFFER** – A Bidder’s submittal will be considered a binding offer to perform the required services, assuming all terms are negotiated satisfactorily. The submission of a bid shall be taken as prima facie evidence that the Bidder has familiarized itself with the contents of this ITB.

**BID FORMS** – All bid proposals must be submitted on our standard Invitation for Bids Form. Bid proposals on vendor quotation forms will not be accepted.

**NO BID** – Where more than one item is listed, any items not bid upon must be indicated “NO BID”.

**MISTAKES** – In the event of extension error(s), the unit price will prevail and the bidder’s total offer will be corrected accordingly. In the event of addition errors, the extended totals will prevail and the bidder’s total will be corrected accordingly. Bidders must check their bid proposal where applicable. Failure to do so will be at the bidder’s risk. Bids having erasures or corrections must be initialed in ink by the Bidder.

**AUDITABLE RECORDS** – The awarded Bidder shall establish and maintain a reasonable
accounting system, which enables ready identification of Bidder’s cost of goods and use of funds. Such accounting system shall also include adequate records and documents to justify all fees for all items invoiced as well as all charges, expenses and costs incurred in providing the goods for at least five (5) years after completion of this contract. The City or its designee shall have access to such books, records, subcontract(s), financial operations, and documents of the Bidder or its sub-consultants as required to comply with this section for the purpose of inspection or audit anytime during normal business hours at the Consultant's place of business. This right to audit shall include the Bidder’s subcontractors used to procure goods or services under the contract with the City. Awarded Bidder shall ensure the City has these same rights with subcontractor(s) and suppliers.

**LIABILITY:** The vendor shall hold and save the City of Bunnell, its officers, agents, and employees harmless against claims by third parties resulting from the vendor’s or supplier’s breach of contract or negligence, including all attorney’s fees and costs, and shall pay any and all damages, fees, and costs assessed on behalf of the City. The City expressly reserves all rights, privileges and benefits of sovereign immunity.

**DRUG-FREE WORKPLACE CERTIFICATION** – By submitting a bid in response to this ITB you are certifying that your company is a drug-free workplace in accordance with Florida Statute 287.087.

**PUBLIC ENTITY CRIMES:** A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a Bid or Proposal on a contract to provide any goods or services to a public entity, may not submit a Bid or Proposal on a contract with a public entity for the construction or repair of a public building or public work, may not submit Bids or Proposals on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO, for a period of 36 months from the date of being placed on the convicted vendor list.

**DISCRIMINATION:** Pursuant to Section 287.134(2)(a), Florida Statutes, an entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid or proposal on a contract to provide any goods or services to a public entity, may not submit a bid or proposal on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids or Proposal on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity.

**CONFLICT OF INTEREST / STATEMENT OF NON-COLLUSION** – The award hereunder is subject to Chapter 112, Florida Statutes. All Bidders must disclose with their bid the name of any officer, director, or agent who is also an employee of the City of Bunnell. Further, all Bidders must disclose the name of any City of Bunnell employee who owns, directly or indirectly, an interest of five percent (5%) or more of the Bidder’s firm or any of its branches.

The Bidder shall certify that he/she has not, either directly or indirectly, entered into any Contract, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding.
in connection with the ITB and that the Bidder is not financially interested in, or otherwise affiliated in a business way with any other Bidder on the same land or improvements.

**EQUAL EMPLOYMENT OPPORTUNITY:** Title VII of the Civil Rights Act of 1964 protects individuals against employment discrimination based on race and color as well as national origin, sex, or religion.

**CODE ETHICS FOR PUBLIC OFFICERS AND EMPLOYEES:** Pursuant to Florida Statutes, any Public Officer or Employee of the City of Bunnell will abide by all ethical requirements as outlined in Chapter 112, Part III.

**AMERICANS WITH DISABILITIES ACT (ADA)** – If you need special services provided for under the Americans with Disabilities Act, contact the Finance Director at 386-437-7500 at least 48 hours before the scheduled event.

**LITERATURE (if applicable)** – If no particular brand, model or make is specified, Bidders shall submit with the ITB two (2) copies of descriptive literature and technical data, fully detailing all features, designs, construction, appointments, finishes and the like not covered in the specifications, necessary to fully describe the equipment, material, and/or services he proposes to furnish.

**LICENSES (if applicable)** – The Contractor shall be responsible for obtaining and maintaining city occupational license and any licenses required pursuant to the laws of the City of Bunnell, Flagler County, or the State of Florida. In furnishing the service or product to the City, the vendor shall comply with all federal, state, county and city rules, regulations and codes and their successors or amendments. Violation of such laws, rules, regulations and codes may be grounds for delaying or reducing the amount due, or in rescinding the contract, Contract, and proposal or quote.

**BRAND NAME OR EQUALS/DEVIATIONS** – Unless otherwise specified, the mention of a particular manufacturer’s brand name or number in the specifications does not imply that this particular product is the only one that will be considered for purchase. This reference is intended solely to designate the type or quality of merchandise that will be acceptable. Equal offers will be considered and must include descriptive literature and/or specifications. Failure to provide descriptive literature and/or specifications with equal offers will result in the disqualification of the bid.

The determination as to whether any alternate product or service is or is not equal shall be made solely by City of Bunnell and such determination shall be final and binding upon all bidders. The City of Bunnell reserves the right to request and review additional information to make such a determination.

Although the City of Bunnell provides for the consideration of alternate bids, it reserves the right to make an award in the best interest of the City. Such award may not necessarily be given to the lowest bid offered.
The bidder shall be responsible for reading very carefully, and understanding completely, the requirements and the specifications of the items bid upon. Unless the bid is in response to a “Brand Name or Equal” requirement, deviations from the specifications will only be considered if requested in writing prior to the date and time specified for receipt of bids. Deviations, if accepted, will be specifically addressed in writing via an addendum to the IFB. Any goods or services that are not in compliance with the specifications will not be accepted.

**COPIES** – Copies of documents, records, materials, and/or reproductions upon request will be charged in accordance with City of Bunnell’s fee schedule. Copyrighted materials may be inspected, but cannot be copied or reproduced per Federal law.

**PROPRIETARY/RESTRICTIVE SPECIFICATIONS** – Prospective bidders, who feel the specifications contained herein are proprietary or restrictive in nature, thus potentially resulting in reduced competition, must contact the Finance Director receipt of this Invitation for Bids and prior to bid opening. Specifications which are unrelated to performance will be considered for deletion via addendum to this Invitation for Bids.

**VENDOR ASSISTANCE WITH SPECIFICATIONS** – Any prospective bidder which assisted the City in developing or writing the specifications contained herein are requested to so note such on the bid proposal page of their bid response.

**CERTIFICATION OF INDEPENDENT PRICE DETERMINATION** – By submission of this bid, the Bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, that in connection with this procurement:

(a) The prices in this bid have been arrived at independently, without consultation, collusion, communication, or agreement for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.

(b) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to opening, directly or indirectly to any other Bidder or to any competitor; and,

(c) No attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition.

**SUCCESSORS AND ASSIGNS** – The City and the vendor each binds itself and its partners, successors, executors, administrators and assigns to the other party of this Contract and to the partners, successors, executors, administrators and assigns of such other party, in respect to all covenants of this Contract. Except as above, neither the City nor the vendor shall assign, sublet, convey or transfer its interest in this Contract without the written consent of the other. Nothing herein shall be construed as creating any personal liability on the part of any officer or agent of the City which may be a party hereto, nor shall it be construed as giving any rights or benefits hereunder to anyone other than the City and the vendor.
**EMPLOYEES OF THE CONTRACTOR** – All work under this contract shall be performed in a professional and skillful manner. The City may require, in writing, that the contractor removes from this contract any employee the City deems incompetent, careless, or otherwise objectionable.

**ALIEN WORKERS** – The City of Bunnell City does not award publicly funded Contracts to those who knowingly employ unauthorized alien workers in violation of section 274A of the Immigration and Naturalization Act. 8 United States Code §132a. Such employment deprives legal workers of job opportunities. Violation of section 274A shall be grounds for unilateral cancellation of the Contract, Agreement, Bid or Quote for purchase of services and goods by the City of Bunnell.

**E-VERIFY** – The Contractor shall utilize the U.S. Department of Homeland Security’s E-Verify system, in accordance with the terms governing use of the system, to confirm the employment eligibility of all persons employed by the Contractor during the term of the Contract to perform employment duties within Florida and all persons, including subcontractors, assigned by the Contractor to perform work pursuant to the Contract with the Department.

**INSURANCE REQUIRED** – Before execution of the contract by the City and commencement of the operations and/or services to be provided, and during the duration of the contract, the vendor shall file with the City current certificates of all required insurance on forms acceptable to the City, which shall include the following provisions:

The Responder shall procure and maintain, at its sole expense during the life of the engagement, insurance of the types and the minimum amounts stated below.

<table>
<thead>
<tr>
<th>Type</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional Liability/Errors &amp; Omissions</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Comprehensive General Liability</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Comprehensive Automobile Liability</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

B. Such insurance shall be written by a company or companies licensed to do business in the State of Florida and satisfactory to the City Commission. Prior to commencing any work under the engagement letter, certificates evidencing the maintenance of said insurance shall be furnished to and approved by the City.

C. The insurance shall provide that no material alteration or cancellation, including non-renewal, shall be effective until thirty (30) days after receipt of written notice by the City; provided, however, that for the professional liability insurance, in lieu of the foregoing requirement, the City in its sole discretion, may agree to accept notice of such material alteration or cancellation from the Responder.

D. The insurance procured for the Responder shall name the City of Bunnell as an additional insured on the comprehensive general liability.

E. Insurance carrier(s) must have a minimum financial rating of A-.
TERMINATION

(a) Termination for Default:

The City may, by written notice to the (vendor/contractor/consultant), terminate this contract for default in whole or in part (delivery orders, if applicable) if the (vendor/contractor/consultant) fails to:

1. provide products or services that comply with the specifications herein or fails to meet the City’s performance standards

2. deliver the supplies or to perform the services within the time specified in this contract or any extension.

3. make progress so as to endanger performance of this contract

4. perform any of the other provisions of this contract

Prior to termination for default, the City will provide adequate written notice to the (vendor/contractor/consultant) through the Finance Department, affording him/her the opportunity to cure the deficiencies or to submit a specific plan to resolve the deficiencies within ten (10) days (or the period specified in the notice) after receipt of the notice. Failure to adequately cure the deficiency shall result in termination action. The contractor and its sureties (if any) shall be liable for any damage to the City resulting from the Contractor’s default of the contract. This liability includes any increased costs incurred by the City in completing contract performance.

In the event of termination by the City for any cause, the vendor will have, in no event, any claim against the City for lost profits or compensation for lost opportunities. After a receipt of a Termination Notice and except as otherwise directed by the City the vendor shall:

1. Stop work on the date and to the extent specified.

2. Terminate and settle all orders and subcontracts relating to the performance of the terminated work

3. Transfer all work in process, completed work, and other materials related to the terminated work as directed by the City.

4. Continue and complete all parts of that work that have not been terminated.

If the (vendor’s/contractor’s/consultant’s) failure to perform the contract arises from causes beyond the control and without the fault or negligence of the (vendor/contractor/consultant), the contract shall not be terminated for default. Examples of such causes include (1) acts of God or the public enemy, (2) acts of a government in its sovereign capacity, (3) fires, (4) floods, (5)
epidemics, (6) strikes and (7) unusually severe weather.

(b) **Termination for Convenience:**

The City, by written notice, may terminate this contract, in whole or in part, when it is in the City’s interest. If this contract is terminated, the City shall be liable only for goods or services delivered and accepted. The City Notice of Termination may provide the contractor thirty (30) days prior notice before it becomes effective. **A termination for convenience may apply to individual delivery orders, purchase orders or to the contract in its entirety.**
SECTION 00300

PROPOSAL

FOR

WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS

BID NO. 05-0-2018

(To be Completed in Duplicate)

Bidder’s Name: ____________________

Submitted: _____, 20___

City of Bunnell
City Manager
102 W. Moody Blvd.
Bunnell, Florida 32110

Gentlemen:

The undersigned, as Bidder, hereby declares that the only person or persons interested in the Proposal, as principal or principals, is or are named herein and that no other persons than herein mentioned has any interest in the Proposal or the Contract to which the work pertains; that this Proposal is made without connection or arrangement with any other person, company, or parties making a bid or proposal and that the Proposal is in all respects fair and made in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and that from personal knowledge and experience, or that he/she has made sufficient test holes and/or other subsurface investigations to fully satisfy self that such site is a correct and suitable one for this work and he/she assumes full responsibility therefore; that he/she is familiar with all legal requirements (Federal, State and local laws, ordinances, rules and regulations) pertaining to the Work; that he/she has examined the Drawings and Specifications for the work and from his/her own experience or from professional advice that the Drawings and Specifications are sufficient for the work to be done and he/she has examined the other Contract Documents and all addenda relating thereto, and that he/she has satisfied himself/herself fully, relative to all matters and conditions with respect to the work to which this Proposal pertains.

The Bidder proposes and agrees, if this Proposal is accepted, to contract with the City of Bunnell, (Owner) in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, transportation, and labor and to perform all work necessary to complete the Work specified in the Proposal and other Contract Documents.

The Bidder further proposes and agrees to comply in all respects with the time limits for commencement and completion of the Work as stated in the Contract Form.
The Bidder further agrees that the deductions for liquidated damages, as stated in the Contract Form, constitute fixed and agreed liquidated damages to reimburse the Owner for additional costs to the Owner resulting from the Work not being completed within the time limit stated in the Contract Form.

The Bidder further agrees to execute a Contract and furnish satisfactory Performance and Payment Bonds, each in the amount of one-hundred percent of the Contract price, and the required Certificates of Insurance, within ten consecutive calendar days after written notice being given by the Owner of the award of the Contract, and the undersigned agrees that in case of failure on his/her part to execute the said Contract, Performance and Payment Bonds and Insurance Certificates within ten (10) consecutive calendar days after the award of the Contract, the bid guarantee accompanying his/her bid and the money payable thereon shall be paid to the Owner as liquidation of damages sustained by the Owner; otherwise, the bid guarantee shall be returned to the undersigned within fifteen days after the Contract is signed and the Performance and Payment Bonds and Insurance Certificates are filed.

The undersigned agrees to accept as full compensation for completion of the project in full compliance with the Contract Documents, the unit prices for the items named in Section 00310, Schedule of Unit Prices, submitted herein with this Proposal.

**The undersigned offers to furnish all materials, equipment and labor for construction of WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS, BID NO. 05-0-2018 for the City of Bunnell, Florida, complete in every respect in strict accordance with the drawings, specifications and any future changes therein. The Contractor shall perform these obligations for the prices listed in the Schedule of Unit Prices: Section 00310 attached and made a part of this Bid.** The estimated bid total:

Base Bid: ________________________________

(In Figures)

________________________________________

(In Words)

1.01 COMPLETION TIME OF CONTRACT

A. The Contractor agrees that the work shall be started not later than the date indicated in the Notice to Proceed and that the work shall be substantially completed within 180 (One Hundred Eighty) days and be final completed within 30 (Thirty) days of the substantial completion or 210 (Two Hundred Ten) days total.

B. The Contractor further agrees that for each calendar day, with the exception of Sundays and legal holidays that any work shall remain uncompleted after the completion time stipulated above the sum of $500 (Five Hundred Dollars) per day shall be deducted from monies due the contractor, not as a penalty, but as liquidated damages. If the Contractor is declared in default in accordance with the provisions of the Specifications, liquidated damages shall be charged as provided herein, and such
amounts shall be deducted from the final amount payable to the Contractor or his/her Surety. Should the total amount chargeable as liquidated damages exceed the amount due or payable to the Contractor or his/her Surety, then such excess shall be paid to the Owner by the Contractor or his/her Surety.

1.02 SUPPLEMENTAL REQUIREMENTS

A. The following documents are attached to and made a condition of this bid:

1. Questionnaire: Section 00311
2. Proposal: Section 00300
3. Schedule of Unit Prices: Section 00310
4. Listing of Subcontractors: Section 00330
5. Listing of Previous Experience: Section 00331
6. Bid Bond: Section 00410
7. Public Entity Crimes Statement: Section 00470
8. Anti-Collusion Statement: Section 00480
9. Drug Free Workplace Certificate: Section 00485
10. Trench Safety Affidavit: Section 00490
11. Vendor Information Form: Section 00600
12. Internal Revenue Service W-9 Form: Section 00610
13. Certificate as to Corporate Principal: Section 00620
14. City of Bunnell Insurance Requirements: Section 00645, Page 6

1.03 REQUIRED DISCLOSURE

A. At its sole discretion, the City of Bunnell, Florida may reject any bidder the City finds to lack, or whose present or former executive employees, officers, directors, stockholders, partners or owners are found by the City to lack honesty, integrity, or moral responsibility. The discretion of the City may be exercised based on the City's own investigation, public records, or any other reliable sources of information. By submitting a bid, bidder recognizes and accepts that the City may reject the bid based upon the exercise of its sole discretion and bidder waives any claim it might have for damages or other relief resulting from the rejection of its bid based on these grounds.
ACKNOWLEDGMENT OF ADDENDA

Addenda will be issued via email and it is the Bidder’s responsibility to confirm that all addenda have been received prior to submitting a bid for the project. Acknowledgment is hereby made of the following Addenda received since issuance of Drawings and Specifications.

Addendum No. _____ Dated: _______________  Addendum No. _____ Dated: _______________
Addendum No. _____ Dated: _______________  Addendum No. _____ Dated: _______________
Addendum No. _____ Dated: _______________  Addendum No. _____ Dated: _______________

Bank of _____________________________________________
or Bid Bond for the sum of ____________________________ Dollars
(___________), made payable to ______________________ (Owner).

____________________________ (Name of Bidder) (Affix Seal)
____________________________ (Signature of Officer)
____________________________ (Title of Officer)

Name of Bidder

____________________________
Address

____________________________
City/State/Zip

____________________________
Telephone

Contractor’s Florida License Number

The full names and residences of persons and firms interested in the foregoing bid, as principals, are as follows:

____________________________
____________________________
____________________________

END OF SECTION

00300 - 4
## Section 00310

### Schedule of Unit Prices

**WWTP Equalization Basin & Effluent Pond Improvements**

**Bid No. 05-0-2018**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Est. Qty.</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Cost</th>
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<tbody>
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<td>Mobilization</td>
<td>1</td>
<td>LS</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Equalization Basin Mixer</td>
<td>1</td>
<td>LS</td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>Pond Excavation</td>
<td>1</td>
<td>LS</td>
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<tr>
<td>4</td>
<td>SolarBee Aerator</td>
<td>1</td>
<td>LS</td>
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<tr>
<td>5</td>
<td>Mechanical, (Including Yard Piping and Flow Meter)</td>
<td>1</td>
<td>LS</td>
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<td></td>
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<tr>
<td>6</td>
<td>Sod Restoration</td>
<td>1</td>
<td>LS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Electrical</td>
<td>1</td>
<td>LS</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>Permits and Allowances</td>
<td>1</td>
<td>LS</td>
<td>$10,000.00</td>
<td>$10,000.00</td>
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<td>9</td>
<td>As-Built Drawings</td>
<td>1</td>
<td>LS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total**

---

### Submitted By

**Signature**

**Contractor**

**Address**

City:  
State:  
Zip:  

**Telephone Number**

( )

**Fax Number**

( )

**State of Florida**

**Contractors License Number**
SECTION 00311

QUESTIONNAIRE

DATE:______________

PROJECT IDENTIFICATION: CITY OF BUNNELL
WWTP EQUALIZATION BASIN & EFFLUENT POND
IMPROVEMENTS, BID NO. 05-0-2018

NAME OF BIDDER:_________________________________________________________

BUSINESS ADDRESS:_____________________________________________________

Telephone No.:__________________________________________________________

CONTRACTOR'S FLORIDA LICENSE NO.______________________________________

The undersigned warrants the truth and accuracy of all statements and answers herein contained. Include additional sheets if necessary.

1. How many years has your organization been in business as a Licensed Contractor?

_____________________________________________________________________

2. Describe and give the date and owner of the last project that you have completed similar in type, size, and nature as the one proposed?

_____________________________________________________________________

_____________________________________________________________________

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

_____________________________________________________________________

_____________________________________________________________________

4. Name three (3) municipalities for which you have performed work and to which you refer:

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

00311 - 1
5. Have you personally inspected the site of the proposed Work? Describe any anticipated problems with the site and your proposed solutions?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6. Will you Subcontract any part of this Work? If so, describe which portions:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7. What equipment do you own that is available for the Work?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8. What equipment will you purchase for the Work?

________________________________________________________________________
________________________________________________________________________

9. What equipment will you rent for the Work?

________________________________________________________________________
________________________________________________________________________

10. The following is given as a summary of the Financial Statement of the undersigned: (List Assets and Liabilities and use insert sheet if necessary).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. State the true and exact, correct, and complete name under which you do business. Bidder is:__________________________

END OF SECTION

00311 - 2
LISTING OF SUBCONTRACTORS

The Bidder proposes that the following subcontractors are qualified to perform the referenced work and have successfully done so on recent projects similar in nature and size. Upon approval of subcontractors listed the successful bidder shall not substitute subcontractors without approval from the Engineer.

<table>
<thead>
<tr>
<th>SUBCONTRACTOR</th>
<th>COMPANY NAME</th>
<th>REFERENCES</th>
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<tbody>
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</tbody>
</table>

END OF SECTION
SECTION 00331

LISTING OF PREVIOUS EXPERIENCE

The bidder proposes that he/she is qualified to perform the referenced work and has successfully done so on recent projects similar in nature and size. A minimum of three (3) projects must be listed below. The Owner reserves the right to check references and confirm information provided herein.

<table>
<thead>
<tr>
<th>NO.</th>
<th>PROJECT/ OWNER/ REFERENCE</th>
<th>DESCRIPTION/COST</th>
<th>DATE WORK STARTED &amp; FINISHED MM/YR TO MM/YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project:</td>
<td>Description:</td>
<td>Start Date:</td>
</tr>
<tr>
<td></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Name:</td>
<td>Cost:</td>
<td>Finish Date:</td>
</tr>
<tr>
<td></td>
<td>Reference Phone Number:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Project:</td>
<td>Description:</td>
<td>Start Date:</td>
</tr>
<tr>
<td></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Name:</td>
<td>Cost:</td>
<td>Finish Date:</td>
</tr>
<tr>
<td></td>
<td>Reference Phone Number:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Project:</td>
<td>Description:</td>
<td>Start Date:</td>
</tr>
<tr>
<td></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Name:</td>
<td>Cost:</td>
<td>Finish Date:</td>
</tr>
<tr>
<td></td>
<td>Reference Phone Number:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
 SECTION 00410

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____________________ as Principal and
_____________________ of the City of ___________________ State of ________________, a
corporation existing under the laws of the State of Florida, as Surety, are held and firmly bound
unto the ________________________________ hereinafter called the Owner, in the sum of
______________________________ Dollars ($ ___________) lawful money
of the United States of America, for the payment of which sum well and truly to be made, we
bind ourselves our heirs, executors, administrators and successors, jointly and severally, firmly
by these presents.

The condition of this obligation is such that whereas the Principal has submitted the
accompanying Proposal or Bid, for the construction of:

WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS

BID NO. 05-0-2018

NOW, THEREFORE, if the Principal shall not withdraw said Bid within sixty (60) days after the
opening of the same and in the event of the acceptance of his proposal by the Owner, shall,
within the period specified therefore, enter into a written contract with the Owner in accordance
with the Bid as accepted, and give bond with good and sufficient surety or sureties, as may be
required, for the faithful performance and proper fulfillment of such contract, or in the event of
the withdrawal of said Bid within the period specified, of the failure to enter into such contract
and give bonds within the time specified, if the Principal shall pay the Owner the difference
between the amount specified in said Bid and the amount for which the Owner may procure the
required work, if the latter amount be in excess of the former, then the above obligation shall be
void and of no effect, otherwise to remain in full force and virtue.
IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this ___ day of ______, 20__, the name and corporate seal of each corporate body being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

IN PRESENCE OF:

__________________________________________ (Seal)

__________________________________________ (Seal)

__________________________________________ (Seal)

Individual or Partner

Witness

__________________________________________

__________________________________________

Address

__________________________________________

Corporate Principal

ATTEST:

__________________________________________

President AFFIX CORPORATE SEAL

__________________________________________

Address

By_____________________________________

AFFIX CORPORATE SEAL

__________________________________________

Corporate Surety

ATTEST:

__________________________________________

Title

END OF SECTION
SECTION 00470

SWORN STATEMENT UNDER SECTION 287.133(3)(a), FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES:

1. This sworn statement is submitted with Bid, Proposal or Contract No._______________ for___________________________________________________.

2. This sworn statement is submitted by ________________________________ whose business address is ______________________________________ and (if applicable) its Federal Employer Identification Number (FEIN) is____________________. (If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement: ________________________).

3. My name is _____________________________ any my relationship to the entity named above is______________________________.

4. I understand that a "public entity crime" as defined in Paragraph 287.133(g), Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid or contract for goods or services to be provided to any public entity or an agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

5. I understand that "convicted" or "conviction" as defined in Paragraph 287.133(i)(b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, nonjury trial, or entry of a plea of guilty or nolo contorters.

6. I understand that an "affiliate" as defined in Paragraph 287.133(l)(a), Florida Statutes, means:

   a. A predecessor or successor of a person convicted of a public entity crime: or

   b. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term “affiliate” includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one person of shares constituting a controlling interest in another person, or a pooling of equipment or income among persons when not for fair market value under an arm’s length agreement, shall be a prima facie that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months shall be considered an affiliate.
7. I understand that a “person” as defined in Paragraph 287.133(i), Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with the legal power to enter into a binding contract and which bids or applies to bid on contracts for the provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term “person” includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

8. Based on information and belief, the statement which I have marked below is true in relation to the entity submitting this sworn statement. (Please indicate which statement applies).

_____ Neither the entity submitting this sworn statement, nor any officers, directors, executives, partners, shareholders, employees, members or agents who are active in management of the entity, nor any affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989.

_____ The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND (Please indicate which additional statement applies.)

_____ There has been a proceeding concerning the conviction before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer did not place the person or affiliate on the convicted vendor list. (Please attach a copy of the final order.)

_____ The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer determined that it was in the public interest to remove the person or affiliate from the convicted vendor list. (Please attach a copy of the final order).

(Signature) _____________________________________ Date: __________

State of_________________________County of_____________________________

PERSONALLY APPEARED BEFORE ME, the undersigned authority, ____________________ who, after first being sworn by me, affixed his/her signature in the space provided above on this ________ day of______________, 20__.

__________________________________
Notary Public

My Commission Expires:

END OF SECTION
SECTION 00480

ANTI-COLLUSION STATEMENT

By signing this form, the bidder agrees that this is made without any other understanding, agreement, or connection with any person, corporation, or firm submitting a proposal for the same purpose and that the proposal is in all respects fair and without collusion or fraud.

SIGN in ink in the space provided below. Unsigned bids will be considered incomplete, and will be disqualified, and rejected.


NAME OF FIRM:_____________________________________________________________

SIGNED BY: ________________________________________________________________

(MUST BE SIGNED BY A COMPANY OFFICER OR AUTHORIZED AGENT)

TITLE:_______________________________________________________________________

ADDRESS:____________________________________________________________________

CITY AND STATE:____________________________________________________________

TELEPHONE:_________________________________________________________________

COMPLETION TIME:__________________________________________________________

NO proposals will be withdrawn for a period of thirty (30) days subsequent to the opening of the proposals, without the consent of the City of _________________.

NO BID (REASON)______________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

END OF SECTION
DRUG FREE WORKPLACE CERTIFICATE

I, the undersigned, in accordance with Florida Statute 287.087, hereby certify that,
__________________________________________ (print or type name of business)

publishes a written statement notifying that the unlawful manufacture, distribution, dispensing, possession or use
of a controlled substance is prohibited in the Workplace named above, and specifying actions that will be taken
against violations of such prohibition.

- Informs employees about the dangers of drug abuse in the workplace, the firm’s policy of maintaining a
drug free working environment, and available drug counseling, rehabilitation, and employee assistance
programs, and the penalties that may be imposed upon employees for drug use violations.

- Gives each employee engaged in providing commodities or contractual services that are under bid or
proposal, a copy of the statement specified above.

- Notifies the employees that as a condition of working on the commodities or contractual services that are
under bid or proposal, the employee will abide by the terms of the statement and will notify the employer
of any conviction of, please or guilty or nolo contendere to, any violation of Chapter 1893, or of any
controlled substance law of the State of Florida or the United States, for a violation occurring in the
workplace, no later than five (5) days after such conviction, and requires employees to sign copies of such
written statement to acknowledge their receipt.

- Imposes a sanction on, or requires the satisfactory participation in, a drug abuse assistance or rehabilitation
program, if such is available in the employee’s community, by any employee who is so convicted.

- Makes a good faith effort to continue to maintain a drug free workplace through the implementation of the
Drug Free Workplace program.

- “As a person authorized to sign this statement, I certify that the above named business, firm or corporation
complies fully with the requirements set forth herein”.

__________________________________________                    ____________________________________________
(Authorized Signature)     (Date)

________________________________________
(Print Name)

STATE OF ___________
CITY OF ___________________________
The foregoing instrument was acknowledged before me _____ day of ________________, 20____ by
__________________________________________, who is personally known to me or who has produced ___ as
identification and who did take an oath.

My Commission Expires:  ____________________________________________
Notary Public
SECTION 00490

TRENCH SAFETY AFFIDAVIT

Trench excavations on this Project are expected to be in excess of 5 feet deep. The Occupational Safety and Health Administration excavation safety standards, 29 CFR 1926.650 Subpart P trench safety standards will be in effect during the period of construction of the Project.

Bidder acknowledges that included in the Bid Price are costs for complying with the Florida Trench Safety Act (90-096, Laws of FL) effective October 1, 1990, and hereby gives assurance that, if awarded the Contract, the Contractor or Subcontractor performing trench excavation work on the Project will comply with the applicable trench safety standards. The Bidder further identifies the costs as follows:

<table>
<thead>
<tr>
<th>Trench Safety Item (Description)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

(Cost in Words)

TOTAL $ __________________________

FAILURE TO COMPLETE THE ABOVE SHALL RESULT IN THE BID BEING DECLARED NON-RESPONSIVE

COMPANY NAME: __________________________

DATE: ________________   BY: __________________________

(Additional sheets shall be attached, as needed, and items shall be organized to correspond with the bid format)

END OF SECTION
THIS AGREEMENT, entered into this ___ day of ________, 20___, by the CITY OF BUNNELL, FLORIDA, hereinafter called the OWNER, Party of the First Part, and a CORPORATION known as ________________________ organized and existing under the laws of the State of Florida; PARTNERSHIP known as ___________________________ consisting of the following members: ___________________________ an INDIVIDUAL ___________________ trading as _________________________ of ___________________________ City ___________________, State of _______________ Zip Code____________, hereinafter called the CONTRACTOR, Party of the Second Part.

WITNESSETH: That the parties hereto do mutually agree as follows:

ARTICLE I.

A. The Contractor agrees to furnish all labor, superintendence, materials, plant and other utilities for, perform all work necessary for or incidental to, and to perform all other obligations imposed by this Contract for the Construction of:

WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS
BID NO 05-0-2018

herein called for, in strict accordance with the Drawings and Specifications prepared by QLH, A Mead & Hunt Company, Engineers, which Contract include, but is not limited to, the following Contract Documents:

a. Invitation
b. Instructions
c. Proposal
d. This Agreement
e. Performance Bond
f. Labor and Material Payment Bond
g. Insurance
h. Specifications
i. Addenda (if any)
j. Drawings

ARTICLE II.

A. The Contractor agrees that the work shall be started not later than the date indicated in the Notice to Proceed and that the total work shall be substantially completed in 180 (one hundred eighty) days and be final completed within 30 (thirty) days of the substantial completion or 210 (two hundred ten) days total.

B. The Contractor further agrees that for each calendar day, with the exception of Sundays and legal holidays that any work shall remain uncompleted after the completion time stipulated above, the sum of $500 (FIVE HUNDRED DOLLARS) shall be deducted from monies due the Contractor, not as a penalty, but as liquidated
damages. If the Contractor is declared in default in accordance with the provisions of the Specifications, liquidated damages shall be charged as provided herein, and such amounts shall be deducted from the final amount payable to the Contractor or his Surety. Should the total amount chargeable as liquidated damages exceed the amount due or payable to the Contractor or his Surety, then such excess shall be paid to the Owner by the Contractor or his Surety.

ARTICLE III.

A. The Contractor shall receive and accept the compensation for the performance of the Contract (subject to additions or deductions noted therein) in accordance with the prices stipulated in the Proposal, and in the manner provided in Article IV for the Contract Price of ____________ and for additions or revisions approved in Change Orders at Unit Prices.

ARTICLE IV.

A. Payment to the Contractor shall be made as follows:

1. Not later than the fifteenth (15th) day of each calendar month, the Owner will make a partial payment to the Contractor on the basis of a duly certified and approved estimate by the Engineer of the work performed during the preceding calendar month under this Contract, and (at the option of the City) an amount equal to 90% of materials and equipment not incorporated in the work but delivered and suitably stored. When payment to the Contractor is made for stored materials and equipment, Contractor shall submit invoices marked paid by the supplier with the next month's request for payment to document that Contractor has paid for said materials and equipment or the previously paid amount for stored materials shall be deducted from any remaining payment(s) for any stored materials not so properly documented. To insure the proper performance of this Contract, the Owner will retain ten percent (10%) of the amount of each estimate until the work is fifty percent (50%) complete.

2. When work is fifty percent (50%) complete, the Owner may allow the reduction of the withholding to five percent (5%) of the dollar value of all work satisfactorily completed to date, provided that the Contractor is making satisfactory progress and there is no specific cause for greater withholding.

3. Upon completion of the entire work under Contract, the Engineer shall make a final inspection and certify such completion to the Owner. Upon approval of the completion certificate by the Owner, the Owner shall notify the Contractor and the Surety of the satisfactory completion of the work and except as otherwise provided in the Specifications, final payment therefore shall be made to the Contractor within thirty (30) days after written acceptance by the Contractor of the final certificate computation.
ARTICLE V.

A. The Contract shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or his right, title or interest therein, without written consent of the Owner.

ARTICLE VI.

A. The work shall be subject at all times to the supervision of the Engineer and his authorized assistants. The Engineer shall decide all questions which may arise relative to the Drawings, Specifications, and the performance of the work. Any doubt concerning the meaning of the Specifications and the Drawings, or any ambiguity or obscurity as to wording or intent of them shall be decided by the Engineer, and such decisions shall be binding upon both parties hereto, and shall not be subject to arbitration.

ARTICLE VII.

A. The Contractor shall guarantee his work and shall remedy, without cost to the Owner, any defects which may develop therein during a period of one (1) year from the date of the Owner's approval of the Completion Certificate issued by the Engineer.

ARTICLE VIII.

A. The Contractor shall maintain all records received or transmitted as part of performing the work included in the Contract. Contractor shall provide public access to such records in accordance with the Owner’s policies concerning public records except for exempt or confidential records as authorized by law. Contractor shall provide the Owner copies of all records maintained by the Contractor upon conclusion or termination of the Contract.

ARTICLE IX.

A. In the event of conflict between any of the Contract Documents, the provisions of this Agreement shall govern.
IN WITNESS WHEREOF, the Parties hereto have signed this Contract in quintuplicate the day and year first above written.

ATTEST: CITY OF BUNNELL, FLORIDA

__________________________________________  By_____________________________________
City Clerk                                     Catherine Robinson
Title_____ Mayor_________

__________________________________________
WITNESS:  CONTRACTOR____________________

By_____________________________________

END OF SECTION
SECTION 00600

VENDOR INFORMATION

Vendor is:
( ) Corporation
( ) Partnership
( ) Sole Proprietorship
( ) Other _________________________________ (Explain)

Federal Employer Identification Number: _________________________________

Firm Name: ___________________________________________________________

Mailing Address: _______________________________________________________

Telephone No.: __________________________ Fax No.: _______________________

Email Address: ___________________________ Web Address: _________________

If remittance address is different from the mailing address so indicate below.

Firm Name: ___________________________________________________________

Remittance Address: _________________________________________________

_____________________________________________________________

_____________________________________________________________

Submitted by: _______________________________________________________

Name & Title Printed: _______________________________________________
Form W-9
Request for Taxpayer Identification Number and Certification

1. Name (as shown on your income tax return). Name required on this line; do not leave this line blank.

2. Business name/disregarded entity name, if different from above.

3. Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes.

   - Individual/sole proprietor or single-member LLC
   - C Corporation
   - S Corporation
   - Partnership
   - Trust/estate
   - Limited liability company (Enter the tax classification here if LLC is classified as a single-member LLC that is disregarded as an entity)
   - Other (see instructions)

Note: Check the appropriate box in line 3 above for the tax classification of the single-member LLC owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded as the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

4. Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3).

   - Exempt payee code (if any)
   - Exemption from FATCA reporting code (if any)

5. Address (number, street, and apt. or suite no.) See instructions.

6. City, state, and ZIP code

7. List account number(s) here (optional).

Part I: Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I. For other entities, it is your employer identification number (EIN). If you do not have a number, see How to get a TIN, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see What Name and Number To Give the Requester for guidelines on whose number to enter.

Social security number

OR

Employer identification number

Part II: Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding; or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here

Signature of U.S. person

Date

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to www.irs.gov/FormW9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1098 (Home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, later.
SECTION 00620

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, ______________________, certify that I am the ________ secretary of the corporation named as Principal in the within Bid Bond; that _______________________________ who signed the said Bid Bond on behalf of the Principal was then___________________ of said corporation; that I know his signature, and his signature thereto is genuine; and that said Bid Bond was duly signed, sealed and attested for in behalf of said corporation by authority of its governing body.

______________________________

AFFIX CORPORATE SEAL

END OF SECTION
Front Page for Bond required by Section 255.05, F.S.

PAYMENT AND PERFORMANCE BOND

(Public Works)

In Compliance with Sections 255.05(1)(a) and (7) Florida Statutes (2001)

BOND No. __________

PRINCIPAL:
Name of Developer: ____________________________

a Florida for-profit corporation

Address: ______________________________________

Contact Person: ________________________________

Phone Number: (__) ___ - ___

SURETY:
Address: ______________________________________

Contact Person: ________________________________

Phone Number: (__) ___ - ___

OWNER: City of Bunnell, Florida, a chartered municipal corporation

102 W. Moody Blvd.

Bunnell, FL 32110

Contact Person: City Manager

Phone Number: (386) 437-7500

Amount: ____________

City Case/Project No. 05-0-2018

Description of Work: The project consists of removal of diffused aeration in the WWTP equalization basin and installing a submersible mixer aerator. Conversion of an existing on site reject pond into a wet detention pond for seasonal storage of reclaimed water. The storage pond includes piping improvements and mixer aeration equipment.

Project Name/Location: WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS

Bunnell, Flagler County, Florida

Legal Description:

Front Page

All other pages are subsequent to this page regardless of any numbers that may be printed thereon.
Certificate for Filing in Public Records

PAYMENT AND PERFORMANCE BOND
(Public Works)
In Compliance with Section 255.05(1)(a) Florida Statutes (2001)

Bond No. ______________

The Principal, ______________________________________ a Florida corporation, by and
through its undersigned representative, does hereby certify that the attached:

Payment and Performance Bond No. ______________,

is a true and correct copy of the fully executed financial guarantee delivered to:

CITY OF BUNNELL, FLORIDA
pursuant to Section 255.05, Florida Statutes (2001); as Owner/Holder of the subject property in
trust for the public, for the public construction project known as:

WWTP EQUALIZATION BASIN & EFFlUENT POND IMPROVEMENTS
BID NO. 05-0-2018

located at ___________________________ in Bunnell, Flagler County, Florida.

All claimants are called upon to take notice of the notice requirements and time
limitations prescribed by Section 255.05(2), Florida Statutes (2001).

_____________________________________________

a Florida corporation.
Mailing Address:

_____________________________________________

By: ________________________________

Name/Title: ________________________________

STATE OF FLORIDA
COUNTY OF FLAGLER

The foregoing Certificate of Filing was acknowledged before me this _________ day of
______________________, 20___, by _________ as a duly authorized representative of
______________________________________, a Florida corporation, the Principal named in the
attached Payment and Performance Bond No. ______________.

Notary, please check one:

_____ Personally known to me
_____ Produced identification

Notary Public, State of Florida
Printed Name, Commission & Term Expiration Date:

_____________________________________________

END OF SECTION
Public Construction Bond

per Section 255.05, Florida Statutes (2001)
Guaranty for Construction of Public Improvements

BY THIS BOND, We _____________________________, a Florida for-profit corporation, and
____________________________________________________________________________, a corporation authorized to do business in the
State of Florida, as Surety, are bound to CITY OF BUNNELL, FLORIDA, a charted
corporation, herein called “Owner” or sometimes referred to as “City” in the sum of _______________($_________), being 100% of the
cost estimate for the construction of the required improvements, for payment of which we bind
ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

THE CONDITION OF THIS BOND is that if Principal:
1. Performs the terms of Construction of WWTP EQUALIZATION BASIN & EFFLUENT
   POND IMPROVEMENTS, and subsequent Change Orders made thereto, hereinafter
   sometimes referred to as the “Contract,” entered into between Principal and Owner for
   construction of improvements reflected on the plans approved by the City Council as prepared by
   QLH, A Mead & Hunt Company, the Contract being made a part of this bond by reference, at the
time and in the manner prescribed in the contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes,
supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in
the prosecution of the work provided for in the contract; and

3. Pays Owner all losses, damages, expenses, costs, and attorney’s fees, including appellate
proceedings, that Owner sustains because of a default by Principal under the contract; and

4. Performs the guarantee of all work and materials furnished under the contract for the time
specified in the contract, then this bond is void; otherwise it remains in full force.
Any changes in or under the contract documents and compliance or noncompliance with any formalities connected with the contract or the changes does not affect Surety’s obligation under this bond.

IN WITNESS WHEREOF, this performance and payment bond is executed in duplicate originals, each of which shall be deemed an original, this ____, ____________, 20__.

____________________________________
(Name of Principal)

Attest:

(As to Corporate Principal) Secretary

By: ________________________________
Name/Title: _______________________

(Witness to Principal) (Corporate Seal)

____________________________________
(Surety)

By: ________________________________

(Witness to Surety) (Attorney-in-Fact) (Corporate Seal)

NOTE: Date of BOND must not be prior to date of Contract. If Developer/Principal is Partnership, all partners shall execute BOND. All BONDS signed by an agent must be accompanied by a certified copy of the authority to act.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department’s most current list (Circular 570 as amended) and be authorized to transaction business in the State of Florida.

END OF SECTION
SECTION 00645

CITY OF BUNNELL

CONTRACTORS STANDARD INSURANCE REQUIREMENTS
AND INDEMNIFICATION CLAUSE

I. INSURANCE

A. Prior to commencing work, the Contractor shall provide at his own cost and expense
insurance to the City of BUNNELL as required below. The insurance companies
must be licensed in the State of Florida and be rated by A.M. Best as A: Class X or
better. The required insurance shall be evidenced by certificates and/or policies as
determined by the City. All policies and certificates of insurance shall be approved
by the City prior to inception of any work.

B. It is required that each Certificate of Insurance and/or policy must give 30 days prior
written notice of cancellation, non-renewal or adverse change to the City of
BUNNELL Finance Department by registered mail, return receipt requested. All
such notices shall name the Contractor and identify the contract number.

C. The "City of BUNNELL," wherever used, shall be defined to include the City itself,
elected officials, officers, employees, volunteers, representatives, agents and any
affiliates.

D. The "Contractor," wherever used, shall be defined to include the Contractor, any
subsidiaries or affiliates, officers, employees, volunteers, representatives, agents,
contractors and subcontractors.

E. If at any time any of the required policies shall be or shall become unsatisfactory to
the City as to form or substance, or if the insurance company becomes unsatisfactory
to the City, the Contractor shall, upon written notice to that effect from the City,
promptly obtain a new policy, submit the policy to the City for approval, and submit
the Certificate of Insurance, as previously required.

F. If at any time the Contractor shall fail to furnish and/or maintain the required
insurance, this contract may be declared suspended, discontinued or terminated, at the
discretion of the City. Failure of the Contractor to take out and/or maintain any of
the required insurances shall not relieve the Contractor from any liability under the
contract, nor shall the insurance requirements be construed to conflict with or
otherwise limit the obligations of the Contractor concerning indemnification.

G. The Contractor is required to provide new Certificates of Insurance to the City at
least 20 days prior to the coverage renewal dates. If any of the insurance
requirements are not complied with at their renewal dates, the City may at their option, (1) withhold payments to the Contractor until those requirements have been met or, (2) pay the renewal premium and withhold such payments from any monies due the Contractor.

H. In the event of any claims having been filed due to any operation under this contract that are in excess of the insured amounts, the excess amount of such claim, or any portion thereof, may be withheld from payments due the Contractor until such time as the Contractor shall furnish such additional security covering such claims as may be determined by the City of BUNNELL.

I. The Contractor shall provide the following insurance on forms no more restrictive than the latest edition of those filed by the Insurance Services Office, and name the "City of BUNNELL" (as defined in "C" above) as an Insured to the extent of the City's interests.

II. LIABILITY INSURANCE

A. Workers' Compensation - Statutory - in compliance with the Workers' Compensation law of the State of Florida including employers liability coverage of at least $100,000. If any operations are to be undertaken on or about navigable waters, coverage must be included for the U.S. Longshoremen and Harbor Workers' Compensation Act and Jones Act.

B. Commercial General Liability - with minimum limits of:

1. $2,000,000 General Aggregate
2. $1,000,000 Products - Completed Operations Aggregate
3. $1,000,000 Personal and Advertisement Injury
4. $1,000,000 Each Occurrence
5. $100,000 Fire Damage

C. Business Automobile Liability - with minimum limits of $1,000,000 per occurrence combined single limit. This insurance shall include for bodily injury and property damage the following coverage:

1. Owned Automobiles
2. Hired Automobiles
3. Non-owned Automobiles
4. Employee Non-ownership
NOTE! The required limits of liability for the above policies may include umbrella insurance with the umbrella policy making up the difference between the policy limits of the underlying policies and the total amount of coverage required. Such Umbrella Liability insurance shall be a "follow form" and be at least as broad as the underlying policies.

III. PROPERTY INSURANCE

A. When this contract includes construction of and/or additions to above-ground buildings or structures, Builder's Risk and/or Installation Floater policies must be provided as follows:

1. Builder's Risk - "All risk" form in the amount of 100% of the completed value of such addition, building or structure to include personal property of others in the care, custody or control of the Contractor, and shall include a flat-premium endorsement.

2. Maximum Deductible - $5,000 each claim

3. Certified Copy of the policy must be provided to the City prior to the commencement of work.

4. Waiver of Occupancy Clause or Warranty - to provide that the Builder's Risk coverage will continue to apply until final acceptance by the City of the building or addition, regardless of any prior occupancy.

5. Flood Insurance must be provided when buildings or structures are located within an identified special flood hazard area. The Flood Insurance must protect the interest of the City and be in the amount of the total insurable value of such building or structure, or the maximum amount of flood insurance coverage available under the National Flood program, whichever is the lesser.

6. For additions or repairs of existing buildings or structures, the "Builder's Risk Completed Form" covering the Contractor's interest in improvements, repairs, additions, or alterations to completed buildings, shall be included.

7. Bridges, Viaducts or similar structures - the "Bridge Builders Risk Form" - "All risk" contract with the flat-premium endorsement should be utilized.

B. Installation Floater - when the contract is for the installation of machinery and/or equipment into an existing structure, but does not contemplate construction of or addition to the structure itself.

1. "All Risk" coverage to include transit and installation.
2. Amount of Insurance - 100% of installed replacement cost value

3. Maximum Deductible - $5,000 each claim.

4. Cessation of Insurance - Coverage is to continue in force until final acceptance by the City.

5. Certified Copy of the policy must be provided to the City prior to commencement of work.

6. Flood Insurance - must be provided when machinery or equipment are located within an identified special flood hazard area. The Flood Insurance must protect the interest of the city and be in the amount of the total insurable value of such machinery or equipment.

IV. CERTIFICATE OF INSURANCE CLAUSES

A. All policies and Certificates of Insurance of the Contractor shall contain the following clauses and agreements:

1. Insurers shall have no right of recovery or subrogation against the City of BUNNELL (as defined in "C" above), it being the intention of the parties that the insurance policies so effected shall protect both parties and be primary coverage for any and all losses covered by the above described insurance.

2. The clause "other insurance" in a policy in which the City of BUNNELL is named as an Insured shall not apply to the City of BUNNELL.

3. The insurance companies issuing the policies shall have no recourse against the City of BUNNELL (as defined in "C" above) for payment of any premiums or for assessments under any policy for insurance.

4. Any and all deductibles in the above described insurance policies shall be assumed by and be for the account of, and at the sole risk of the Contractor.

5. Any loss payable under the Property Insurance, if any, is to be adjusted with and made payable to the City of BUNNELL, as their interest may appear.
V. CITY INDEMNIFICATION

A. The following Indemnification Agreement shall be a provision of this contract and also shall be endorsed onto or attached to the insurance policy and Certificate of Insurance:

B. "The Contractor agrees to protect, defend and pay on behalf of, and hold the City of BUNNELL and its elected officials, officers, employees, volunteers, representatives, agents and affiliates free and harmless from and against all claims for personal or bodily injury or death, or property damage or destruction of tangible property including loss of use thereof, losses, penalties, damages, settlements, costs, charges, professional fees or other expenses of every kind and character in connection with and arising directly or indirectly out of this agreement and/or performance thereof, unless such claims are a result of the City of BUNNELL’s sole negligence. This indemnification clause includes claims made by the employees and subcontractors of the Contractor against the Owner and the Contractor hereby waives its entitlement, if any, to immunity under Section 440.11, Florida Statutes. Nothing contained herein shall be construed as a waiver of any immunity from or a limitation of liability the City may have under the doctrine of sovereign immunity or Chapter 768.28, Fla. Stat. This indemnification provision shall survive the completion of the project and shall be in full force and effect beyond the completion of the project or the termination of this contract.

VI. ENGINEER INDEMNIFICATION

A. The Contractor agrees to protect, defend and pay on behalf of, and hold the ENGINEER and its officers, employees, and affiliates free and harmless from and against all claims for personal or bodily injury or death, or property damage or destruction of tangible property including loss of use thereof, losses, penalties, damages, settlements, costs, charges, professional fees or other expenses of every kind and character in connection with and arising directly or indirectly out of this agreement and/or performance thereof, unless such claims are a result of the ENGINEER’S sole negligence. This indemnification clause includes claims made by the employees and subcontractors of the Contractor against the ENGINEER. This indemnification provision shall survive the completion of the project and shall be in full force and effect beyond the completion of the project or the termination of this contract.

B. The Contractor shall be responsible for such requirements through the date of final acceptance of the project by the City. With regard to the Contractor’s indemnification obligation for products and completed operations, the Contractor shall be responsible for a minimum period of at least one year subsequent to the City’s acceptance of the product or completed operation.
VII.

A. The following Insurance Requirement Checklist shall be adhered to in its entirety. The coverage limits and language as indicated on the following checklist shall be reflected on the Contractor’s Certificate of Insurance.

VIII.

A. A Waiver of Subrogation shall be provided to the City.

IX.

A. The Contractor’s insurance carrier shall submit a letter showing authorization that the company is registered by the State of Florida Department of Insurance.
### CITY OF BUNNELL, FLORIDA

**INSURANCE REQUIREMENTS CHECKLIST**

**FOR**

**WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS**

**CITY OF BUNNELL, FLAGLER COUNTY, FLORIDA**

Items marked "X" must be provided

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| X | Automobile Liability | Owned, Hired & Non-Owned | $ 1,000,000 | Combined Single Limit per Occurrence |

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<th>Builder's Risk/Installation Floater (*To be completed by Bidder)</th>
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|   | City must be a named insured. Copy of policy will be required. |

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| X | The Certificate of Insurance must show "The City of BUNNELL, elected officials and employees" as an additional insured. |

| X | Certificates must give to the City of BUNNELL 30 days' prior written notice of cancellation, non-renewal, or adverse change. |

| X | Certificates must identify bid number and bid title. |

| X | A Waiver of Subrogation shall be provided to the City. |

**Statement of Bidder:**

We understand the requirements requested and agree to comply fully.

Bidder - Authorized Signature: __________________________________________________________

A complete copy of this form with original signature must accompany bid.

END OF SECTION
This is to certify __________________________ Company has issued to
_____________________________ of the City of ______________, State of
_____________________________, the following policy or policies; Public Liability Policy No.
_____________________________, 20___, limits ________________, Property Damage Policy No.
__________ effective on ___________, 20___, and expiring on ___________, 20___, limits
______________.

If at any time this coverage is to be canceled, the undersigned will notify the insured and
__________________, in writing thirty (30) days prior to cancellation of the policy.

(This certificate must be made by a duly authorized official of the Insurance Company carrying the
risk, or a separate certificate of similar context executed on Insurance Company's Standard Form
may be attached hereto.)

END OF SECTION
STATE OF ________________

COUNTY OF ________________

being duly sworn according to law, deposes and says (it, he, they) have accepted the Workmen's Compensation laws of the State of Florida, with its supplements and amendments and has insured (its, his, their) liability thereunder in accordance with the terms of said Laws with the ________________ Company, under the terms of Policy No. ________________ for a period from __________, 20__ to __________, 20__. 

WITNESS: __________________________

CONTRACTOR

By __________________________

Title __________________________

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

My Commission Expires:

______________________________
Notary Public

END OF SECTION
This is to certify that

Company has issued to

of the City of Bunnell, State of Florida,

the following policy or policies: Workmen's Compensation and Employer's Liability Policy No. effective on , 20 .

re Policy No. effective on , 20 and expiring on .

If at any time this coverage is to be canceled, the undersigned will notify the insured and the in writing thirty (30) days prior to cancellation of policy.

(This certificate must be made by a duly authorized official of the Insurance Company carrying the risk, or a separate certificate of similar context executed on Insurance Company's Standard Form may be attached hereto.)

END OF SECTION
SECTION 00670

CONTRACTOR'S STATEMENT UNDER OATH, TO OWNER

To: __________________________

The undersigned as Contractor, has heretofore, on the ___ day of ____________, A.D., 20 __, has been awarded a Contract by you, as Owner, to furnish all the materials and labor in the construction of a project entitled: __________________________________________________________

for the Contract Price of ___________________________ in accordance with plans and specifications therefore as prepared by QLA, A Mead & Hunt Company.

Said project has been completed and the Contract and Plans therefore fully complied with and all of the Contract Price has been paid by you, except the Final Payment thereon, which is now due, but is being withheld until a sworn statement is furnished, as required by ___________________________ showing whether there are any unpaid and outstanding bills in connection with said Project.

The undersigned hereby certified, under oath, that all lienors contracting directly with or directly employed by the undersigned, on said Contract, have been paid in full, and further certifies, under oath, that there are no outstanding or unpaid bills for labor performed, or materials furnished in connection with said work or improvements.
Dated at ___________ this ___ day of ________________, A.D., 20__.

__________________________________________________________________
Contractor
By__________________________________________

Title__________________________________________

State of:
County of:

Sworn to and subscribed before me this _____ day of ________________ A.D., 20__.

My Commission Expires:______________________________________

Notary Public,
State of ____________________________

END OF SECTION
RECEIPT AND RELEASE

KNOW ALL MEN BY THESE PRESENTS:
That the undersigned ______________________ of ______________________ was heretofore, on _________________, 20 ___, award a Contract by ______________________ for the Contract Price of ______________________ to furnish all the materials and labor in the construction of a project entitled: ______________________ in accordance with the plans and specifications therefore, as prepared by QLH, A Mead & Hunt Company and the undersigned has completed said work and fully complied with said Contract and has heretofore received the sum of $________________ as payment thereon.

That the undersigned has this date received from ______________________ the sum of $________________, representing the full balance due ______________________, as Contractor, under the terms of said Contract, and certified that said Contract has been fully performed in accordance with the terms thereof, and that ______________________ has paid in full all persons furnishing labor and/or materials in connection therewith, including all subcontractors and suppliers, and that there are no unpaid bills for labor performed or materials furnished in connection with said work or improvements.

That the undersigned, for value received, does hereby forever release and discharge the said ______________________ as described in the said Contract, from any and all liens, claims or demands whatsoever that ______________________ has or may have for work performed or materials furnished thereon by any subcontractor or supplier and that ______________________ will hold harmless the ______________________ from any and all loss and liability arising or to arise by reason of any unpaid bills for labor performed or materials furnished on said project in connection with said work or improvements. This document is only binding upon receipt of a check for the above balance due.

IN WITNESS WHEREOF, the undersigned has hereto set _______ hand and seal this ______ day of __________, A.D., 20 ___.

Witnessed by:

____________________________________________________

CONTRACTOR

By__________________________________________________

Title __________________________

00680-1
State of:
County of:

Before me, the undersigned authority, personally appeared ________________, to me well known and known to me to be the person described in and who executed the foregoing instrument, and he acknowledged before me that he executed the same.
IN WITNESS WHEREOF, I have hereunto set my hand and official seal this ___ day of ________________, A.D., 20 ___.

My Commission Expires:

______________________________________
Notary Public, State of

END OF SECTION
Before me the undersigned authority in said County and State, appeared ____________________ who, being first duly sworn, deposes and says that he is ____________________ of _____________________________, a company and/or corporation authorized to do business under the laws of Florida, which is the Contractor on the Contract described as: **WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS, BID NO. 05-0-2018**, dated the ___ day of ______________, 20___, that the said deponent is duly authorized to make this affidavit by resolution of the Board of Directors of said company and/or corporation; that deponent knows of his own knowledge that said Contract has been complied with in every particular by said Contractor and that all parts of the work have been approved by the Owner’s Engineers; that there are no bills remaining unpaid for labor, material, or otherwise, in connection with said Contract and work, and that there are no suits pending against the undersigned as Contractor or anyone in connection with the work done and materials furnished or otherwise under said Contract. Deponent further says that the final estimate which has been submitted to the owner simultaneously with the making of the affidavit constitutes all claims and demands against the Owner on account of said Contract or otherwise, and the acceptance of the sum specified in said final estimate will operate as full and final release and discharge of the Owner from any further claims, demands or compensation by Contractor under the above Contract. Deponent further agrees that all guarantees under this Contract shall be in full force from the date of this release as spelled out in the Contract Documents.

Sworn to and subscribed to before me this _______day of ___________________. 20____.

_______________________________________
Notary Public

My Commission Expires ___________

We, the ____________________having heretofore executed a Performance Bond for the above-mentioned Contractor covered Project and Section as described above in the sum of ___________________________ dollars ($_________________________), hereby agree that the Owner may make full payment of the final estimate, including the retained percentage, to said Contractor.
It is fully understood that the granting of the right to the Owner to make payment of the final estimate to said Contractor and/or his assigns, shall in no way release the surety company of its obligations under its bond, as set forth in the Specifications, Contract and Bond pertaining to the above Project.

IN WITNESS WHEREOF, the ______________________________ has caused this instrument to be executed on its behalf by its ___________________________ and/or its duly authorized attorney in fact, and its corporate seal to be hereunto affixed, all of this _______ day of _______________, A.D., 20_____

________________________
Surety Company

________________________
Attorney in Fact

(Power of Attorney must be attached if executed by Attorney in Fact)

STATE OF FLORIDA

COUNTY OF ____________________

Before me the undersigned authority, personally appeared to me well known as the person described in and who executed the foregoing instrument in the name of ___________________________ and/or authority to execute the same on behalf of said ______________________________, a corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal at __________________ this _______day of _______________________,

________________________
Notary Public

END OF SECTION
Section 00690

CONSENT OF SURETY
For Final Payment

Project Name WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS
BID NO. 05-0-2018

Location_____________________________________

Project No.___________ Contract No.___________

Type of Contract

Amount of Contract

In accordance with the provisions of the above-named contract between the Owner and the Contractor, the following named surety: _____________________________________________ on the Payment Bond of the following named Contractor: ____________________________ hereby approves of final payment to the Contractor, and further agrees that said final payment to the Contractor shall not relieve the Surety Company named herein of any of its obligations to the following named Owner: as set forth in said Surety company's bond: ____________________________

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand and seal this day of ___________ 20 ___.

__________________________________________
(Name of Surety Company)

__________________________________________
(Signature of Authorized Representative)

(Affix Corporate Seal)

END OF SECTION
SECTION 00695
RELEASE OF ALL CLAIMS

STATE OF __________________________
COUNTY OF _______________________
CITY OF _________________________

KNOW ALL MEN BY THESE PRESENTS, that the sum of ________________________
Dollars ($_________________) set out in the accompanying Estimate Statement No. ________
Final, the receipt of which is hereby acknowledged, is accepted as full and complete payment
for all work done, materials furnished, and damages or claims arising under the City of Bunnell
Contract entitled:
____________________________________________________________________________
____________________________________________________________________________

__________________________________________
Contractor

______________________________
Title:

By: ___________________________________
Witness

__________________________________________
Witness

______________________________
Witness (SEAL)

Taken, sworn, and subscribed to before me this ________ day of __________, 20________.

_______________________________________
Notary Public

My commission Expires: _____________________

_______________________________________ (SEAL)

END OF SECTION
STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

Prepared by
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by

CONSTRUCTION SPECIFICATIONS INSTITUTE

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.
These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).
STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. 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 which is evidence of the agreement between Owner and Contractor covering the Work.

3. Application for Payment—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. Asbestos—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. Bid—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. Bidder—The individual or entity who submits a Bid directly to Owner.


8. Bidding Requirements—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. Change Order—A document recommended by Engineer 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, issued on or after the Effective Date of the Agreement.
10. Claim—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. Contract—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. Contract Documents—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. Contract Price—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. Contract Times—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer’s written recommendation of final payment.

15. Contractor—The individual or entity with whom Owner has entered into the Agreement.


17. Drawings—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. Effective Date of the Agreement—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. Engineer—The individual or entity named as such in the Agreement.

20. Field Order—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. General Requirements—Sections of Division 1 of the Specifications.
22. **Hazardous Environmental Condition**—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. **Hazardous Waste**—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. **Laws and Regulations; Laws or Regulations**—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. **Liens**—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. **Milestone**—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. **Notice of Award**—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. **Notice to Proceed**—A written notice given 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 under the Contract Documents.

29. **Owner**—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. **PCBs**—Polychlorinated biphenyls.

31. **Petroleum**—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. **Progress Schedule**—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.

33. **Project**—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. Project Manual—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. Radioactive Material—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. Resident Project Representative—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. Samples—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. Schedule of Submittals—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. 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.

40. Shop Drawings—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. 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 for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. Specifications—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. 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 at the Site.

44. Substantial Completion—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and
“substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.

45. Successful Bidder—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. Supplementary Conditions—That part of the Contract Documents which amends or supplements these General Conditions.

47. Supplier—A manufacturer, fabricator, supplier, distributor, material man, 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 Subcontractor.

48. Underground Facilities—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

49. Unit Price Work—Work to be paid for on the basis of unit prices.

50. Work—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. Work Change Directive—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. Intent of Certain Terms or Adjectives:
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. Day:

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective:

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:

   a. Does not conform to the Contract Documents; or

   b. Does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

   c. Has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. Furnish, Install, Perform, And Provide:

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. Evidence of Insurance: Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 Copies of Documents

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement 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 Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.
2.05 Before Starting Construction

A. Preliminary Schedules: Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), 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 Documents;

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.

2.06 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 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, 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 instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 Initial Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for
sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor’s full responsibility therefore.

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 component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 Reference Standards

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement 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, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or
authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies:

1. Contractor’s Review of Contract Documents Before Starting Work: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. Contractor’s Review of Contract Documents During Performance of Work: If, 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) any standard, specification, manual, or code, or (c) 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 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

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 Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

   a. The provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); 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  *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer’s approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer’s written interpretation or clarification.

3.05  *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. Have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

2. 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.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06  *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user’s sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data’s creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the...
receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data’s creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner’s furnishing the Site or a part thereof, Contractor may make a Claim therefore as provided in Paragraph 10.05.

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 the Work is to be performed 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.

4.02 Subsurface and Physical Conditions

A. Reports and Drawings: The Supplementary Conditions identify:

1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such “technical data” is identified in the Supplementary Conditions. Except for such reliance on such “technical data,” Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers,
directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. The completeness of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. Any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions, or information.

4.03 **Differing Subsurface or Physical Conditions**

A. **Notice:** If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. Is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. Is of such a nature as to require a change in the Contract Documents; or

3. Differs materially from that shown or indicated in the Contract Documents; or

4. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

5. 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 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. **Engineer’s Review:** After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner’s obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer’s findings and conclusions.

C. **Possible Price and Times Adjustments:**
1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition 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 meet any one or more of the categories described in Paragraph 4.03.A; and
   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 Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
   a. Contractor knew of the existence of such conditions at the time Contractor made a final 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
   b. The existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor’s making such final commitment; or
   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefore as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 Underground Facilities

A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
   a. Reviewing and checking all such information and data;
   b. Locating all Underground Facilities shown or indicated in the Contract Documents;
   c. Coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
   d. The safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated:

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, 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 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefore as provided in Paragraph 10.05.
4.05 **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.

4.06 **Hazardous Environmental Condition at Site**

A. Reports and Drawings: The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such “technical data” is identified in the Supplementary Conditions. Except for such reliance on such “technical data,” Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. The completeness of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. Other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. Any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition,
Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) 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 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefore as provided in Paragraph 10.05.

F. 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. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefore as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner’s own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual’s or entity’s own negligence.

H. 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 a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual’s or entity’s own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor’s obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.
5.02 **Licensed Sureties and Insurers**

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverage so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 **Certificates of Insurance**

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor’s obligation to maintain such insurance.

E. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

F. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor’s liability under the indemnities granted to Owner in the Contract Documents.

5.04 **Contractor’s Insurance**

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor’s performance of the Work and Contractor’s other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. Claims under workers’ compensation, disability benefits, and other similar employee benefit acts;
2. Claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor’s employees;

3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor’s employees;

4. Claims for damages insured by reasonably available personal injury liability coverage which are sustained:
   a. By any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
   b. By any other person for any other reason;

5. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting there from; and

6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. With respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. Include at least the specific coverage and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. Include contractual liability insurance covering Contractor’s indemnity obligations under Paragraphs 6.11 and 6.20;

4. Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued.
(and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. Remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. Include completed operations coverage:
   a. Such insurance shall remain in effect for two years after final payment.
   b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 Owner’s Liability Insurance

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner’s option, may purchase and maintain at Owner’s expense Owner’s own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 Property Insurance

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. Include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. Be written on a Builder’s Risk “all-risk” policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
3. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. Cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. Allow for partial utilization of the Work by Owner;

6. Include testing and startup; and

7. Be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser’s own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall advise Contractor in writing whether or not such other insurance has been procured by Owner.
5.07 Waiver of Rights

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees there under. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. Loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner’s property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. Loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.
5.08 Receipt and Application of Insurance Proceeds

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner’s exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 Acceptance of Bonds and Insurance; Option to Replace

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds or insurance required of such party by the Contract Documents, 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. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party’s interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 Partial Utilization, Acknowledgment of Property Insurer

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent
by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 Supervision and Superintendence

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

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

6.02 Labor; Working Hours

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 Services, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish
satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

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

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 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 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and “Or-Equals”*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description 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 or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. “Or-Equal” Items: If in Engineer’s sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an “or-equal” item, in which case review and approval of the proposed item may, in Engineer’s sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

   a. In the exercise of reasonable judgment Engineer determines that:

      1) It is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
2) It will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

3) It has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:
   1) There will be no increase in cost to the Owner or increase in Contract Times; and
   2) It will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items:
   a. If in Engineer’s sole discretion an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
   b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
   c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
   d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
      1) Shall certify that the proposed substitute item will:
         a) Perform adequately the functions and achieve the results called for by the general design,
         b) Be similar in substance to that specified, and
         c) Be suited to the same use as that specified;
      2) Will state:
a) The extent, if any, to which the use of the proposed substitute item will prejudice Contractor’s achievement of Substantial Completion on time,

b) 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

c) Whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) Will identify:

a) All variations of the proposed substitute item from that specified, and

b) Available engineering, sales, maintenance, repair, and replacement services; and

4) Shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer’s sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer’s Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No “or equal” or substitute will be ordered, installed or utilized until Engineer’s review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an “or equal.” Engineer will advise Contractor in writing of any negative determination.
D. Special Guarantee: Owner may require Contractor to furnish at Contractor’s expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer’s Cost Reimbursement: Engineer will record Engineer’s costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. 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.

F. Contractor’s Expense: Contractor shall provide all data in support of any proposed substitute or “or-equal” at Contractor’s expense.

6.06 Concerning Subcontractors, Suppliers, and Others

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner’s acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor’s own acts and omissions. Nothing in the Contract Documents:
1. Shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

2. Shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 Patent Fees and Royalties

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment
of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 Permits

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 Laws and Regulations

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor’s compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear 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. However, it shall not be Contractor’s responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor’s obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefore as provided in Paragraph 10.05.

6.10 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.

6.11 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas:

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. 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 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 by or based upon Contractor’s performance of the Work.
B. Removal of Debris During Performance of the Work: During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. Cleaning: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site 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 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 property to stresses or pressures that will endanger it.

6.12 Record Documents

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

6.13 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. 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, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner’s safety programs, if any. The Supplementary Conditions identify any Owner’s safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor’s safety program with which Owner’s and Engineer’s employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor’s duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 Safety Representative

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

6.15 Hazard Communication Programs

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
6.16 Emergencies

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

6.17 Shop Drawings and Samples

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. Shop Drawings:
   a. Submit number of copies specified in the General Requirements.
   b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. Samples:
   a. Submit number of Samples specified in the Specifications.
   b. 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 6.17.D.

B. 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. Submittal Procedures:

1. Before submitting each Shop Drawing or Sample, Contractor shall have:
   a. Reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
   b. Determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
   c. Determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
   d. Determined and verified all information relative to Contractor’s responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor’s obligations under the Contract Documents with respect to Contractor’s review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer’s Review:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer’s review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer’s review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.
thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer’s review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.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’s review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 Continuing the Work

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 Contractor’s General Warranty and Guarantee

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor’s warranty and guarantee.

B. Contractor’s warranty and guarantee hereunder excludes defects or damage caused by:

1. Abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. Normal wear and tear under normal usage.

C. Contractor’s obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor’s obligation to perform the Work in accordance with the Contract Documents:
1. Observations by Engineer;
2. Recommendation by Engineer or payment by Owner of any progress or final payment;
3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. Use or occupancy of the Work or any part thereof by Owner;
5. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. Any inspection, test, or approval by others; or
7. Any correction of defective Work by Owner.

6.20 Indemnification

A. 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 performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting there from 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 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers’ compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer’s officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. The preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. Giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 **Delegation of Professional Design Services**

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor’s responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional’s written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer’s review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer’s review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.
ARTICLE 7 – OTHER WORK AT THE SITE

7.01 Related Work at Site

A. Owner may perform other work related to the Project at the Site with Owner’s employees or through other direct contracts therefore, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. Written notice thereof will be given to Contractor prior to starting any such other work; and

2. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefore as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner’s employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. 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. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor’s Work depends upon work performed by others under this Article 7, 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.

7.02 Coordination

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. The individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. The specific matters to be covered by such authority and responsibility will be itemized; and

3. The extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 **Legal Relationships**

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor’s wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor’s wrongful action or inactions.

**ARTICLE 8 – OWNER’S RESPONSIBILITIES**

8.01 **Communications to Contractor**

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

8.02 **Replacement of Engineer**

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 **Furnish Data**

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

8.04 **Pay When Due**

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.
8.05 **Lands and Easements; Reports and Tests**

A. Owner’s duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 **Insurance**

A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 **Change Orders**

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 **Inspections, Tests, and Approvals**

A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 **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.

8.10 **Undisclosed Hazardous Environmental Condition**

A. Owner’s responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 **Evidence of Financial Arrangements**

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner’s obligations under the Contract Documents.
8.12 Compliance with Safety Program

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 pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER’S STATUS DURING CONSTRUCTION

9.01 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 Documents.

9.02 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 9.09. 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.

9.03 Project Representative

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer’s consultant, agent or employee, the
responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 Authorized Variations in Work

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which 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. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefore as provided in Paragraph 10.05.

9.05 Rejecting Defective Work

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 Shop Drawings, Change Orders and Payments

A. In connection with Engineer’s authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer’s authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer’s authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer’s authority as to Applications for Payment, see Article 14.

9.07 Determinations for Unit Price Work

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer’s preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer’s written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual
conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer’s decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer’s written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer’s Authority and Responsibilities*

A. Neither Engineer’s authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor’s failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
D. Engineer’s review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.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 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 **Compliance with Safety Program**

A. While at the Site, Engineer’s employees and representatives shall comply with the specific applicable requirements of Contractor’s safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

**ARTICLE 10 – CHANGES IN THE WORK; CLAIMS**

10.01 **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 by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefore as provided in Paragraph 10.05.

10.02 **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 as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 **Execution of Change Orders**

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. Changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner’s correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. Changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. Changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 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.

10.05 Claims

A. Engineer’s Decision Required: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. Notice: Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant’s written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit
any response to Engineer and the claimant within 30 days after receipt of the claimant’s last submittal (unless Engineer allows additional time).

C. Engineer’s Action: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. Deny the Claim in whole or in part;
2. Approve the Claim; or
3. Notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer’s sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer’s written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 Cost of the Work

A. Costs Included: The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of
their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers’ compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers’ field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor’s Cost of the Work and fee shall be determined in the same manner as Contractor’s Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

   a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor’s employees incurred in discharge of duties connected with the Work.

   b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

   c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of
transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor’s fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone 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 Contractor are required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor’s officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, 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 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor’s fee.
2. Expenses of Contractor’s principal and branch offices other than Contractor’s office at the Site.

3. Any part of Contractor’s capital expenses, including interest on Contractor’s capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. Contractor’s Fee: When all the Work is performed on the basis of cost-plus, Contractor’s fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor’s fee shall be determined as set forth in Paragraph 12.01.C.

D. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 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:

1. Contractor agrees that:

   a. 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

   b. Contractor’s costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
C. Contingency Allowance:

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 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. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

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. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. The quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. There is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the
Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for 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, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor’s fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. Contractor’s Fee: The Contractor’s fee for overhead and profit shall be determined as follows:

1. A mutually acceptable fixed fee; or

2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. For costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor’s fee shall be 15 percent;

   b. For costs incurred under Paragraph 11.01.A.3, the Contractor’s fee shall be five percent;

   c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

   d. No fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor’s fee by an amount equal to five percent of such net decrease; and

f. When both additions and credits are involved in any one change, the adjustment in Contractor’s fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 Change of Contract Times

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 Delays

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefore as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor’s entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor’s ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor’s ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor’s sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

**ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

13.01 Notice of Defects

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

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

13.03 Tests and Inspections

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. For inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. That costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. As otherwise specifically provided in the Contract Documents.
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 and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner’s and Engineer’s acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor’s purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. 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.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor’s expense unless Contractor has given Engineer timely notice of Contractor’s intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 Uncovering Work

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer’s observation and replaced at Contractor’s expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, 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, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such 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 Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefore as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and
reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefore as provided in Paragraph 10.05.

13.05 **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, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 **Correction or Removal of Defective Work**

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner’s special warranty and guarantee, if any, on said Work.

13.07 **Correction Period**

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor’s use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner’s written instructions:

1. Repair such defective land or areas; or

2. Correct such defective Work; or

3. If the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. Satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting there from.

B. If Contractor does not promptly comply with the terms of Owner’s written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting there from) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor’s obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer’s recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) 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 pursuant to this sentence. If any such acceptance occurs prior to Engineer’s recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefore as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.
13.09 **Owner May Correct Defective Work**

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, 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, take possession of Contractor’s tools, appliances, construction equipment and machinery at the Site, 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 (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) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefore as provided in Paragraph 10.05. 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 13.09.

**ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION**

14.01 **Schedule of Values**

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.
14.02 Progress Payments

A. Applications for Payments:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner’s interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor’s legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer’s reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer’s recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer’s observations of the executed Work as an experienced and qualified design professional, and on Engineer’s review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer’s knowledge, information and belief:

   a. The Work has progressed to the point indicated;

   b. The quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests
called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, 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 Documents; or

b. There may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer’s review of Contractor’s Work for the purposes of recommending payments nor Engineer’s recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. To supervise, direct, or control the Work, or

b. For the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. For Contractor’s failure to comply with Laws and Regulations applicable to Contractor’s performance of the Work, or

d. To make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. To determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer’s opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation.
previously made, to such extent as may be necessary in Engineer’s opinion to protect Owner from loss because:

a. The Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. The Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

1. Ten days after presentation of the Application for Payment to Owner with Engineer’s recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment:

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

   a. claims have been made against Owner on account of Contractor’s performance or furnishing of the Work;

   b. 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;

   c. There are other items entitling Owner to a set-off against the amount recommended; or

   d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action 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, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner’s refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 Contractor’s Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 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 (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

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 therefore.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefore. If, after consideration of Owner’s objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform
Engineer in writing prior to Engineer’s issuing the definitive certificate of Substantial Completion, Engineer’s aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. 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 tentative list.

14.05 Partial Utilization

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. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and 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 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and 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 therefore. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 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 5.10 regarding property insurance.

14.06 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 is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07  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, marked up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2.  The final Application for Payment shall be accompanied (except as previously delivered) by:

   a.  All documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b.  Consent of the surety, if any, to final payment;

   c.  A list of all Claims against Owner that Contractor believes are unsettled; and

   d.  Complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3.  In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner’s property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B.  Engineer’s Review of Application and Acceptance:

1.  If, on the basis of Engineer’s observation of the Work during construction and final inspection, and Engineer’s review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor’s other obligations under
the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer’s recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. 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. Payment Becomes Due:

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer’s recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 Final Completion Delayed

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor’s final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. A waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor’s continuing obligations under the Contract Documents; and

2. A waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.
ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 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 notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefore as provided in Paragraph 10.05.

15.02 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will 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 established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor’s disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor’s repeated disregard of the authority of Engineer; or


B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. Exclude Contractor from the Site, and take possession of the Work and of all Contractor’s tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. 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

3. Complete the Work as Owner may deem expedient.
C. If Owner proceeds as provided in Paragraph 15.02.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 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) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed 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.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor’s services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. 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. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 Owner May Terminate For Convenience

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. Completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. Expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. 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) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
4. Reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 Contractor May Stop Work or Terminate

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 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 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer’s action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
1. Elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. Agrees with the other party to submit the Claim to another dispute resolution process; or

3. Gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice
   A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

   1. Delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

   2. Delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 Computation of Times
   A. When any period of time is referred to in the Contract Documents 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.

17.03 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 Documents. 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.

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

17.05 Controlling Law

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

17.06 Headings

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.
These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (NSPE/ACEC Document No. C-700, 2007 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

SC-1.01A.44 Delete the definition of Substantial Completion and insert the following in its place:

44. Substantial Completion - The Work (or a specified part thereof) has progressed to the point where, in the opinion of the ENGINEER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents and that all conditions precedent to Substantial Completion have been met in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Add the following definitions at the end of Article 1 - definitions of the Standard General Conditions of the Constitutions Contracts:

SC-1.01A.52 Compensable Delay - Any delay beyond the control and without the fault or negligence of the CONTRACTOR resulting from OWNER-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by the OWNER.

SC-1.01A.53 Correction Period - The time during which the CONTRACTOR must correct defective Work or remove defective Work from the site and replace it with non-defective Work, all at no cost to the OWNER, pursuant to paragraph 13.07 of the General Conditions, as supplemented.

SC-1.01A.54 Final Completion - The date upon which final payment is due to be paid by OWNER to CONTRACTOR.

SC-1.01A.55 Excusable Delay - Any delay beyond the control and without the fault or negligence of the CONTRACTOR, the OWNER, or any other contractor caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, acts of interveners, acts of the government, fires, floods, epidemics, quarantine restrictions, freight embargoes, and hurricanes, tornadoes, or new sink holes. Labor disputes and above average rainfall shall give rise only to Inexcusable Delays.

SC-1.01A.56 Float or Slack Time - The time available in the progress schedule during which an unexpected activity can be completed without delaying the Substantial Completion of the Work.
SC-1.01A.57 Initiation of Operation - The date when the OWNER actually begins to use the entire Work for the purposes for which it was planned, designed and built, thus commences the Correction Period. The OWNER shall not be deemed to have accepted the Work until Initiation of Operation.

SC-1.01A.58 Modification - (a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, or (c) a Field Order. A modification may be issued after the Effective Date of the Agreement.

SC-1.01A.59 Inexcusable Delay - Any delay caused either (i) by events or circumstances within the control of the CONTRACTOR, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the CONTRACTOR, (ii) by weather conditions (other than hurricanes and tornadoes) or (iii) labor disputes.

SC-1.01A.60 Non-prejudicial Delay - Any delay impacting a portion of the Work within the available total Float or Slack Time, as that term is used in Section 01310: Progress Schedules, and not necessarily preventing completion of the Work within the Contract Time.

SC-1.01A.61 Prejudicial Delay - Any Excusable or Compensable Delay impacting the Work and exceeding the total Float Time available in the progress schedule, thus preventing completion of the Work within the Contract Time unless the Work is accelerated.

SC-1.01A.62 Preoperational Testing (Check-Out-Testing) - All field inspections, installation checks, water tests, performance tests, and necessary corrections required of the CONTRACTOR as a condition or conditions to achieving Substantial Completion to demonstrate to the OWNER and ENGINEER that individual components of the Work have been properly constructed and operate in accordance with the Contract Documents for their intended purposes.

SC-1.01A.63 Start-Up Testing (Demonstration Testing) - A predefined trial period required as a condition to Initiation of Operation during which CONTRACTOR is to operate the entire Work (or any part thereof agreed to by the OWNER) under actual and simulated operating conditions for the purpose (i) of making such minor adjustments and changes to the Work as may be necessary for the Work to comply with the Contact Documents and (ii) of complying with the final test requirements in the Contract Documents.

SC-2.02 Modify paragraph 2.02A of the General Conditions:

A. After the Agreement has been executed, the Engineer will furnish the CONTRACTOR five (5) complete sets of Contract Documents.

SC-2.03 Delete paragraph 2.03 of the General Conditions in its entirety and insert the following in its place.
A. A “Notice to Proceed” may be given to the Contractor at any time after the Effective date of the Agreement. The Contract Time will commence to run on the day indicated in the Notice to Proceed. In no event will the Contract Time commence to run later than the sixtieth (60th) day after the Effective Date of the Agreement.

SC-2.05 Add the following immediately after subparagraph 2.05A.3 of the Standard General Conditions:

4. The submittals required in subparagraphs 1, 2 and 3 shall be as specified in Section 01310, 01340 and 01370, respectively.

SC-3.01 Add the following immediately after paragraph 3.01C of the Standard General Conditions:

D. When measurements are affected by conditions already established or where items are to be fitted into construction conditions, it shall be the CONTRACTOR's responsibility to verify all such dimensions at the site and the actual job dimensions shall take precedence over scale and figure dimensions on the Drawings.

E. The CONTRACTOR shall carefully study and compare all Drawings, Specifications and other instructions; shall test all figures on the Drawings before laying out the Work; shall notify the ENGINEER of all errors, inconsistencies, or omissions which he may discover; and obtain specific instructions before proceeding with the Work. The CONTRACTOR shall not take advantage of any apparent error or omissions which may be found in the Drawings or Specifications, and the ENGINEER shall be entitled to make such corrections therein and interpretations thereof as may be deemed necessary for the fulfillment of their intent. The CONTRACTOR shall be responsible for all errors in construction which could have been avoided by such examination and notification and shall correct, at its own expense, all Work improperly constructed through failure to notify the ENGINEER and request specific instructions.

SC-4.03 Change the first sentence "Contractor shall promptly". Add "The CONTRACTOR shall, within three (3) days, after becoming aware thereof..."

SC-4.06 Add a new paragraph immediately after paragraph 4.06 I. of the Standard General Conditions which is to read as following:

J. No claim of the CONTRACTOR under paragraphs 4.02, 4.04 and 4.06 shall be allowed unless, (1) the CONTRACTOR has given the notice required in sub-paragraph 4.06D, and (2) within thirty (30) days (but before final payment) after the CONTRACTOR has given
written notice, the CONTRACTOR submits to the OWNER a detailed claim setting forth the CONTRACTOR’s right to an increase in the Contract Price or extension of the Contract Time as provided in Articles 11 and 12 of the Standard General Conditions.

Add a new paragraph immediately after paragraph 5.01 B. Of the Standard General Conditions which is to read as follows:

1. The following requirements shall be met by all surety companies furnishing bid, performance, payment or other type of Bonds:
   a. The Surety shall be rated as "A" or better as to General Policyholders Rating and Class X or better as to Financial Category by Best's Key Rating Guide, published by Alfred M. Best Company, Inc., 75 Fulton Street, New York, New York, 10038.

   All Surety Companies are subject to approval and may be rejected by the OWNER without cause.

2. Limitations: Bonding limits or bonding capacity refers to the limit or amount of Bond acceptable on any one (1) risk.
   a. The bonding limit of the Surety shall not exceed ten percent (10%) of the policyholder surplus (capital and surplus) as listed by the aforementioned Best's Key Rating Guide, on any one risk (penalty or amount of any one bond).

3. Requirements:
   a. Policyholders surplus is required to be five (5) times the amount of any one bond.
   b. The Agent countersigning the bond shall be resident in the County where the Project is located and/or other counties that are acceptable to the OWNER.

Add a new paragraph immediately after paragraph 5.01C of the Standard General Conditions which read as follows:

D. Contractor shall pay Owner all losses, damages, expenses, costs, and attorney’s fees, including but not limited to any appellate proceedings, which the Owner sustains because of default by the Contractor under the contract.
In the case of a conflict between paragraph 5.04A of Section 00700 and one or more of the provisions of Section 00800A, the provisions of 00800A shall prevail.

Delete paragraph 5.05A of the Standard General Conditions in its entirety.

Delete paragraph 5.06 of the Standard General Conditions in its entirety and insert the following in its place:

A. CONTRACTOR shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in these Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. Include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. Be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, false work and Work in transit and shall insure against at least the following perils; fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, hurricanes, flood, tornadoes, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions.

3. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. Cover materials and equipment in transit for incorporation in the Work or stored at the site or at another location provided that such materials and equipment are to be included in an Application for Payment.

5. Allow for partial utilization of the Work by Owner;

6. Include testing and startup; and

7. Be maintained in effect until the later of the two; Initiation of Operation or Final Completion, unless otherwise agreed to in
writing by OWNER, CONTRACTOR and ENGINEER with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.

The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph 5.06 shall comply with the requirements of Section 00800A.

**SC-5.06B** Delete paragraph 5.06B of the Standard General Conditions in its entirety.

**SC-5.06D** Delete paragraph 5.06D of the Standard General Conditions in its entirety.

**SC-5.06E** Delete paragraph 5.06E of the Standard General Conditions in its entirety.

**SC-5.10** Delete paragraph 5.10 of the Standard General Conditions in its entirety and insert the following in its place:

A. The CONTRACTOR shall maintain all insurance as required in Paragraph 5.06A for the Work and allow OWNER to occupy or use a portion or portions of the Work prior to Substantial Completion. CONTRACTOR shall make appropriate provisions with insurers providing the proper endorsements, if required. The property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

**SC-6.01** Add the following sub-paragraphs immediately after paragraph 6.01B of the Standard General Conditions which are to read as follow:

C. The Owner reserves the right to review and approve the resident superintendent.

**SC-6.02** Add the following sub-paragraphs immediately after paragraph 6.02B of the Standard General Conditions which are to read as follow:

C. Maintenance work may be performed during hours other than regular working hours. Regular working hours are defined as daylight hours between one-half hours after sunrise to one-half hour before sunset but not more than eight (8) hours per day at 5 days per week or ten (10) hours per day at 4 days per week totaling forty (40) hours per week during weekdays. Requests to Work during other regular working hours must be submitted to the OWNER at least seventy-two (72) hours in advance of the period proposed for such irregular working hours and shall set forth the proposed schedule for such hours to give the OWNER ample time to arrange for its personnel to be at the site of the Work.
The OWNER will pay for charges of ENGINEER and construction observation performed during regular working hours. The CONTRACTOR shall pay for additional engineering and construction observations charges required during irregular hours which may be authorized under the provisions of paragraph SC-6.02C. The rate paid to the OWNER by the CONTRACTOR for additional engineering and construction observation changes shall be in accordance with the existing Contract between the OWNER and ENGINEER.

The CONTRACTOR shall also pay for the costs of additional engineering charges and construction observation required during the correction of defective Work. Such additional costs incurred during irregular working hours and during the correction of defective Work, shall be a subsidiary obligation of the CONTRACTOR and no extra payment shall be made by the OWNER on account of such Work.

Delete paragraphs 6.06A and 6.06B of the Standard General Conditions and insert the following in its place:

A. The CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom OWNER may have reasonable objection and shall not be required to employ as a Subcontractor, Supplier or any person or organization against whom the CONTRACTOR has reasonable objection. A Subcontractor, Supplier or other person or organization identified in the CONTRACTOR's Bid and not objected to in writing by OWNER prior to the execution of the Agreement will be deemed acceptable to OWNER. All other Subcontractors shall be deemed to have been accepted if the OWNER delivers no written objection thereto within forty-five (45) days after CONTRACTOR's written identification of such Subcontractors.

B. However, if the OWNER has reasonable objection to any Subcontractor identified in the Bid or subsequently, the CONTRACTOR shall submit an acceptable substitute without entitlement to any change in Contract Price. If the OWNER demands the substitution of a Subcontractor at any time without having reasonable objection to such Subcontractor, the CONTRACTOR shall comply and shall be entitled to change in Contract Price (by appropriate Change Order or Written Amendment) for the difference in cost occasioned by such substitution. After acceptance by the OWNER, the CONTRACTOR shall make no substitution without written approval of the OWNER, which may be granted or withheld at OWNER's sole discretion. No acceptance by the OWNER of any
such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of the OWNER to reject defective work.

SC-6.08 Add the following to the end of paragraph 6.08 in the Standard General Conditions:

B. "The OWNER, prior to the advertisement of the Project, has applied for or has secured permits and/or licenses for the Project as described in "Location, Scope and Special Requirements."

SC-6.11 Add new sub-paragraphs immediately after paragraph 6.11A.3 of the Standard General Conditions which are to read as follows:

A. Use of OWNER's property by the CONTRACTOR for storage of materials and equipment will be negotiated.

B. Use of the OWNER's existing washrooms, lavatories, sanitary facilities or plumbing fixtures by the CONTRACTOR or any of its employees or Subcontractors will not be permitted.

SC-6.13 Add the following at the end of Paragraph A:

The Engineer is not responsible for the safety of any person on the jobsite other than the Engineer’s own employees. The Contractor is responsible for construction means, methods, sequences, testing, techniques and procedures necessary for performing, superintending or coordinating all portions of the work in accordance with the contract documents and any health or safety precautions required by the contract documents and/or any regulatory agencies. The Engineer has no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Engineer does not have the authority to stop the work of any construction contractor. The Owner agrees that the Contractor is solely responsible for jobsite safety, and warrants that this intent shall be made evident in the Owner’s agreement with the Contractor. The Owner agrees that the Engineer shall be entitled to indemnification from the Contractor for any loss incurred by the Engineer arising out of any claim brought by any person or personal injuries sustained on the jobsite and warrants that this intent shall be made evident in the Owner’s agreement with the Contractor. The Engineer shall be made an additional insured under the Contractor’s general liability insurance policy for personal injuries to any person sustained on the jobsite.

SC-6.13 The CONTRACTOR’s obligations under paragraph 6.13 of the Standard General Conditions shall continue after the date of Substantial Completion until the Initiation of Operation.

Add the following paragraph after paragraph 6.13F of the Standard General Conditions:
G. "The CONTRACTOR shall be completely responsible for any tanks, wet wells or similar structures that may become buoyant during the construction and modification operations due to the ground water or floods and before the structure is put into operation. If there is any possibility of buoyancy of a structure, the CONTRACTOR shall take the necessary steps to prevent its buoyancy either by increasing the structures weight, by filling it with approved material or other acceptable methods. The proposed final structures have been designed against buoyancy; however, during various construction stages, methods employed by the CONTRACTOR and other conditions which may affect the buoyancy, the CONTRACTOR shall take the necessary precautions against buoyancy. Damage to any structures due to floating or flooding shall be repaired or the structures replaced at the CONTRACTOR's expense."

SC-6.17 Add the following paragraph after 6.17D.3 in the Standard General Conditions:

4. Shop Drawings and other submittal data shall be reviewed by the ENGINEER for each original submittal and first resubmittal; thereafter, the CONTRACTOR shall reimburse OWNER for services rendered by ENGINEER for review time of subsequent resubmittals.

SC-6.19 Add the following after paragraph 6.19C.

D. Contractor warrants that (1) the supplies to be provided to the Owner pursuant to this Agreement are fit and sufficient for the purpose intended; (2) the supplies are merchantable, of good quality, and free from defects, whether patent or latent, in material or workmanship, and (3) the supplies sold to the Owner pursuant to this Agreement conform to the standards required by this Contract.

The Contractor further warrants that the Contractor has title to the supplies provided, in that the supplies are free and clear of all liens encumbrances, and other security interests. All warranties made in this Agreement, together with service warranties and guarantees, shall run to the Owner and its successors and assigns.

E. Additional Warranties – Contractor further expressly warrants the manufacturer must provide a one (1) year Warranty on equipment. This shall cover 100% of all component failures due to defects in workmanship or repeated use. Routine maintenance is not included. Warranty claims shall be handled by manufacturer or distributor. This is a minimum acceptable warranty. Warranty will be considered in bid award.
In the event of a conflict between this paragraph and other provisions of the Contract Documents, this paragraph shall control.

Delete paragraph 6.20B of the Standard General Conditions in its entirety and insert the following in its place:

B. The Contractor agrees not to bring any claim, suite, action or other legal proceeding against the engineer and its consultants that may arise out of or in connection with the Work or this agreement. The Engineer and its consultants are intended third-party beneficiaries of this covenant not to sue, and are entitled to enforce this covenant in law or in equity.

Delete paragraph 7.02 of the Standard General Conditions in its entirety and insert the following in its place:

7.02 A. The parties expressly acknowledge that the Work to be done contractors.

1. The CONTRACTOR shall cooperate with all other contractors who may be performing Work on behalf of the OWNER in the vicinity of the Work to be done under this contract, and he shall conduct his operation as to interfere to the least possible extent with the Work of such contractor.

2. The CONTRACTOR shall promptly make good, at its own expense, any injury or damage that may be caused by it to other contractors, employees or subcontractors or suppliers thereof.

3. Any difference or conflict which may arise between the CONTRACTOR and other contractors in regard to their respective Work shall be adjusted and determined by the OWNER.

4. If the Work is delayed because of any acts of omissions of any other contractor, the CONTRACTOR shall have no claim against the OWNER on that account.

Delete paragraph 8.06 of the Standard General Conditions in its entirety.

Delete paragraphs 9.08A-C in their entirety and insert the following:

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. Claims, disputes and other matters relating to requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of
changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than thirty (30) days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within sixty (60) days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty (30) days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty (30) days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR unless a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within thirty (30) days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty (60) days of the date of such decision, unless otherwise agreed in writing by OWNER and CONTRACTOR.

SC-9.08 Re-letter paragraph 9.08D as 9.08B.

SC-9.08 Add the following sentences to the end of paragraph 9.08B of the Standard General Conditions:

"No action, either at law or at equity, shall be brought in connection with any such claim, dispute or other matter later than thirty (30) days after the date on which the ENGINEER has rendered such written decision in respect thereof. Failure to bring an action within said thirty (30) day period shall result in ENGINEER's decision being final and binding upon the OWNER and the CONTRACTOR. In no event may any such action be brought after the time at which instituting such proceedings would be otherwise barred by the applicable statute of limitations."

SC-10.01 Delete paragraph 10.01 A of the Standard General Conditions in its entirety and insert the following in its place:
A. Without invalidating the Agreement, and without notice to any Surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders. The CONTRACTOR shall not proceed with any Change Order until the OWNER and Engineer have signed and delivered to the CONTRACTOR the written Change Order. Upon receipt of a Change Order, CONTRACTOR shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 11 or Article 12 on the basis of a claim made by either party.

SC-12.02 Delete paragraphs 12.02A and 12.02B of the Standard General Conditions in its entirety and insert the following in its place:

A. The Contract Time may be changed only by a Change Order or a Written Amendment. Any claim for an extension or shortening in the Contract Time shall be based on written notice delivered to the OWNER and ENGINEER within fifteen (15) days from detection or the beginning of any event or circumstance giving rise to an Excusable or Compensable Delay and setting forth the general nature of the cause of delay. Within thirty (30) days of any such detection or beginning of event, the CONTRACTOR shall provide the analysis and documentation required to ascertain the facts, as specified in Section 01310: Progress Schedules and shall provide a written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR has reason to believe it is entitled as a result of the occurrence of said event. No claim by the CONTRACTOR under this provision shall be allowed unless the CONTRACTOR has given the notice and the analysis and documentation required in this paragraph, or if asserted after final payment, as defined in paragraph 14.07 of the Standard General Conditions.

B. No forfeiture due to delay shall be made because of any Excusable and Prejudicial Delays in the completion of the entire Work or a specified part thereof. Any such delays shall not entitle the CONTRACTOR to any change in Contract Price. The sole remedy of the CONTRACTOR shall be an extension of the Contract Time pursuant to this Article and the provisions of Section 01310: Progress Schedules.

C. No forfeiture due to delay shall be made because of any Compensable and Prejudicial Delays in the completion of the Work or a specified
part thereof. Any such delays will entitle the CONTRACTOR solely to an extension of the Contract Time pursuant to this Article and the provisions of Section 01310: Construction Progress Schedules, of the General Requirements.

D. No extensions of Contract Time or increases in Contract Price shall be granted for Non-prejudicial Delays of any type or for Inexcusable Delays, unless otherwise agreed to by the OWNER at his sole discretion.

SC-12.06 Paragraph 12.06B is hereby revised to provide equitable adjustment in contract time only; not contract price.

SC-13.03 Delete Paragraph 13.03B and sub-paragraphs 1, 2 and 3 in their entirety and insert the following:

B. Payment of testing and laboratory services is specified in Section 01410; Testing and Laboratory Services for inspections and tests required by the Contract Documents. CONTRACTOR shall pay for inspections, tests or approvals covered by paragraph 13.03C. Costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04B shall be paid as provided in said paragraph 13.04B.

SC-13.04 Amend paragraph 13.04C of the Standard General Conditions to read as follows:

“...replacement of Work of others), and any additional expenses experienced by OWNER due to delays to other contractors, an appropriate deductive Change Order shall be issued. The CONTRACTOR shall further bear the responsibility for maintaining the schedule and will be excluded from a time extension and the recovery of delay damages due to the uncovering. If, the parties…”

SC-13.06 Add the following new paragraph immediately after paragraph 13.06B of the Standard General Conditions:

C. CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all Work will be in accordance with the Contract Documents and will not be defective. The CONTRACTOR shall not be entitled to an extension of Contract Time for correcting or removing defective Work.

SC-13.07 Add the following new sub-paragraph immediately after sub-paragraph 13.07A.4:

5. When deemed necessary by OWNER, CONTRACTOR shall furnish and install at no cost to OWNER, such temporary equipment and material necessary to maintain functionality of the Work while defective Work is being corrected or replaced.
Add the following new paragraphs immediately after paragraph 13.07E:

F. Subject to adjustments as described in sub-paragraph 13.07G, the period during which the CONTRACTOR must correct defective Work or remove it from the site and replace it with non-defective Work, all at no cost to the OWNER (the "Correction Period"), shall be no more than one (1) year. If the date of Substantial Completion is not the same date as Initiation of Operation, such Correction Period shall commence upon Initiation of Operation, not upon the date of Substantial Completion. In such cases, the time between Substantial Completion and Initiation of Operation shall not exceed one hundred (100) days.

G. No later than thirty (30) days before Initiation of Operation the OWNER shall notify the CONTRACTOR in writing of the date upon which Initiation of Operation is expected to occur, and the CONTRACTOR shall ensure that the Work is ready in its entirety by such date for use by the OWNER as contemplated in the Contract Documents.

H. From the date of Substantial Completion until Initiation of Operation, the CONTRACTOR shall bear all risks of injury, loss, or damage to any part of the Work arising from the elements or from any other cause. The CONTRACTOR shall rebuild, repair, restore, and make good at no cost to the OWNER, all injuries, losses, or damage to any portion of the Work occasioned by any cause and shall, at no expense to the OWNER, provide suitable drainage and erect such temporary structures and take all other actions as are necessary for the protection of the Work. Suspension of the Work or the granting of an extension of the Contract Time for any cause shall not relieve the CONTRACTOR of its responsibility for the Work as herein specified. The CONTRACTOR's responsibilities under this paragraph 13.07 are in addition to, not in lieu of, all other obligations imposed by these Contract Documents.

I. At the OWNER's sole option, the Correction Period may be extended or shortened. The Contract Price shall be adjusted accordingly as provided in paragraphs 11 and 12 of the Standard General Conditions.

SC-14.02.A.1 Add the following sentence to end of paragraph 14.02 A.1:

Payment to Contractor for stored materials shall be the Owner’s option and at the Owner’s sole discretion.

SC-14.02 Add the new sub-paragraph immediately after sub-paragraph 14.02A.3:
4. Each monthly Application for Payment shall incorporate the corresponding "Monthly Progress Status Report" prepared per the requirements of Section 01310: Progress Schedules.

SC-14.02.C.1 This section is hereby deleted. The requirements of Florida Statute 218.735(a) of the Florida Prompt Payment Act shall apply.

SC-14.04.A Delete paragraph 14.04.A in its entirety and insert the following in its place:

A. After all requirements of Section 01700: Contract Closeout have been met with respect to Substantial Completion, and when the 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 (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion.

SC-15.01 Add a new subparagraph immediately after paragraph 15.01A of the Standard General Conditions to read as follows:

1. Notwithstanding this paragraph 15.01A, if the OWNER stops Work under paragraph 13.05 or suspends the CONTRACTOR's services under paragraph 13.09 of the Standard General Conditions, or suspends the Work or any portion thereof because of the CONTRACTOR's failure to prosecute the Work without endangering persons and property, the CONTRACTOR shall not be entitled to an extension of Contract Time or increase in Contract Price.

SC-16 Delete Article 16 and all other references to "Dispute Resolution Agreement" in the Standard General Conditions. Disputes between OWNER and CONTRACTOR shall be arbitrated only if and to the extent agreed to by the parties at the time each dispute arises. The CONTRACTOR shall carry on the Work and maintain the progress schedule during any dispute, regardless of how resolved, unless otherwise mutually agreed in writing. Venue for any litigation, at law or equity or arbitration, shall lie exclusively in the place of Volusia County, Florida. This Contract, or any provision hereof, shall be construed and interpreted, and any litigation arising there from, shall be governed by the laws of the State of Florida.

SC-17.06 Add the following paragraph immediately after paragraph 17.05 of the General Conditions which are to read as follows:

17.06 The form of all submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the ENGINEER. The forms for Notice to Proceed, Notice of Award and others, which the
ENGINEER may use are contained in the subsequent pages of these Supplementary Conditions.

END OF SECTION
SECTION 00844
APPLICATION AND CERTIFICATE FOR PAYMENT FORM

Application No. __________          Progress __________          Final __________

Engineer's Project No ________________________________________________

Project: _____________________________________________________________

Contractor: __________          Contract Date: ________________

Contract for: _______________________________________________________

Application Date: __________________          For Period Ending __________

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| TOTALS | $ 0.00 | $ 0.00 |

Net Change by Change Orders $ 0.00

1. ORIGINAL CONTRACT SUM $ 0.00
2. Net Change by Change Order $ 0.00
3. CONTRACT SUM TO DATE (Line 1 and 2) $ 0.00
4. TOTAL COMPLETED AND STORED TO DATE $ 
5. RETAINAGE: (Column I & N, Forms 00845 and 00846)
   a. ___% of Completed Work $ 
   b. ___% of Stored Material $ 
   Total Retainage (Line 5a and 5b) $ 0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 Total) $ 0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate) $ 0.00
8. AMOUNT DUE THIS APPLICATION $ 0.00
9. BALANCE TO FINISH, PLUS RETAINAGE (Line 3 less Line 6) $ 0.00

00844-1
Contractor's Certification

The undersigned Contractor hereby swears under penalty of perjury that (1) all previous progress payments received from the Owner on account of Work performed under the contract referred to above have been applied by the undersigned to discharge in full all obligations of the undersigned incurred in connection with Work covered by prior Applications for Payment numbered 1 through ____ inclusive; and (2) all materials and equipment incorporated in said Project or otherwise listed in or covered by this Application for Payment are free and clear of all liens, claims, security interest and encumbrances; (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective as that term is defined in the Contract Documents.

Dated ________________________________

(Contractor)

By: __________________________________________

(Name)

________________________

(Title)

COUNTY OF
STATE OF

Before me on this ________ day of ___________, 20____, personally appeared ____________________, known to me, who being duly sworn, deposes and says that (s)he is the _____________________ of the Contractor above mentioned; that (s)he executed the above Application for Payment and statement on behalf of said Contractor; and that all of the statements contained therein are true, correct and complete.

(Notary Seal)

Notary Public

My commission Expires ______________________________

Engineer's Recommendation

Payment of the above AMOUNT DUE THIS APPLICATION is recommended.

QLH, A Mead & Hunt Company

By: ________________________________

(Authorized Signature)

Date: ________________________________
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Total Contract Amount

Subtotal:

Stored Materials Installed/Received:

Subtotal:

Less Retainage ( %)

Grand Total:
SECTION 00848
CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER'S Project No.:  ENGINEER's Project No.: 

CONTRACTOR:  
Contract Date:  

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof.

To:  
Owner

And To:  
Contractor

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on:

Date of Substantial Completion

Certificate of Substantial Completion
A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item therein does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract documents. When this Certification applies to a specified part of the Work the items in the tentative list shall be completed or corrected by CONTRACTOR within ____ days of the above date of Substantial Completion.

The date of Substantial Completion is the date upon which all guarantees and warranties begin, except as follows:

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities and insurance shall be as follows:

RESPONSIBILITIES:

OWNER: ____________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

CONTRACTOR: ______________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

The following documents are attached to and made a part of this Certificate:
This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR'S obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on _____________, 20__.

(Engineer)

By______________________________

The CONTRACTOR accepts this Certificate of Substantial Completion on __________, 20__.

(Contractor)

By______________________________

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Work to be done consists of the furnishing of all labor, materials and equipment, and the performance of all Work included in this Contract. The summary of the Work is presented in Section 01010: Summary of Project.

B. Work Included:

1. The Contractor shall furnish all labor, superintendence, materials, plant power, light, heat, fuel, water, tools, appliances, equipment, supplies, and means of construction necessary for proper performance and completion of the Work. The Contractor shall obtain and pay for all necessary local building permits. The Contractor shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Engineer, and in strict accordance with the Contract Documents. The Contractor shall clean up the Work and maintain it during and after construction, until accepted, and shall do all Work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the Work.

2. The cost of incidental work described in these Project Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the Work and shall be included in the prices for the various Contract Items. No additional payment will be made therefore.

3. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the Work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials, and equipment, prior approval of the Engineer notwithstanding.
C. Public Utility Installations and Structures:

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner, other governmental bodies, or privately owned by individuals, firms, or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water, or other public or private property which may be affected by the Work shall be deemed included hereunder.

2. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition, and extent of all such installations and structures as may be encountered and as may affect the construction operations.

3. The Contractor shall protect all public utility installations and structures from damage during the Work. Access across any buried public utility installation or structure shall be made to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor shall be repaired by the Contractor, at his expense. No separate payment shall be made for such protection or repairs to public utility installations or structures.

4. Public utility installations or structures owned or controlled by the Owner or other governmental body which are shown on the Drawings to be removed, relocated, replaced, or rebuilt by the Contractor shall be considered as a part of the general cost of doing the Work and shall be included in the prices bid for the various Contract Items; therefore, no separate payment shall be made.

5. Where public utility installations of structures owned or controlled by the Owner or other governmental body are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement, or rebuilding is necessary to complete the Work under this Contract, such Work shall be accomplished by the utility having jurisdiction, or such Work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously, and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement, or rebuilding as
required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided in the Agreement.

6. The Contractor shall, at all times in performance of the Work, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage, or destruction of public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end.

7. The Contractor shall give written notice to Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least 48-hours in advance of breaking ground in any area or on any unit of the Work.

8. The maintenance, repair, removal, relocation, or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the owners of such utilities.

1.02 DRAWINGS AND PROJECT MANUAL

A. Drawings: When obtaining data and information from the Drawings, figures shall be used in preference to scaled dimensions, and large-scale drawings in preference to small-scale drawings.

B. Supplementary Drawings:

1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the Work to be done or to illustrate the Work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer, and the Contractor will be furnished one (1) complete set of reproducible Mylar sepias (24 inches by 36 inches) and one (1) reproducible copy of the Project Manual.

2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of Work, credit to the Owner or compensation therefore to the Contractor shall be subject to the terms of the Agreement.
C. Contractor to Check Drawings and Data:

1. The Contractor shall verify all dimensions, quantities, and details shown on the Drawings, Supplementary Drawings, schedules, Specifications, or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts, or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction, or improper operation resulting there from, nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the Engineer, should such errors or omissions be discovered.

2. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility or the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

D. Specifications: The Technical Specifications consist of three (3) parts: General, Products, and Execution. The General part of a Specification contains General Requirements which govern the Work. The Products and Execution parts modify and supplement the General Requirements by detailed requirements for the Work and shall always govern whenever there appears to be a conflict.

E. Intent:

1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, the interpretation of these Specifications shall be made upon that basis.
1.03 MATERIALS AND EQUIPMENT

A. Manufacturer:

1. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request and at the Engineer's option, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.

2. Any two (2) or more pieces of material or equipment of the same kind, type, or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery:

1. The Contractor shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.

2. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any related Contractor.

C. Tools and Accessories:

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind, or size of equipment, one (1) complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

2. Spare parts shall be furnished as specified herein and as recommended by the manufacturer necessary for the operation of the equipment, not including materials required for routine maintenance.

3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight, and principal rate data.

D. Service of Manufacturer's Engineer:

1. The Contract Prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install,
adjust, test, and place in operation, the equipment in conformity with the Contract Documents.

2. After the equipment is placed in permanent operation by the Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

1.04 INSPECTION AND TESTING

A. General:

1. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Five (5) copies of the reports shall be submitted, and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.

2. If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract Documents, the Contractor will be notified thereof, and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the Work and replace it with acceptable material, without cost to the Owner.

3. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with the recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

4. The Contractor shall be fully responsible for the proper operation of equipment during testing 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.

B. Costs:

1. All inspection and testing of materials furnished under this Contract will be provided by the Contractor, unless otherwise expressly specified.

2. The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor, and such costs shall be deemed to be included in the Contract Price.
3. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Owner for compliance. The Contractor shall reimburse the Owner for the expenditures incurred in making such tests of materials and equipment which are rejected for non-compliance.

C. Certificate of Manufacture:
   1. Contractor shall furnish to Engineer authoritative evidence in the form of a certificate of manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents.
   2. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

D. Shop Tests:
   1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.
   2. Five (5) copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company and/or independent laboratory, shall be submitted to the Engineer for approval.
   3. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

E. Start-up Tests:
   1. As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make start-up tests of equipment.
   2. If the start-up tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the Contractor shall, prior to demonstration tests, make all changes, adjustments, and replacements required. The furnishing Contractor shall assist in the start-up tests as applicable.
F. Demonstration Tests:

1. Prior to Contractor's request for a Substantial Completion inspection, all equipment and piping installed under this Contract shall be subjected to demonstration tests as specified or required to prove compliance with the Contract Documents.

2. The Contractor shall furnish labor, fuel, energy, water, and all other materials, equipment, and instruments necessary for all demonstration tests, at no additional cost to the Owner. Contractor shall assist in the demonstration tests as applicable.

1.05 LINES AND GRADES

A. Grade:

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

2. The vertical bench marks provided is USGS “Public Records” monumentation and the horizontal control is the monumentation on plats contained in the “Public Records of Flagler County.”

B. Surveys:

1. The Contractor shall furnish and maintain, at his own expense, stakes and other such materials.

2. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Engineer's attention to any inaccuracies.

3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the reference marks set by the Engineer, and shall be solely responsible for the accuracy thereof. He shall, however, be subject to the check and review by the Engineer.

C. Safeguarding Marks:

1. The Contractor shall safeguard all points, stakes, grade marks, monuments, and bench marks made or established on the Work, bear the cost of re-establishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes, and marks.
2. The Contractor shall safeguard all existing and known property corners, monuments, and marks adjacent to but not related to the Work and shall bear the cost of re-establishing them if disturbed or destroyed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01010

SUMMARY OF PROJECT

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. This Contract is for the construction of the City of Bunnell’s WWTP EQUALIZATION BASIN & EFFLUENT POND IMPROVEMENTS, BID NO. 05-0-2018. The work consists of furnishing all labor, equipment, and materials for the construction of the facilities consisting of, but not limited to, the following:

The project consists of removal of diffused aeration in the WWTP equalization basin and installing a submersible mixer aerator. Conversion of an existing on site reject pond into a wet detention pond for seasonal storage of reclaimed water. The storage pond includes piping improvements and mixer aeration equipment.

B. The Contractor shall furnish all labor, equipment, tools, services and incidentals to complete all Work required by these Specifications and as shown on the Drawings.

C. The Contractor shall perform the Work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, cleanup, replacements and restoration required as a result of damages caused during this construction.

D. All materials, equipment, skills, tools and labor which is reasonably and properly inferable and necessary for the proper completion of the Work in a substantial manner and in compliance with the requirements stated or implied by these Specification or Drawings shall be furnished and installed by the Contractor without additional compensation, whether specifically indicated in the Contract Documents or not.

E. The Contractor shall comply with all City, County, State, Federal, and other codes which are applicable to this Project.
1.02 CONTRACTOR’S USE OF PREMISES

A. The Contractor shall assume full responsibility for the protection and safekeeping of products and materials at the job site. If additional storage or work areas are required, they shall be obtained by the Contractor at no additional cost to the Owner.

1.03 PROJECT SEQUENCE

A. The Contractor shall establish his work sequence based on the use of crews to facilitate completion of construction and testing within the specified Contract time.

END OF SECTION
SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

A. Separate payment will be made only for the items of work described herein and listed on the Schedule of Unit Prices, Section 00310. Any related work not specifically listed, but required for satisfactory completion of the work, shall be considered to be included in the scope of the appropriate listed work items.

B. The Contractor's attention is called to the fact that cleanup is considered a part of the work of construction. No payment will be made until cleanup is essentially complete.

C. No separate payment will be made for the following items and the cost of such work shall be included in the applicable pay items of work.

1. Excavation
2. Shoring and sheeting.
3. Dewatering and disposal of surplus water.
4. Structural Fill.
5. Backfill.
7. Replacement of unpaved driveways, grass and shrubbery plots.
8. Cleanup.
9. Maintaining the existing quality of service during construction.
10. Appurtenant work as required for a complete and operable system.

D. No payment shall be made for work constructed outside the authorized limits of work.

PART 2 - MATERIALS AND EQUIPMENT

2.01 Mobilization/Demobilization    Bid Item 1

Lump sum payment will be made for mobilization and shall be full compensation for the preparatory work and operations in mobilizing for beginning work on the Project including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for the establishment of on-site facilities, safety equipment and first aid supplies, sanitary and other facilities, as required by these Specifications, and state and local laws and regulations; and any other pre-construction expense necessary for the start of the Work; the cost of field engineering including disposal of cleared and grubbed material and debris, permits and fees, costs of bonds, required insurance, construction schedules, project signs, shop drawings, temporary facilities, laydown storage area, construction aids, erosion control, work associated with contractor support during Owner/Engineer reviews and inspection, re-inspections and any re-work resulting
from same, cleaning, operation and maintenance data, and for all other work required for
demobilization. The Contractor shall submit invoices substantiating the cost of mobilization with
each pay request. Ten percent (10%) of the cost for this item will be withheld until acceptance and
final payment.

2.02  Basin Mixer Equalization  Bid Item 2

Lump sum payment will be made for all labor, materials, and equipment necessary for rehabilitating
the existing south clarifier. This pay item includes all structural, mechanical, and associated work
required by the scope detailed in the plans and specifications for a complete and operable installation
providing, installing and outfitting the equalization basin mixer and Davit Hoist assembly.

2.03  Pond Excavation  Bid Item 3

Lump sum payment will be made for excavation and grading of the pond as shown on the plans and
described in the specifications. The contractor retains ownership, and responsibility, for all materials
calculated. The pond may be excavated “wet”, but the contractor shall be responsible for transporting
the material without tracking material off site.

2.04  Solar Bee Aerator  Bid Item 4

Payment shall be made at the lump sum price for the provision and installation of a Solar Bee
Aerator in the proposed reuse pond. The Solar Bee SB Series devise by Medora Corp. is the basis of
the design. The contractor is responsible for coordinating sizing and installation details with the
manufacturer. Payment shall be full compensation for all labor, materials, and equipment required to
complete the installation in accordance with the drawings and specifications. Payment also included
any costs associated with setting and/or adjustments required.

2.05  Mechanical (includes yard piping and flow meter)  Bid Item 5

Payment shall be made at the lump sum price for the installation of yard piping and flow meter. The
lump sum price shall be for all labor, materials and equipment required to complete the described
work in accordance with the plans and specification. Payment also includes all costs associated with
fittings, valves, tie-ins, and removal of existing yard piping where indicated by the plans and
specifications.

2.06  Sod Restoration (Bahia unless shown or to match other types)  Bid Item 6

Lump sum payment shall be made for sod installed and shall be for full compensation for furnishing
all plant labor, materials and equipment necessary to furnish and properly install sod without gaps or
overlaps within the limits shown on the drawings. Items shall include watering and maintenance for
a one-month period. Dead or insect infested sod shall be replaced by the Contractor at no cost to the
Owner if manifestation or damaged becomes apparent within the one-month maintenance period.
Staking and staggering of joints are included where required.
2.07  Electrical  

Lump sum payment shall be made for all electrical work shown on the plans. This item includes all material, equipment, and labor required for a complete and operable system.

2.08  Permits and Allowances  

An allowance is established to reimburse costs associated with Building Permit fees, inspections and related expenses. The Contractor will be reimbursed at actual cost for invoices associated with this item.

2.09  As-Builts  

Payment for As-Built Drawings/Certified Record Drawings shall be on a lump sum basis. The completeness of the As-Built Drawings/Certified Record Drawings shall conform to section 01720 (As-Built/Record Documents) and will be the City’s determination.

END OF SECTION
PART I - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Submit Application for payment to the Engineer in accordance with schedule established by Conditions of the Contract and Agreement between Owner and Contractor. Contractor shall use the Application and Certificate for Payment Form included on Section 00844 as the official pay request form.

B. Related Requirements Described Elsewhere:

1. Schedule of Values: Section 00310
2. Agreement: Section 00500.
3. Construction Progress Schedules: Section 01310.
4. Project Record Documents: Section 01720.

1.02 FORMAT REQUIRED

A. Submit applications typed on the form provided in Division 0, Section 00844: Application and Certificate for Payment Form, with itemized data typed on 8-1/2 inch x 11 inch or white paper continuation sheets.

B. Provide itemized data on continuation sheets of format, schedules, line items, and values specified on the Application and Certificate for Payment Form. The Contractor shall use the item descriptions and contract values included in schedule of values, approved and accepted by the Engineer as a basis for preparation of the Application for Payment Form.

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.

2. Fill in percent complete for each activity and dollar values to agree with respective percent’s.

3. Execute certification with signature of a responsible officer of Contractor.
B. Continuous Sheets:

1. Fill in total of all scheduled component items of the Work, with item number and schedule dollar value for each item.

2. Fill in dollar value in each column for each scheduled line item when Work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.

3. List each Change Order executed prior to date of submission, at the end of the continuation sheets. List by Change Order Number, and description, as for an original component item Work.

4. To receive approval for payment on component material stored on site, submit copies of the original invoices with Application and Certificate for Payment.

5. As provided for in the Application and Certificate for Payment Form, the Contractor shall certify, for each current pay request, that all previous progress payments received from the Owner, under this Contract, have been applied by the Contractor to discharge in full, all obligations of the Contractor in connection with Work covered by prior Applications for Payment, and all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest, and encumbrances. Contractor shall attach to each Application and Certificate for Payment like affidavits by all Subcontractors.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. Contractor shall submit suitable information, with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

4. For stored products:

5. Item number and identification as shown on application.

6. Description of specific material.

B. Submit one (1) copy of data and cover letter for each copy of application.
C. The Contractor is to maintain an updated set of drawings to be used as record drawings in accordance with Section 01720: Project Record Documents. As a prerequisite for monthly progress payments, the Contractor is to exhibit the updated record drawings for review by the Owner and the Engineer.

D. Each monthly application for payment shall incorporate the corresponding “monthly progress status report” and updated construction schedule, prepared in accordance with the requirements of Section 01310: Construction Progress Schedules.

E. As a prerequisite for payment, Contractor shall submit a duly executed letter from surety consenting to payment due and progress to date.

F. Provide construction photographs in accordance with Section 01380: Construction Photographs.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in application form as specified for progress payments. Provide information as required by the General Conditions and Section 01700: Contract Closeout.

B. Furnish evidence of completed operations and insurance in accordance with the General Conditions.

C. Provide Contractor’s Final Release of Lien (Section 00849) and other close-out submittals as required by the General Conditions.

1.06 SUBMITTAL PROCEDURE

A. Submit Application for Payment to the Engineer at the time stipulated in the Agreement, or as agreed to at the pre-construction meeting. Review the percents complete with the Engineer and resolve any conflict or discrepancies.

B. Number of copies for each Application for Payment: Five (5) copies plus additional copies for Contractor’s needs.

C. When the Engineer finds the Application and Certificate for Payment Form is properly completed and correct, he will execute the Certificate for Payment and transmit the forms to the Owner, with a copy to the Contractor.

PART II - PRODUCTS (NOT USED)

PART III - EXECUTION (NOT USED)

END OF SECTION
SECTION 01300

LOCATION, SCOPE AND SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.01 The Contractor shall not have any right in property in any materials taken from any excavation and he shall not remove any earth, sand or other material from the lines of the work before the excavation is refilled except upon direction of the Engineer. The provisions of this paragraph shall not be construed as relieving the Contractor of any kind of his obligations to remove and dispose of any of the material excavated, with or without rehandling, at his cost and expense as provided in these specifications.

1.02 From investigations, including surveys made at the site, it is assumed that physical conditions are approximately as indicated on the drawings, but the nature of the materials below the surface, the depth to satisfactory foundations, or the stability of beds or banks or quantity of groundwater are not guaranteed.

1.03 Where reference is made within these documents to government specifications, or those of well known organizations such as ASTM, ASA, ASME, etc., the latest editions shall be used, any or all references in these documents to earlier stated editions notwithstanding.

1.04 The Contractor shall take all necessary precautions to prevent damage to existing City utilities which are to remain in service during any of his construction operations. Should such utilities be damaged by the Contractor, he shall be required to replace, or repair same, to the satisfaction of the Engineer, at no additional cost to the Owner.

1.05 Certain information regarding the reputed presence, size, character, and location of existing underground structure, pipes and conduits has been shown on the contract drawings. The location of underground structures shown may be inaccurate, and other obstructions than those shown may be encountered. The Contractor distinctly agrees that the Engineer and the Owner are not responsible for the correctness or sufficiency of the information given; that in no event is this information to be considered as a part of the Contract; that he shall have no claim for delay or extra compensation on account of incorrectness of information given; or on account of insufficiency or absence of information regarding obstructions either revealed or not revealed by the drawings; and that he shall have no claim for relief from any obligation or responsibility under this Contract, in case the location, size or character of any pipe or other underground structure is encountered that is not shown on the drawings.

1.06 The Contractor agrees that the work shall be started not later than the date indicated in the "Notice to Proceed", and that the total work shall be completed within the contract time.

A. The Contractor further agrees that for each calendar day, with the exception of Sundays and legal holidays, that any such work shall remain uncompleted after the completion time stipulated above, the sum of **Five Hundred Dollars ($500)** per day shall be deducted by the Owner from monies due the Contractor, not as a penalty but as liquidated damages. Charges
shall accrue upon failure to achieve final completion target date, unless otherwise approved. If the Contractor is declared in default in accordance with the provisions of the specifications, liquidated damages shall be charged as provided herein, and such amounts shall be deducted from the final amount payable to the Contractor or his Surety. Should the total amount chargeable as liquidated damages exceed the amount due or payable to the Contractor or his Surety, then such excess shall be paid to the Owner by the Contractor or his Surety.

1.07 The City shall provide reference points as shown on the plans. Contractor shall be responsible for having a land surveyor registered in the State of Florida and approved by the Engineer lay out the work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of the Engineer. Contractor shall report to Engineer whenever such reference point is lost or destroyed or required location because of necessary changes in grades or locations, and the Contractor shall be responsible for replacement or relocation of such reference points by professionally qualified personnel, registered in the State of Florida and approved by the Engineer.

1.08 All dewatering and pumping necessary to accomplish the work of this Contract shall be performed by the Contractor at no extra or additional cost to the Owner. Any permits required shall be the responsibility of the Contractor.

1.09 Examination of Contract Documents and Site. Before submitting a Bid each Contractor must (a) examine the Contract Documents thoroughly, (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the work, (c) familiarize himself with federal, state and local laws, ordinance, rules and regulations that may in any manner affect cost, progress or performance of the work, and (d) study and carefully correlate Bidder's observations with the Contract Documents.

1.10 Attention is directed to the requirements of the following agencies with regard to permits and construction of utilities within their rights of way or jurisdiction.

A. City of Bunnell

B. FDEP Wastewater Operating Permit.

1.11 Contract Insurance Requirements. The insurance requirements in Section 00645 represent the minimum insurance requirements for contract with the City of Bunnell.

1.12 The Contractor is responsible for recording the Payment and Performance Bond and the Public Construction Bond in the Official Records of Flagler County, Florida. The Contractor shall submit a copy of the bond package to the Engineer prior to recording. The Engineer will verify the contract specifics contained on the bonds and submit them to the City Attorney for review and approval. Once approval has been received by the City Attorney, the Engineer will notify the Contractor that the bonds have been approved for recording. The Contractor shall provide copies of the recorded documents and/or the recording receipt from the County Clerk’s office to the Engineer prior to the issuance of the
"Notice to Proceed". The Contractor shall be responsible for paying all costs associated with
the recording of these documents and no separate contract payment shall be made to the
Contractor for this item. The original bond documents should be annotated RETURN TO
THE CITY CLERK, CITY OF BUNNELL and sent to: 102 W. Moody Blvd. Bunnell,
Florida 32110, after recording.

1.13 The Contractor shall provide an English speaking full time superintendent to supervise sub-
contractors and provide direction to field crews. The Engineer’s representative shall not be
responsible for providing direction to sub-contractor or field crews. The Contractor’s
superintendent shall not be verbally or physically abusive to citizens or other project
personnel. Use of “foul” language in the presence of or belligerence towards citizens or
project representatives shall be grounds for immediate replacement of the superintendent at
no cost to the owner.

1.14 The Contractor acknowledges that he is responsible for complying with all aspects of the
Florida Trench Safety Act (90-96, Laws of Fla.) effective October 1, 1990. He assumes all
responsibility and costs entailed.

1.15 The proposed conduit alignments indicated on the project plans may require adjustment in
the field due to conflicts or field conditions. Field changes shall be paid for at the contact
unit price.

1.16 Land disturbed shall have hay bales or "turbidity curtains" installed around the perimeter to
control erosion and sediment runoff where it is likely to occur during construction at no
extra cost to the Owner.

1.17 The Contractor shall submit an executed "Consent of Surety for Final Payment" form, copy
of which is included with the Contract Documents, prior to submitting a final request for
payment.

1.18 All unit pricing shall remain valid for the duration of the contract.

1.19 Florida Sales Tax on materials, as well as all other customary taxes on construction
activities, shall be paid for by the Contractor at no additional expense to the Owner.

1.20 The Contractor shall not sublet, sell, transfer, assign or otherwise dispose of the utility
portion thereof, or his right, title or interest therein, without written consent of the Owner.

1.21 Limitations on the Engineer's Responsibilities

A. Neither the Engineer's authority to act under this Paragraph nor any decision made by
him in good faith either to exercise or not exercise such authority shall give rise to
any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any
of their agents or employees or any other person performing any of the work.
B. The Engineer will not be responsible for the construction means, methods, techniques, sequences or procedures, or the safety precautions and programs incident thereto, and he will not be responsible for the Contractor's failure to perform the work in accordance with the Contract Documents.

C. The Engineer will not be responsible for the acts or omissions of the Contractor, any subcontractors, or any of his or their agents or employees, or any other persons performing any of the work.

1.22 Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

1.23 All existing improved areas disturbed by construction shall be sodded with the same type sod as the existing variety of sod encountered. Separate unit price payment or lump sum payment will be made for this work.

1.24 The Contractor shall make his own provisions for materials security. Any City provided work areas shall be returned to its original or better condition upon the completion of the project. Sodding of any disturbed areas utilized by the Contractor for work area will be accomplished by the Contractor at no additional cost to the City. Separate payment for this work will not be made and shall be included in the appropriate contract work items by the Contractor in the bid proposal.

END OF SECTION
SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Contractor will employ, and pay for services of an Independent testing Laboratory to perform testing specifically indicated on the Contract Documents or specified in the Specifications herein and may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.

2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

3. Contractor shall provide engineer with all test results as indicated herein within five (5) days of receipt.

B. Related Requirements Described Elsewhere:

1. Testing laboratory inspection, sampling and testing is required for, but not limited to the following:

   a. Excavating, Backfill and Compacting: Section 02221

   b. Paving: Section 02300

   c. Cast-in-Place and Poured Concrete: Section 03100

C. The following schedule defines the responsibility for various tests.

<table>
<thead>
<tr>
<th>Test</th>
<th>Notes</th>
<th>Paid for By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Compaction</td>
<td>Pipe Work: every 300 ft. at each lift of compaction minimum. Beneath Structures: each 500 sq.ft. lift of compaction minimum and each lift around structures.</td>
<td>Contractor</td>
</tr>
<tr>
<td>Pressure</td>
<td>As specified in Section 15050</td>
<td>Contractor</td>
</tr>
</tbody>
</table>
D. Additional Tests: The Contractor shall pay for first tests as specified herein. In the event that first test samples do not meet the applicable material specification, the Contractor shall take measures to conform the material and equipment to the Specifications. All subsequent tests shall be paid for by the Contractor.

1.02 LABORATORY TESTS

A. The materials listed below shall require advance and periodic laboratory tests as indicated, and shall be sampled in accordance with the methods of the A.S.T.M. and as directed by the Engineer. With the exception of concrete test cylinders and mixing water, duplicate advance samples of all materials requiring laboratory tests shall be submitted to the Engineer, one of which will be certified by the Engineer for submission to the testing laboratory and the other retained on the job site in suitable storage provided by the Contractor. Except as noted below, preliminary samples of materials for advance laboratory tests shall be submitted at least two weeks prior to starting delivery of such materials to the site of the project. The testing laboratory shall furnish both the Engineer and the Contractor with two copies of the reports showing the results of such tests, and the reports shall be considered as sufficient evidence of the acceptance or rejection of the quality of the materials tested. The specifications for, and the method of testing, will be found under the detailed specifications for the particular material involved. All samples shall be properly packed and clearly marked as to source and intended use.

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>TEST FREQUENCY</th>
<th>SAMPLE SIZE</th>
<th>SHIPPING CONTAINER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine Aggregate</td>
<td>Advance, first shipment then each 100 tons</td>
<td>100 lbs.</td>
<td>Canvas Sack</td>
</tr>
<tr>
<td>Coarse Aggregate</td>
<td>Advance, first shipment then each 200 tons</td>
<td>Stone or Gravel 200 lbs.</td>
<td>Strong Sack</td>
</tr>
<tr>
<td>Concrete</td>
<td>Advance test using approved materials</td>
<td>4 cylinders per mix, 2 broken at 7 days, 2 at 28 days</td>
<td></td>
</tr>
<tr>
<td>Concrete (b) Air Entrainment</td>
<td>Advance test on trial mix air entraining agent is used. Test as specified under Article 405 (e)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.03 TESTS

A. The materials listed below shall be tested at the shop or plant of, and by, the producer. Each manufacturer of such materials shall be fully equipped to carry out the tests herein designated. Upon demand of the Engineer, the manufacturer shall perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use. The Engineer shall be furnished with the certified records of reports of the results of all tests, such reports of records to contain a sworn statement that the tests have been made as specified.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>ASTM C114</td>
</tr>
<tr>
<td>Ductile Iron Pipe (Centrifugally Cast)</td>
<td>As required under ANSI A21.51-1176</td>
</tr>
<tr>
<td>Brick</td>
<td>ASTM C-32</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>ASTM A-15 &amp; A-305</td>
</tr>
</tbody>
</table>

1.04 FIELD TESTS

A. All sewers, water lines, piping and equipment shall be tested in the field in the presence of the Engineer or his authorized assistant, in the manner prescribed in the sections of these specifications pertaining to such installations. The Engineer may also perform or have performed any other field tests necessary to determine compliance with the Contract requirements. The Contractor shall furnish all necessary labor, equipment, and materials for such tests and, with the exception of the Engineer's expenses, shall bear all the cost thereof.

1.05 PAVING TESTS

A. The following tests will be made, unless otherwise stipulated by the Engineer, by a testing laboratory approved by the Engineer.
<table>
<thead>
<tr>
<th>Material</th>
<th>Test or Test Method</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subbase</td>
<td>1) AASHO T-180 (Modified Proctor Minimum 98% Density)</td>
<td>Every 300 LF</td>
</tr>
<tr>
<td></td>
<td>2) Limerock Bearing Ratio 40</td>
<td>Every 300 LF</td>
</tr>
<tr>
<td>Base</td>
<td>(Soil Cement)</td>
<td>Prior to Mixing Base</td>
</tr>
<tr>
<td></td>
<td>(1) Mix Design 350 psi @ 28 days. Mix design required 7 days in advance.</td>
<td>Every 300 LF</td>
</tr>
<tr>
<td></td>
<td>(2) Optimum Moisture content and Maximum Density (AASHTO T-134)</td>
<td>Every 300 LF</td>
</tr>
<tr>
<td></td>
<td>(3) LBR 100</td>
<td>Every 1500 sf</td>
</tr>
<tr>
<td></td>
<td>(4) Depth (6 inch minimum)</td>
<td>Every 300 feet</td>
</tr>
<tr>
<td>Paving</td>
<td>(1) Job Mix Formula. Required 7 days in advance and submit to Engineer</td>
<td>Each Job</td>
</tr>
<tr>
<td></td>
<td>(2) Bitumen Content of Mix</td>
<td>Every 2500 SY or fraction thereof</td>
</tr>
<tr>
<td></td>
<td>(3) In Place Density</td>
<td>Every 300' (left, right &amp; center)</td>
</tr>
<tr>
<td></td>
<td>(4) Marshall Field Stability Index</td>
<td>Every 1500 SY or fraction thereof</td>
</tr>
<tr>
<td></td>
<td>(5) Thickness Cores</td>
<td>Every 300' (left, right, &amp; center)</td>
</tr>
</tbody>
</table>

1.06  Basis of Payment

A. All shop tests and mill inspection shall be included in the price of the manufactured article, and no separate or extra payment will be made for such tests and inspection.

B. All laboratory and field tests will be paid for by the Contractor; he shall furnish all necessary labor, equipment and materials for such tests and, with the exception of the Engineer's expenses, shall bear all the costs thereof.
1.07 LABORATORY DUTIES: LIMITATIONS OF AUTHORITY

A. Cooperate with Engineer and Contractor; provide qualified personnel promptly on notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:
   1. Comply with specific standards; ASTM, other recognized authorities, and as specified.
   2. Determine and report on compliance with requirements of Contract Documents.

C. Promptly notify the Engineer and Contractor of material or operations which do not meet the specifications.

D. Promptly submit five (5) copies of reports of inspections and tests to the Engineer including:
   1. Date issued.
   2. Project title and Engineer’s job number.
   3. Testing Laboratory name and address.
   4. Name and signature of inspector.
   5. Date of inspection of inspector.
   6. Date of inspection or sampling.
   7. Date of test.
   8. Identification of product and Specification section.
   9. Location in project.
   10. Type of inspection or test.
   11. Compliance with Contract Documents or not.

E. Laboratory is not authorized to:
   1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Approve or reject any portion of work.
   3. Perform any duties of the Contractor.

1.08 CONTRACTOR’S RESPONSIBILITIES

A. Cooperate with laboratory personnel; provide access to Work and manufacture’s operations.
B. Secure and deliver to the laboratory adequate representational samples of materials purposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be for concrete, and other materials mixes which require control by the testing laboratory.

D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacturer of fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators that in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.

E. Furnish incidental labor and facilities:

1. To provide access to Work to be tested.

2. To obtain and handle samples at the Project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

5. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01568
TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as required by Rules and Regulations and permit conditions.

2. Temporary erosion controls include, but are not limited to, grassing, mulching, setting, watering and re-seeding on-site surfaces and soil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Owner.

3. Temporary sedimentation controls include, but are not limited to silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Owner.

4. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

B. Related Work Described Elsewhere:

1. Excavation, Backfill, and Embankment: Section 02100

2. Grassing, Mulching and Sodding: Section 02900.

PART 2 - PRODUCTS

2.01 EROSION CONTROL

A. Sodding is specified in Section 02900.

B. Netting shall be fabricated of material acceptable to the Owner.
2.02 SEDIMENTATION CONTROL

A. Bales shall be clean, seed-free cereal hay type.
B. Netting shall be fabricated of material acceptable to the Owner.
C. Filter stone shall be crushed stone which conforms to Florida Department of Transportation (FDOT) specifications.
D. Concrete block shall be hollow, non-load bearing type.
E. Concrete shall be exterior grade not less than 1-inch thick.

PART 3 - EXECUTION

3.01 EROSION CONTROL

A. Minimum procedures for grassing are:
   1. Scarify slopes to a depth of not less than 6 inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
   2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
   3. Apply mulch loosely and to a thickness of between 3/4 inch and 1-1/2 inches.
   4. Apply netting over mulched areas on sloped surfaces.
   5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.02 SEDIMENTATION CONTROL

A. Install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings. Hay bales which deteriorate and filter stone which is dislodged shall be replaced.

3.03 PERFORMANCE

A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the State of Florida, the Owner or Engineer, the Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

END OF SECTION
SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintain at the site for the Owner one record copy of:
   1. Drawings
   2. Specifications
   3. Addenda
   4. Change Orders and other modifications of the contract
   5. Engineer's Field Orders or written instructions
   6. Approved Shop Drawings
   7. Field Test records
   8. Construction photographs, preconstruction videos, and pipeline videos.
   9. Preliminary as-built drawings

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.
   1. Provide files and racks for storage of documents.
   2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with CSI format with section numbers as provided herein.

C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by the Engineer.
E. As a prerequisite for monthly progress payments, the Contractor shall provide the currently updated "Record Documents" for review by the Engineer and Owner.

1.03 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

A. Label each document. "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction:

1. Depths of various elements of foundation in relation to finish first floor datum.

2. All underground piping with elevations and dimensions. Change to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe materials, class, etc.

3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. Field changes of dimensional and detail.

5. Changes made by Field Order or by Change Order.

6. Details not on original contract drawings.

7. Equipment and piping relocations.

8. Major architectural and structural changes including relocation of doors, windows, etc.

9. Architectural schedule changes according to Contractor's records or shop drawings.

a. Contractor shall provide copies of all such recordings to the Contractor’s surveyor for incorporation into the preliminary and final as-built drawings.
D. Specifications and Addenda: Legibly mark each section to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.

2. Changes made by Field Order or by Change Order.

E. Shop Drawings (after final review and approval): Provide four (4) sets of record drawings for each process; equipment, piping, electrical system and instrumentation system.

1.05 PIPING “AS-BUILTS” (CITY ADDITIONAL REQUIREMENTS)

A. As-built drawings are required for all systems to be accepted by the City. As-builts will be prepared by a surveyor or an engineer registered in the State of Florida. As-builts will be drawn at scale of 1” = 100’. Areas requiring additional detail may be enlarged as necessary. Rights-of-way, easements, and lot lines will be accurately shown. Lots, block numbers, and street names will be included. As-builts shall be prepared by an AutoCAD (Version 14 or higher) compatible program or DFX file. A diskette with that file will be provided to the City.

B. One reproducible print or computer diskette and three (3) signed and sealed blue-line prints are required. After the surveyor or engineer has certified the locations, the engineer will certify on F.D.E.P. Form 62-555.910(9) that the system depicted on the as-built drawing was constructed in substantial conformance with approved plans and will function as intended. The as-built drawings shall contain the following information:

1. Location of all valves, service lines, fittings and fire hydrants using at least two (2) ties to permanent points (manholes, property corners, curbs, or stormwater inlets). An acceptable station and offset system may be used for service lines and fittings only.

2. Location of mains from property easement lines or edge of pavement at intervals 300 feet.

3. Elevations to the top of the water line at intervals 300 feet and at all drainage and sewer main crossings. Benchmark to be shown on as-builts.

4. Separation between reclaimed water or force mains and water mains if they are installed within 10 feet of water mains.

5. Water main material and distance of mains from buildings or structures within 20 feet of the water main.
6. Distance from hydrant to hydrant valve.

7. Pertinent easement information.

8. Certification by the surveyor or engineer accepting responsibility for accuracy of information supplied on the as-built drawings and a statement certifying that all mains are within easements and/or public rights-of-way. The name “CITY OF BUNNELL” must appear on all as-built survey information.

1.06 SUBMITTAL

A. Accompany each submittal with transmittal letter in duplicate, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. Title and number of each Record Document.
   5. Signature of Contractor of his authorized representative.

B. Preliminary As-built Drawings: The Contractor shall submit to the Engineer two (2) paper copies of preliminary as-built drawings prepared and signed/sealed by the Contractor’s surveyor with each monthly progress payment request. Preliminary as-built drawings shall conform to the requirements of final as-built drawings and shall represent the completed work to date. Preliminary as-built drawings shall include all work which the Contractor is requesting to be paid for.

C. Final As-built Drawings: Upon project closeout and as a prerequisite to the final pay request, the Contractor shall submit to the Engineer final as-built drawings prepared and signed/sealed by the Contractor’s surveyor and conforming to the Minimum Technical Standards per Chapter 61G17-6, Florida Administrative Code, pursuant to Section 472.027 of the Florida Statutes. The Engineer shall supply the Contractor copies of AutoCad files for the Contractor’s use in the as-built drawing preparation. Final as-built drawings shall include all work which the Contractor is requesting to be paid for. The final as-built drawing submittal shall include:

   1. Two (2) sets of paper plans signed and sealed by a professional land surveyor licensed in the State of Florida and CD(s) or other media containing AutoCad, version 14, drawing files.
2. AutoCad drawing files shall include as-built information on layers separate from the original drawing layers and shall be named descriptively to represent the as-built features. (i.e.-Layer “wat ab” and “wat ab txt” for water as-built linework and text, respectively.) Drawing entities are to be shown on the correct layer. All as-built entities shall have color and line type set “by layer”. Text sizes shall be relative to the plotted scale. Additional details or exploded views shall be included to accurately and fully represent the as-built conditions.

3. Certification by surveyor that the as-built information shown is accurate and that all improvements shown were constructed within or on public rights-of-way, easements or property specifically owned by the Owner. Certification shall be to the Owner, Engineer and St. Johns River Water Management (if applicable.)

4. No linework and text shall be erased from the original design (construction) drawings during the as-built drawing preparation. Original linework or text shall be circled if accurate or stricken (not erased) if not with the accurate information noted/shown. New linework and text shall be provided to accurately show the as-built information for the constructed improvements. Revisions to design dimensions alone will not be permitted.

5. Pressure Pipeline Improvements: For utility improvement projects, horizontal locations of the constructed pipelines with respect to the right-of-way lines or other readily visible, permanent features at 100 foot minimum intervals and at critical locations such as road intersections shall be shown. For treatment plant and pump station improvements, horizontal locations shall be provided at 20 foot intervals. Vertical locations of the constructed pipelines by elevation of centerline of pipe for above ground/exposed pipe or with respect to finished grade over buried pipe. (i.e. final cover) For underground piping, all valves, blow-offs, stub-outs, pigging stations, fire hydrants, backflow preventers and services shall be located horizontally in relation to readily visible, permanent features with three way horizontal dimensions less than 100 feet, each. Three way dimensions to all buried fittings on treatment plant and pump station improvement projects shall be provided. If adequate features are not available, a station and offset dimensioning system can be used if prior approval is obtained from the Engineer. For above ground/exposed pipe, as-built dimensions between fittings or flanges shall be provided. Separations between “sanitary hazards” to potable water and reclaimed water mains per FDEP shall be shown.
6. Gravity Pipeline Improvements: Show elevations for all inverts, manhole tops, inlet throats/weirs, grate tops, etc. Show size and type of each structure. As-built length, size and type of pipes between the structures shall be shown. All service laterals and cleanouts shall be located horizontally to readily visible, permanent features with three way horizontal dimensions less than 100 feet, each. If adequate features are not available, a station and offset dimensioning system can be used if prior approval is obtained from the Engineer. A labeling and dimension table scheme is recommended for the three way or station/offset dimensioning. (i.e.-Constructed feature labeled as “A”, permanent feature labeled as “B”, “A”- “B” dimension shown in table for distance measured between the two. Use continuous labeling and complete single table per plan sheet.) Separations between gravity “sanitary hazards” to potable water and reclaimed water mains per FDEP shall be shown.

7. Roadway Improvements: Elevation, size and location of swales, ditches, gutter flow-lines, edge of pavement, and road crown on both sides of the road if applicable shall be provided at 100 foot minimum intervals and at critical areas such as intersections and inlets/flumes. As-built points of curvature, tangent and vertical intersection, along with radii of road alignment, intersecting streets and driveways and other alignment information shall be provided.

8. Stormwater Improvements: The limits, slopes and bottom depths of stormwater ponds, swales and other retention areas shall be provided. All stormwater piping information shall conform to the Gravity Pipeline Improvement requirements. Size, type, material, and elevations of all stormwater structures, including appurtenances such as weirs, orifices, skimmer plates, etc. shall be shown. As-built information shall conform to St. Johns River Water Management District requirements.

9. Treatment Facility Improvements: Location, size, number, and type of treatment equipment and structures shall be shown. Applicable requirements of as-built information listed herein for similar improvements shall be required.

10. Building Improvements: Finished floor elevations, ceiling heights, building locations, wall opening dimensions, equipment (electrical, mechanical, plumbing) locations, etc. shall be provided. Change of material shall be specifically noted as such.

11. Landscaping Improvements: Number, type, size, and general location of installed plant material shall be provided. Change of material shall be specifically noted as such. Location of irrigation meters, services, manual valves, automatic valves, controllers, rain shut off switches, etc. shall be shown. Changes to the designed irrigation system shall be shown.
12. Other Improvements: Changes from the original design of other improvements such as electrical, mechanical and structural improvements shall be noted as such on the as-built drawings with the size, number, type and location of the constructed/installed improvements noted.

13. Contractor may be required to reimburse the Owner for services rendered by the Engineer for review of multiple resubmittals per SC-6.17, 1. of Section 00800, Supplementary Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01740
WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Compile specified warranties and bonds as specified in these Specifications.
2. Co-execute submittals when so specified.
3. Review submittals to verify compliance with Contract Documents.
4. Submit to Engineer for review and transmittal to Owner.

B. Related Work Described Elsewhere:

1. Instructions to Bidders: Bid Bonds
2. Performance Bond and Payment Bond
3. Labor and Material Payment Bond: Section 00645

1.02 SUBMITTAL REQUIREMENTS

A. Assembly warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: Two each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product of work item
2. Firm, with name of principal, address and telephone number
3. Scope
4. Date of beginning of warranty, bond or service and maintenance contract
5. Duration of warranty, bond or service maintenance contract.
6. Provide information for Owner's personnel:
   a. Proper procedure in case of failure.
   b. Instances which might affect the validity of warranty or bond.
7. Contractor, name of responsible principal, address and telephone numbers.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets

B. Format:

1. Size 8½” x 11 inches, punch sheets for standard three-post binder.
   a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
   a. Title of Project
   b. Name of Contractor

C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of two inches.

1.04 WARRANTY SUBMITTALS REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. Manufacturer's warranty period shall be concurrent with Contractor's for one (1) year, unless otherwise specified, commencing at the time of final acceptance by Owner.

B. Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment which has at least a 1 hp motor or which lists for more than $1,000. Engineer reserves the right to request warranties for equipment not classified as major. Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.

C. In the event that the equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at the time of Owner acceptance, the Contractor shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two-year warranty from the manufacturer shall not relieve the Contractor of the one-year warranty starting at the time of Owner acceptance of the equipment.

D. Owner shall incur no labor or equipment cost during the guarantee period.
E. Guarantee shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by manufacturer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This Section includes furnishing all labor, materials, equipment and incidentals required for selective site demolition.

2. This Section provides for the complete or partial removal and disposal of specified existing structures, foundations, piping, mechanical, and miscellaneous appurtenances encountered during construction operations.

3. This Section specifies certain activities necessary to maintain and facilitate operation during and immediately following construction and do not purport to cover all the activities necessary. The Contractor shall exercise due care for the existing system operation and shall maintain continuous operation of the existing lift station and the overall wastewater service and minimize operation inconvenience. In accordance with this requirement, a Demolition and Removal Plan shall be developed in accordance with Paragraph 1.06.

4. Demolition includes:

a. Demolition, complete or partial removal and cutting of existing piping and/or structures as required for the new construction.

b. Disposal of salvageable and excess unacceptable material as specified below.

c. Complete removal and off-site disposal of excess and unacceptable materials.

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

6. Specific piping and/or structures to be partially or completely demolished are identified in the Construction Drawings.
1.02 PERMITS AND NOTICES

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

B. Notices: Contractor shall issue written notices of planned demolition to Owner, Engineer and companies or local residents located within the project site. Notices shall be received with at least 48 hours in advance of the planned demolition activity.

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

1.03 CONDITIONS OF PIPING AND/OR STRUCTURES

A. The Standard Building Codes shall control the demolition, modification or alteration of the existing piping and structures.

B. No blasting shall be done on site. The Contractor shall not bring or store any explosives on site.

1.04 DISPOSAL OF MATERIAL

A. Salvageable material shall become the property of the Owner, if the Owner requests any specific item. The Contractor shall dismantle all materials to such a size that it can readily handled, and deliver any of this salvageable material requested by the Owner to a storage area designated by the Owner.

B. The following materials are examples of the type that the Owner may maintain ownership of:

1. Valves greater than 3 inches in diameter.

2. Water meters on service connections.

C. Any materials that the Owner rejects shall become the Contractor’s property and must be removed from the site.

D. Concrete, concrete block and unsalvageable bricks shall be hauled to a waste disposal site by the Contractor.

E. All other material shall be hauled to a waste disposal site by the Contractor.
F. The storage of or sale of removed items on the site will not be allowed.

1.05 SUBMITTALS

A. Submit to the Engineer for approval, two (2) copies of the proposed Demolition and Removal Plan for the modifications as shown on the Drawings or as specified herein prior to the start of work. Include in the schedule the coordination of shutoff, capping and continuation of utility service as required. The Demolition and Removal Plan shall include as a minimum, the following:

1. A detailed sequence of demolition and removal work to insure the uninterrupted operation of the Owner’s utility systems, and the expeditious completion of the Contractor’s work.

2. Evidence (by signature) of approval by the Owner of the work plan.

B. Before commencing demolition work, all modifications necessary to bypass the affected portion of the system will be completed. Contractor shall coordinate with the residential Owner’s personnel to determine the locations of the affected valves, fittings and water meters.

C. The above procedure must be followed for each individual demolition operation.

1.06 TRAFFIC AND ACCESS

A. Conduct demolition and modification operation, and removal of piping and debris to ensure minimum interference with roads, streets, and sidewalks both onsite and off-site and to ensure minimum interference with occupied or used facilities.

B. Contractor shall at all times maintain safe and convenient access to the existing site.

C. Do not close or obstruct streets or walks without permission from the Owner and Engineer. Provided alternate traffic routes around closed or obstructed access ways.

1.07 DAMAGE

A. Promptly repair damage caused to adjacent facilities by demolition operations at no cost to the Owner.

1.08 UTILITIES

A. Maintain existing utilities to remain in service and protect against damage during demolition operations. This may include the installation/construction of bypass piping where necessary.

B. Do not interrupt existing utilities serving occupied or used facilities, except when
authorized by the Owner and Engineer. Provide temporary services during interruption to existing utilities as required by the Owner.

C. The Contractor shall cooperate with the Owner to shut off utilities serving the existing facilities as required by demolition operations. If service must be cut off to existing customers, the Owner must have at least three (3) days notice to make necessary preparations.

D. 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 of all public and private utilities or services under this jurisdiction of utility companies.

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

1.09 POLLUTION CONTROL

A. 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 or work. Comply with the governing regulations.

B. Clean structures and improvements of all dust, dirt and debris caused by demolition operations as directed by the Engineer. Return areas to conditions existing prior to the start of work.

1.10 QUALITY CONTROL

A. Protect all existing materials and equipment to be salvaged or reused from damage.
B. Cap or plug all lines to be abandoned.
C. Leave all exposed ends of all pipe covered and safe.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition and removal of the existing facilities will be in accordance with the approved Demolition and Removal Plan as specified in Paragraph 1.06 of this Section. The Contractor is solely responsible for construction and demolition sequencing of the Work.
3.02 REMOVAL OF EXISTING PIPING AND APPURTENANCES

A. Subject to the constraints of maintaining the existing systems in operation; existing piping and appurtenances not necessary for the operation of the new system shall be removed as shown or indicated on the Drawings.

B. All piping and appurtenances shall be cleaned, flushed and drained. Equipment to be retained by the Owner as specified in Paragraph 1.05 above shall be dismantled sufficiently to permit thorough cleaning and draining. All valves shall be left open. All abandoned piping shall be capped and sleeves and openings remaining after removal of the existing equipment, piping, and appurtenances shall be plugged and sealed as shown on the Drawings.

C. All water meters on residential service connections located within the right-of-way that have not been relocated and connected to the new service lines shall be removed and given to the Owner.

3.03 STRUCTURES TO BE COMPLETELY DEMOLISHED

A. Existing structures shall be completely demolished as shown on the Drawings. Structures shall be demolished to make room for construction of new facilities, unless otherwise shown on the Drawings. All demolished material and equipment shall be removed from site.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE

A. The work covered by this section and required by this Contract includes the completion of all excavation, backfilling and embankment to the lines and grades indicated by the drawings, as further specified below, and necessary to the following operations:

1. Stripping, storing and replacing topsoil;
2. Excavation and backfill for pipe trenches;
3. Excavation and embankment for road, grading and drainage of the site;
4. Excavation and backfill for buildings and structures; and
5. Borrow excavation.

1.02 CHARACTER OF MATERIAL.

A. The Contractor must satisfy himself regarding the character and amount of loam, clay, sand, quicksand, muck, gravel, rock, water and all other material to be encountered in the work to be performed.

1.03 DESCRIPTION

A. The Contractor shall excavate, protect and backfill all foundations, trenches, tunnels and other excavations that may be necessary for completing the work to be done under this Contract. All excavation shall be in open cuts, except where and to such extent as the Engineer may authorize or direct that the same be done in tunnel, or where such is specified in the Special Requirements or Contract drawings. Trenches may, in general, be excavated and backfilled either by machinery, or by hand as the Contractor may elect; provided, however, that the Engineer shall be empowered, wherever he shall decide that such necessity exists, to direct that hand excavation by employed; and, provided, further that backfilling by hand shall be done to the extent hereinafter specified. The Contractor shall have not claim for extra compensation due to the fact that hand, instead of machine, excavation may be necessary from any cause whatever.

B. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the lines and grades or depths indicated by the drawings, as specified herein, or as directed by the Engineer. Embankments shall be prepared in accordance with the Specifications, and as necessary to bring the ground surface to the subgrade elevation for roads and to finished grade elevations for other areas as shown on the drawings, or directed by the Engineer. All excavated material not
required for backfill or embankment shall be removed and wasted or otherwise disposed of as directed or specified.

C. The term "subgrade" as used herein shall have the meaning given below:

1. The bed of a trench prepared as specified to receive pipes or other conduits;
2. The area upon which the lower surface of roadway paving, walks, gutters, or curb rests;
3. The surface of excavation or embankment areas prepared to receive topsoil; and
4. The areas upon which rest the planned bottom of footings, foundations, or slabs.

PART 2 - MATERIALS

2.01 TOPSOIL

A. Stripping. The area from which topsoil is to be stripped and the locations where it is to be stored shall be as shown on the drawings or as specified below. The topsoil shall be stripped to a depth of not less than six (6) inches. On all areas where any type of grading is to be performed, including the areas within the lines of buildings and structures, the topsoil shall be carefully removed and spread either on areas already graded or prepared for topsoil, or in stockpiles conveniently located to the areas which are later to receive application of topsoil.

B. Spreading. On areas intended to receive topsoil, the compacted subgrade shall be scarified to a depth of two (2) inches for bonding topsoil with subsoil. The topsoil shall then be evenly spread, compacted and graded to the finished elevations shown on the drawings or as specified by the Engineer. Compaction shall be effected by a single pass of an approved roller.

2.02 REMOVAL AND STORAGE OF MATERIAL

A. In locations where the working space is limited, the material excavated from the first one hundred (100) feet of any trench, or from such additional length as may be required, shall be taken order of the Engineer, be removed at the Contractor's own cost and expense, as soon as excavated. The materials subsequently excavated shall be used to refill the trench. In no case will the Contractor be allowed to cast excavated material beyond curb of right-of-way lines, or on sidewalks or lawns, and the failure or refusal of the Contractor to comply with this requirement shall be sufficient cause for the Engineer to stop all work under the Contract.
B. In case more material is excavated from any trench than can be backfilled over the completed sewer or can be stored within the limits of the right-of-way, leaving space for the traffic and drainage as herein provided, the excess material shall be removed to some convenient place, provided by the Contractor. The Contractor shall at his own cost and expense bring back as much of the material so removed, as may be required to properly backfill the trench, if of the proper kind; or, if so directed by the Engineer, the Contractor shall, at his own cost and expense, furnish such other suitable material as may be necessary.

C. When it is necessary to haul soft or wet material over the streets, the Contractor shall provide suitable tight vehicles, or a pattern approved by the Engineer for this purpose.

2.03 SHEETING, BRACING AND SHORING

A. The Contractor shall furnish the material for, and do all timber shoring, bracing and sheeting necessary to perform and protect the excavation, and as required by the Engineer to protect the work, other structures, the public, and the Contractor's employees. If trench protection is necessary, per OSHA requirements, the Contractor shall account for the anticipated expense in the appropriate bid item, or in the unit cost for pipe installed, or a combination of both. If the Engineer deems that sheeting, bracing, or shoring is necessary, it shall be supplied by the Contractor at no additional expense to the Owner. Such sheeting, etc. may be removed as the work progresses, but where, in the opinion of the Engineer, damage may result through removal; it shall be left in place with payment therefore made as hereinafter provided. The right of the Engineer to order sheeting, etc. left in place shall not render the issuance of such order obligatory on the part of the Engineer.

B. All sheeting, etc. shall be arranged so that it may be withdrawn, as the trenches are backfilled, without injury to the pipe and its appurtenances, and without injury to or settlement of adjacent structures and pavements. All voids caused by withdrawal shall be immediately filled with sand or other satisfactory material and compacted by ramming or other method satisfactory to the Engineer.

C. No timber sheeting, bracing or shoring shall be left within eighteen (18) inches of any natural ground surfaces or within twelve (12) inches of the subgrade of any rigid or flexible type pavement, or railroad roadbed. In any trench shoring system no vertical member shall remain directly over the pipe and no horizontal member shall remain within twelve (12) inches of any pipe. After backfilling is started, no sheeting shall extend below the horizontal diameter of the pipe without the Engineer's approval. Sheetimg left in place shall be cut off at such point as the Engineer may order, and the portions cut off shall be removed from the work.
D. If the Engineer determines that the material furnished is not of proper size or quality, or not properly placed, the Contractor shall furnish and place other and satisfactory material in an acceptable manner, and shall not be entitled to additional compensation for such corrective work.

PART III - EXECUTION

3.01 ORDER OF WORK

A. The Contractor shall submit a progress schedule as specified in Article 2.40 and shall carry on his work in strict accordance therewith. Deviations from the progress schedule may be made only with the approval of the Engineer.

B. Manholes shall be constructed either at the same time as the main sewer or immediately after its completion.

3.02 SEWER LINES AND GRADES. Sewer lines and grades shall be laid out and maintained during construction in the following manner.

A. Prior to the commencement of trench excavation, the Contractor shall prepare and submit to the Engineer for approval, detailed cut sheets provided by the Contractor's surveyor. The surveyor shall be registered in the State of Florida. Cut sheet shall show; the beginning and ending of manholes; the distance between manholes; the grade, size and type of line, the depth of cut; etc. The form of cut sheets shall be satisfactory to the Engineer. All expense for the preparation of cut sheets shall be borne by the contractor and be included in the unit price per foot of pipe. Cut sheets must be approved by the Engineer in writing before pipe laying operations may be permitted. It shall be the responsibility of the Contractor to prepare cut sheets far enough in advance of his anticipated trenching schedule so that avoidable delay in the work will not occur.

B. Before beginning the excavation for any run of main sewer, the Contractor's forces, under the direction of the Engineer, shall:

1. Set control points for line and grade as given on the Drawings or as otherwise determined by the Engineer. In unpaved or unsurfaced areas, these points shall be placed on the top of stakes securely driven into the ground. In paved areas, there may be spikes driven into the paving or crosses cut into the paving, and in either case, enclosed in a painted circle. Stakes or points shall be sufficiently offset from the centerline so as to be undisturbed during the excavation and pipe laying operations. The offset shall be on the side of the centerline opposite to that on which excavation will be thrown.

2. As the rough excavation is completed, the Contractor's surveyor shall place grade or batter boards of finished, straight lumber across the trench opposite each stake or point. The grade boards shall be securely supported so as not to be subject to accidental displacement. The top of each board shall be leveled
and set at the same distance above the sewer invert. A nail shall then be driven into the top of each board on the centerline of the sewer and each nail connected by a string line pulled taut.

3. The preparation of the final subgrade and the pipe laying shall then proceed in the manner specified herein, beginning at the manhole having the lower invert and working upgrade and using the string line as control for maintaining sewer grade and horizontal alignment. A straight wooden pole suitably marked and with a right-angled offset at the bottom to project past the bell of the pipe and rest upon the pipe invert, shall be used to check the vertical distance from string line to invert.

C. The use of laser beams shall be acceptable as a method of controlling pipe alignment and grade.

3.03 WIDTH AND DEPTH OF TRENCHES

A. From the subgrade elevation to an elevation at least twelve (12) inches above the top of the outside barrel of the pipe, the banks of trenches in all cases shall be excavated to vertical lines, and the trenches shall be not less than twelve (12) inches nor more than sixteen (16) inches wider nor more than eight (8) inches in width is provided on each side of the barrel of the pipe. If sheeting is required, the foregoing dimensions shall be applicable to the inside faces of the sheeting.

B. From a point twelve (12) inches above the top of the outside barrel of the pipe to the surface, the banks of trenches in all streets, roads or highways, paved or unpaved, shall be kept as nearly vertical as possible, and in no case shall the width of trench at the top exceed the outside diameter of the pipe plus forty (40) inches. If the specified maximum width of trench cannot otherwise be maintained, the Contractor shall install temporary sheeting at his own cost and expense. Where sewers are to be constructed on rights-of-way or easements in open country, the specified maximum width of trench at the top may be exceeded only if the construction is kept entirely within the limits of the easements or rights-of-way and can be carried on without damage to adjoining property.

C. Except at locations where excavation of rock or unsuitable material is required, care shall be taken not to excavate below the depths specified, when rock is encountered, it shall be removed to a depth six (6) inches below the outside bottom of the pipe at the barrel. When the material encountered at subgrade is unstable, it shall be removed from under the pipe and on each side of the pipe for a distance of one (1) diameter of the pipe. Such rock or unsuitable material excavation below subgrade shall be backfilled with moist clay, sand, bankrun gravel, or other suitable material compacted to the satisfaction of the Engineer, and the bed thus formed shaped as required above. In rock excavation, if trenches are shattered by blasting below the lines of excavation specified herein, the trench shall be refilled to subgrade with sand, well tamped earth, or concrete, if required by the Engineer, at the Contractor's expense. If earth trenches
are excavated beyond the specified depths, they shall be backfilled to the proper grade with suitable, thoroughly tamped material at the expense of the Contractor.

3.04 PREPARATION OF FOUNDATION

A. In earth trenches, the bottom thereof shall be carefully rounded to fit the lower ninety degrees (90°) of the circumference of the pipe, i.e., so that one-fourth of the external circumference of the pipe will rest firmly on the undisturbed soil. Bell-holes shall be excavated to insure that the barrel of the pipe will rest for its entire length upon the trench bottom.

B. Bell-holes shall be properly cut to provide free support of the pipe barrel and shall be directed by the Engineer. All irregularities and cavities, either in earth or rock excavation, in the bottom of trenches or tunnels, shall be filled up to a level which will support ninety degrees (90°) of the lower pipe circumference with selected material free from large gravel, rocks and stones, firmly compacted before pipe lines are laid therein.

C. Where, in the opinion of the Engineer, the ground does not afford a sufficiently firm foundation, the Contractor shall construct a timber foundation, or shall excavate the trench to such increased depth as may be directed, and then shall bring up the bottom of the trench to the required level and form with such material and in such manner as the Engineer may direct.

3.05 CONCRETE CRADLE AND ENCASEMENT

A. The profiles generally indicate the approximate vertical limits where concrete cradle and encasement are necessary to support the anticipated loads on completed sewers for the widths of trench as required for each size and class of pipe, based on the crushing strength of the pipe.

B. The Contractor is warned that if the trench widths or clearances between pipe and trench walls or face of sheeting, as specified above, are exceeded, he will be required to furnish in all locations at his own expense either concrete cradle or encasement as directed by the Engineer.

C. It is anticipated that subsurface conditions may require a cradle for a portion of the project to provide an adequate foundation, even though the ultimate anticipated load on the pipe is less than the minimum crushing strength for sand bearing. The Contractor shall place the cradle or encasement at the location, and of the materials, as directed and required by the Engineer. The Contractor will not be paid for any cradle beyond the required widths of trench.

D. All excavation made beyond the required limits shall be at the Contractor's expense.
3.06 LENGTH OF OPEN TRENCH

A. The Engineer shall have the right to limit the amount of trench opened in advance of pipe laying and the amount of pipe laid in advance of backfilling, but in no case, except when leakage tests are required by the Engineer, shall these amounts exceed three hundred (300) feet and one hundred (100) feet, respectively. Trench excavation shall be fully completed, except for the shaping of the bottom of the trench, at least twenty (20) feet in advance of the pipe placement and shall be kept free from obstructions, except that at the close of work at night, or at the discontinuance of work, the pipe laying may be completed to within five (5) feet of the end of the open trench.

B. The Engineer shall be empowered, at any time, to require the refilling of open trenches over completed pipe lines, if, in his judgment, such action is necessary, and the Contractor shall thereby have no claim for extra compensation even though to accomplish said refilling, he is compelled temporarily to stop excavation or other work at any place.

C. If the work is stopped on any trench, for any reason except by order of the Engineer, and the excavation is left open for an unreasonable length of time (in the opinion of the Engineer) in advance of construction, the Contractor shall, if so directed, refill such trench at his own cost and shall not again open said trench until he is ready to complete the structure therein.

3.07 ACCOMMODATION OF TRAFFIC

A. Streets shall not be unnecessarily obstructed and, unless the Engineer, in writing, shall authorize the complete closing of the street, the Contractor shall take such measures at his own expense as may be necessary to keep the street or road open and safe for traffic.

B. The Contractor shall construct and maintain without extra compensation such adequate and proper bridges over excavations as may be necessary or as directed for the safe accommodation of pedestrians or vehicles. The Contractor shall furnish and erect without cost to the Owner substantial barricades at crossings of trenches, or along the trench, to protect the traveling public.

C. The Contractor shall not obstruct fire hydrants.

D. The roadway on one side of the line of work shall be kept open at all times.

E. The streets, crosswalks and sidewalks shall be kept clean, clear and free for the passage of vehicles or pedestrians, unless otherwise authorized in writing by the Engineer. A straight and continuous passageway on sidewalks and over crosswalks, at least three (3) feet in width, shall be preserved free from all obstruction.
F. Where deemed necessary, such additional passageway as may be directed shall be maintained free from obstructions.

G. In narrow or congested streets or alleys, when so directed, the Contractor shall complete his work up to a point designated by the Engineer before opening the work ahead, in order to give access to garages and other places. The Contractor shall in all cases so arrange his work as to cause the least inconvenience to property owners consistent with the proper precaution of the work as determined by the Engineer.

3.08 ACCOMMODATION OF DRAINAGE

A. Gutters, sewers, drains and ditches shall be kept open at all times for surface drainage. No damming or ponding of water in gutters or other waterways will be permitted, except where stream crossings are necessary and then only to an extent which the engineer shall consider necessary. The Contractor will be responsible for all clean-up to existing utilities caused by their activities.

B. The Contractor shall not direct any flow of water across or over pavements except through approved pipes or properly constructed troughs and he shall, when so required at his own expense and cost, provide pipes or troughs of such sizes and lengths as may be required and place the same as directed.

C. The grading in the vicinity of sewer trenches shall be controlled so that the ground surface is properly pitched to prevent water running into trenches.

3.09 PUMPING

A. The Contractor shall keep all excavations free from water, at his own expense, while structural work is in progress, and to such extent as may be necessary while excavation work along is being carried on.

B. The Contractor shall build all dams and other devices necessary for this purpose, including lowering the water table below trench bottom by well points and pumping, and provide and operate pumps of sufficient capacity for dewatering the excavations.

C. He shall provide for the disposal of the water removed from excavation in such manner as shall not cause injury to the public health, to public or private property, to the work of other Contractors, to any portion of the work completed or in progress, or produce any impediment to the use of the highways, roads, lanes, and streets by the public.

D. Any dewatering required shall be performed at the Contractor's expense. Payment for dewatering shall be included in the Contractor's bid prices for pipe or other structures requiring dewatering for installation. If holes made for installation of well points are installed in a roadway, shoulder, or under a structure, these holes shall be filled with lean grout prior to backfill and compaction. Any permits needed for dewatering shall be obtained and paid for by the contractor.
3.10 EMBANKMENT

A. Where embankment is necessary to support the foundations of the pipe or structure, it shall be made to the height, width and slopes shown on the drawings, or as directed. The entire embankment, or such portion thereof as may be deemed necessary by the Engineer, shall be made prior to the construction of the sewer, structure, or the foundation thereof, at such time and in such order as the Engineer may direct; and the embankment, sewer, or structure, and appurtenances, which may be laid thereon or therein, shall be maintained by the Contractor, at his own cost and expense, until the completion of the period of one (1) year from and after the date of the Certificate of Completion and Acceptance.

B. After carefully grubbing and clearing the ground, removing all loose rock and stone, and all muck and improper material, to such a depth as the Engineer may determine, the embankment shall be built up of good loam, gravel or sand, or other selected and approved material, free from all stone above four (4) inches diameter, and not containing in any place a proportion of stones exceeding one (1) part stone to three (3) parts earth.

C. In cast material which is unsatisfactory for the foundation of any embankment is encountered, said material shall be removed to such depth, and for such length and width as may be directed by the Engineer. Payment for the removal of material unfit for the foundation of an embankment will be made at the price bid or stipulated per cubic yard for excavation below subgrade.

D. The material for embankment shall be deposited in layers of not more than nine (9) inches in thickness; each layer shall be separately compacted by heavy, grooved iron rollers, or where such rollers cannot be used, by heavy paver's rammers. The embankment shall be watered during rolling, if so required. No breaks or irregularities in the distribution of the material or the formation of the layers will be allowed. The whole embankment shall be carried up evenly to the height given by the Engineer in such a manner as to make a compact and solid foundation. When pipe is to be laid in a fill, the embankment shall be brought to a height of at least one (1) foot above the proposed top of the pipe before the trench is excavated. The embankment shall then be excavated to the proper form and grade, and the sewer placed thereon; after which the embankment shall be carried up to a height of not less than three (3) feet above the top of the sewer, the material being placed and rolled or rammed in layers as above described.

3.11 BACKFILLING TRENCHES

A. It is the intent of the following requirements for the backfilling of trenches to specify materials and methods which will:
1. Result in thorough compaction of the backfilled material without the displacement of the grade or alignment of the sewer line and its appurtenances, and

2. Eliminate settlement of the backfilled material.

B. If displacement of the sewer or settlement of the backfilled material does occur, it will be considered as conclusive evidence of improper workmanship or the inclusion of unsuitable materials or both, and it shall be the Contractor's responsibility, at his own expense, to remove and recompact the settled material and regrade and realign the sewer. During the course of the backfilling operation, the Engineer may, at any location of depth of trench, make tests to determine whether the Contractor's compaction operations are sufficient to meet the requirements specified below.

C. The procedure of backfilling shall be as follows:

1. After the structure, pipe, or conduit and its appurtenances have been installed or constructed, the excavation, to a height of at least two (2) feet above the top of pipe or conduit, shall be refilled with clean earth deposited in four (4) inch layers and solidly rammed down and tamped around the pipe, or conduit and under it, with mechanical tampers and proper tools made for this purpose. The operation shall be done in such manner as not to disturb the structure. The area around the pipe shall be hand-tamped.

2. The earth, to the height specified above, shall be carefully thrown in with hand shovels; under no condition shall any other means than hand shoveling, such as pushing in with heavy equipment be used.

3. The remainder of the trench, except as described below, shall then be refilled evenly to the required height in layers, each layer not to exceed six (6) inches in thickness after compaction. Mechanical tampers shall be used so as to produce a density of backfill (as determined by weight) at the bottom of each layer of not less than ninety-five percent (95%) of the optimum density of that material based upon the AASHTO T-180 modified proctor. The earth shall be properly rammed as directed, and wetted as required as the work progresses.

4. Care shall be taken to carry the fill up evenly on opposite side of the sewer, other trench excavations, and around the sides of all structures.

D. If, in the opinion of the Engineer, the material being used for backfilling is of such character that satisfactory results cannot be obtained by tamping and ramming, the Contractor shall backfill and puddle the excavations in such manner and at such times as the Engineer may direct.
E. If the material excavated is not clean earth, as above specified, the best of the materials excavated shall be used in backfilling, in position and manner as directed by the Engineer.

F. In rock trenches, selected earth, sand or gravel shall be provided and used as backfill in the manner hereinbefore described to a height of two (2) feet above the top of the sewer. The backfill for the balance of the trench in all cases shall be of good earth, sand or gravel, which may contain stores not more than six (6) inches in largest dimensions, but not in proportion exceeding twenty percent (20%) of the total volume of backfill.

G. No bulkheads, or retaining walls for the backfilling, will be allowed in the trenches over the sewer, except for temporary use.

H. Should there be a deficiency of proper material for refilling the Contractor shall furnish acceptable material at his own cost and expense.

I. No house ashes, putrescible refuse or other material of unsatisfactory character shall be used in refilling, and the Contractor shall not permit the trench to be used as a dumping ground for refuse.

J. Testing of backfill in trenches shall be performed as deemed necessary by the Engineer or his representatives; the Contractor will supply and pay for the testing.

3.12 BORROW EXCAVATION

A. In cases where the amount of embankment exceeds the amount of excavation within the limits of the site as indicated by the Drawings, and where material is not available from other sources of contracts, the Contractor shall obtain sufficient, suitable material from borrow pits located entirely beyond the limits of the site unless the Engineer gives written permission to obtain such material from an area within the site.

B. The Contractor shall notify the Engineer sufficiently in advance of borrow excavation requirements to permit the Engineer to determine necessity and to view the proposed borrow pit.

C. Borrow obtained from within the site shall be removed to uniform lines and grades satisfactory to the Engineer, and in such a manner as will not to detract from the general appearance of the improvement and shall not create unsatisfactory conditions.

D. All borrow pits shall be stripped of brush, roots, grass and other vegetation prior to removal of material for embankment purposes.
3.13 BUILDINGS AND STRUCTURES

A. Excavation.

1. All excavation for buildings and structures shall be performed in the dimensions indicated on the Drawings. If suitable bearing is not encountered at the planned footing or foundation elevations, the excavation shall be carried to such elevations as are approved by the Engineer.

2. Prior to construction of foundations, the excavation shall be inspected by the Engineer and no foundation work shall be started prior to the Engineer's approval of the excavation. Care shall be exercised to avoid excavation below the depths indicated on the Drawings or as directed by the Engineer.

3. Where excavation is made below plan elevation or below elevations directed by the Engineer. Where excavation is made below plan elevation or below elevations directed by the Engineer, through the fault of the Contractor, the excavation shall be restored to the proper elevation in the manner described for backfill below, or the heights of walls or footings shall be increased, as may be directed by the Engineer, at the expense of the Contractor.

B. Drainage.

1. Grading in the vicinity of structures shall be controlled to prevent water running into excavated areas. Any accumulation of water in excavations shall be removed by pumping or other means at the Contractor's expense.

C. Backfill.

1. After completion of footings and walls, and the removal of forms, and prior to backfilling, the excavation shall be cleaned of all trash and debris.

2. Backfill material shall consist of the excavation or other materials free from trash, lumbar or other debris. It shall be placed in horizontal layers not exceeding six (6) inches in depth, moistened if required and compacted by hand or mechanical tampers to a density to prevent excessive settlement.

3.14 RESPONSIBILITY FOR CONDITION OF EXCAVATION

A. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave-ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.
B. The failure of the Engineer to order the use of bracing or sheeting or a better quality, grade or section, or larger sizes of steel or timber, or to order sheeting, bracing, struts, or shoring to be left in place, or the failure to give orders or directions as to the manner or methods of placing or driving sheeting, bracing jacks, wales, rangers, or other members, shall not in any way or to any extend relieve the Contractor of any responsibility concerning the condition of excavation or of any of his obligations under the Contract; nor shall any delay, whether caused by any action or want of action on the part of the Contractor, or by any act of the Owner, or his agents, or employees, resulting in the keeping of an excavation open longer than would otherwise have been necessary, relieve the Contractor or from the necessity of properly and adequately protecting the excavation from caving or slipping, nor from any of his obligations under the Contract relating to injury of persons or property, nor entitle him to any claim for extra compensation.

3.15 PROTECTION OF PROPERTY AND STRUCTURES

A. The Contractor shall, at his own expense, sustain in their places, and protect from direct or indirect injury, all pipes, tracks, walls, buildings, and other structures or property in the vicinity of his work, whether above or below the ground, or that may appear in the excavation. He shall at all times have a sufficient quantity of timber and plank, chains, ropes, trench boxes, and other material and equipment, on the ground and shall use them as necessary for sheeting his excavations and for sustaining or supporting any structures that are uncovered, undermined, endangered, threatened or weakened.

B. The Contractor shall take all risks attending the presence of proximity of pipes, poles, tracks, walls, buildings, and other structures and property, of every kind and description, in or over his excavation, or in the vicinity of his work, whether above or below the surface of the ground; and he shall be responsible for all damages and assume all expense for direct or indirect injury, caused by his work, to any of time, or to any person or property by reason of injury to them, whether such structures are not shown on the Drawings.

C. Where necessary, in order to keep one side of the street or roadway free from any obstruction or to keep the material piled alongside the excavation from falling on private property outside the right of way, a safe and suitable fence shall be placed alongside the excavation.

D. In the event of encountering quicksand, subsurface streams or similar dangerous contingencies, or where passing especially heavy building or any structures which by their construction or position might bring a great pressure upon the excavations the right is reserved by the Engineer to direct that such buildings, or structures, shall be underpinned, or supported and protected, or that special sheeting shall be driven in such a manner and to such depth, as may be directed, or that only a short length of
excavation shall be opened at one time; and furthermore, if necessary, that the excavation shall be securely sheeted and braced on all sides, after the manner of a shaft, and that the permanent work shall be constructed in the same manner and the shaft backfilled before another opening is made. Any work done as above directed shall be at the cost and expense of the Contractor.

E. The Engineer reserves the right under such conditions to stop the excavation or any other part of the work, and to require the Contractor to complete the structure and the backfilling up to such a point as the Engineer may direct before proceeding further with the excavation; and the Contractor shall not thereby become entitled to demand or to receive any allowance or compensation, other than an extension of the contract time for as many days as the Engineer may determine that the work was delayed by such stoppage.

3.16  OBSTRUCTION SHOWN ON DRAWINGS

A. Certain information regarding the reputed presence, size, character, and location of existing underground structures, pipes and conduits has been shown on the Contract Drawings. There is no certainty of the accuracy of this information. The location of underground structures shown may be inaccurate and other obstructions not shown may be encountered.

B. The Contractor hereby distinctly agrees that the Owner is not responsible for the correctness or sufficiency of the information given; that in no event is this information to be considered as a part of the Contract; that he shall have no claim for delay or extra compensation on account of incorrectness of information given, or on account of the insufficiency or absence of information regarding obstructions either revealed or not revealed by the Drawings; and that he shall have no claim for relief from an obligation of responsibility under the Contract, in case the location, size or character of any pipe or other underground structure is not as indicated on the Drawings; or in case any pipe or other underground structure is encountered that is not shown on the Drawings.

C. The Contractor is solely and completely responsible for contacting utility providers and locating services to field locate existing utilities 48 hours in advance of his activities. If inadequate locations are made, or if hand-digging of "test holes" is deemed necessary, this shall be accomplished and affected by the Contractor at no additional expense to the Owner.

3.17  REMOVAL OF OBSTRUCTIONS

A. Should the position of any pipe, conduits, pole, or other structures, above or below the ground be such as, in the opinion of the Engineer, to require its removal, realignment, or change due to work to be done under the Contract, the work of
removal, realignment, or change will be done as extra work, or will be done by the Owner of the obstructions, without cost to the Contractor; but the Contractor shall uncover and sustain the structures, at his own expense, before such removal and before and after such realignment or change as constituting part of the Contract; and the Contractor shall not be entitled to any claim for damage or extra compensation on account of the presence of said structure, or on account of any delay in the removal or rearrangement of the same.

B. The Contractor shall, without extra compensation, break through and reconstruct, if necessary, the invert or arch of any sewer, culver, or conduit that may be encountered, if the said structure is in such a position that in the judgment of the Engineer, as not to require its removal, realignment or complete reconstruction.

C. The Contractor shall not interfere with any persons, firms or corporations, or with the Owner in protecting, removing, changing, or replacing their pipes, conduits, poles, or other structures; but he shall suffer said persons, firms, or corporations, or the Owner to take all such measures as they may deem necessary or advisable for the purpose aforesaid, and the Contractor shall thereby be in no way relieved of any of his responsibilities under this Contract. At railway or railroad track crossings or paralleling, any expense to which the Owner of the trackage is put in shoring up tracks, or in maintaining traffic, shall be borne by the Contractor, whether the same is billed directly to him, or the Owner. Should any such bill be unpaid by the Contractor, before final payment under the Contract is made, the Owner shall be empowered to pay said bill and retain the amount thereof, from any monies due, or to become due the Contractor.

D. Except where trees are in rights-of-way, in immediate proximity to the excavation, they shall not be cut down except by authorization of the Engineer, and the Contractor shall have no claim for the extra compensation owing to the fact that he may be required to excavate by hand, or tunnel in the vicinity of trees that may be left standing.

3.18 CHANGE OF EXCAVATION LOCATION

A. In case the Engineer shall direct that the location of a trench or other excavation be changed from that shown on the Drawings, on account of the presence of an obstruction, or from other cause, or if a changed location shall be authorized upon the Contractor's request, the Contractor shall not be entitled to extra compensation, or to a claim for damage, provided that the change is made before the excavation is begun. If, however, such change, made at the direction of the Engineer, involves the abandonment of excavation already made, such abandoned excavation, together with the necessary refill, will be classed as miscellaneous excavation. In the event that the excavation is abandoned in favor of a new location, at the Contractor's request, the abandoned excavation and refill shall be at the Contractor's expense.
B. Minor changes in alignment of pipe or other structures to accommodate the actual location of existing facilities shall be considered typical of construction activities and no additional compensation will be made for changes of this nature.

3.19 CLEANUP

A. As the trenches are filled in and the work completed, the Contractor shall immediately and at his own cost and expense remove and dispose of all surplus earth, stone or other material from the work, in such manner and at such point or points, as he may select or provide, subject to the approval of the Engineer; or he may deposit the same, either with or without rehandling, at any point or points on the line of the work covered by the Contract, if so directed by the Engineer; and shall leave all roads, sidewalks and other places free, clear and in good order. In case the Contractor shall fail or neglect to do so, or to make satisfactory progress in doing so within twenty-four (24) hours after the receipt of a written notice from the Engineer, the Owner may remove such surplus material and clear the roadways, sidewalks and other places, and the cost of said work shall be charged to the Contractor and deducted from any monies due or to become due him under the Contract.

B. All surplus earth or other material wasted on public property shall be evenly spread and left in a neat and smooth condition. All removed materials shall become the property of the Owner, if they so desire. If the Owner does not want the removed materials, surplus materials will be removed by the Contractor at no extra cost to the Owner.

C. As soon as the trenches are refilled, all surplus earth, sand or rubbish shall be removed and kept removed to a point not more than two hundred (200) feet from the head of the open trench, unless otherwise authorized by the Engineer.

3.20 MAINTENANCE OF BACKFILLED TRENCH SURFACES

A. The Contractor shall crown to such height, as directed by the Engineer, the top of all backfilled trench excavations. The Contractor shall also maintain these crowned surfaces to the satisfaction of the Engineer, without additional compensation, from the time of crowning operation to and including a period of eight (8) months beyond date of a Certificate of Completion of the work under this contract.

B. The Contractor shall be responsible for any injury or damage resulting from lack of required trench maintenance during the prescribed maintenance period. If the Contractor does not satisfactorily provide specified maintained surfaces or begin repairs of such surfaces when needed, within twenty-four (24) hours after written notice from the Engineer, such work may be done by the Owner and the cost thereof charged against the Contractor.

END OF SECTION
SECTION 02900A
GRASSING, MULCHING AND SODDING

PART I - GENERAL

1.01 WORK INCLUDED

A. The work specified in this section consists of grassing, or of grassing and mulching on slopes, shoulders and other areas. The work of grassing shall include seeding and fertilizing; also watering as required. Any of the items of work covered by this section may be eliminated from the contract, at the discretion of the Engineer. Sodding is included herewith and shall conform to the lines and grades as shown on the plans.

PART II - MATERIALS AND EQUIPMENT

2.01 MATERIALS AND EQUIPMENT

A. The materials used for the work in this section shall conform to the requirements hereinafter specified.

2.02 SOD

A. Sod shall be well matted with roots. St. Augustine shall be used in residential areas. Bahia shall be used in the right-of-way areas, not covered by St. Augustine grass.

B. The sod shall be taken up in commercial-size rectangles, preferably 12-inch by 12-inch, except where 6-inch strip sodding is called for.

C. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh and uninjured, at the time of planting. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted. The sod shall be approved by the Engineer before placing.

D. Source Requirements for Sod and Mulch. No mulch material or sod shall be used which is not certified as being free of the imported fire ant, and before any mulch or sod is brought to the project, the Contractor will be required to furnish the Engineer a written certification and clearance, from pest control officials of either the State or the Federal Department of Agriculture, verifying that the materials are being obtained from an area outside of the zone of quarantine of the imported fire ant, or that they are free of the imported fire ant.
2.03 WATER

A. The water used in the grassing operations may be obtained from the reclaimed water system.

B. The water shall be free of excess and harmful chemicals, acids, alkalis, or any substance which might be harmful to plant growth or obnoxious to traffic.

C. Salt water shall not be used.

2.04 EQUIPMENT

A. Fertilizer Spreader

1. The device for spreading dry fertilizer or for spraying liquid fertilizer shall meet the approval of the Engineer.

B. Seed Spreader.

1. The seed spreader shall be an approved mechanical head spreader or other approved type of spreader and may be integral with the cultipacker roller equipment specified below.

C. Equipment for Cutting Mulch into Soil.

1. The mulching equipment shall be a rotovator, or other equipment determined by the Engineer to be equally suitable for cutting the specified materials uniformly into the soil and to the required controlled depth.

2. Harrows will not be allowed.

D. Rollers

1. A cultipacker, traffic roller, or other roller approved by the Engineer, will be required for rolling the grassed and mulched areas.

E. Water-Metering Devices

1. The vehicle used for applying the water to the grassed areas shall be equipped with an approved metering device installed at such point on the vehicle as to measure the water at the time of its being applied to the grassed areas.
PART III - EXECUTION

3.01 TIME OF BEGINNING OPERATIONS

A. Whenever a suitable length of roadway is completed and ready for planting the Contractor shall, if directed by the Engineer, proceed at once with the planting of the available shoulder or embankment areas.

3.02 WEATHER AND SOIL LIMITATIONS

A. Fertilizing, seeding or mulching operations will not be permitted when wind velocities exceed 15 miles per hour.

B. Seed shall be sowed only when the soil is moist and in proper condition to induce growth.

3.03 SOIL MANIPULATION

A. All soil manipulation shall be done at right angles to the direction of slope.

3.04 WATERING

A. The soil shall be maintained in a moist condition for a period of at least two weeks after the planting.

3.05 APPLYING AND MIXING FERTILIZER

A. Rate of Application

1. At the Contractor's option either dry or liquid commercial grade fertilizer may be used.

2. The rate of application for dry fertilizer shall be 800 to 1000 pounds per acre, with application in the upper range for sandy soils in the lower range for loamy soils. The exact rate will be set by the Engineer.

3. Liquid fertilizer shall be applied at an equivalent rate which will provide the same amount of plant food as required for dry fertilizer (or at approximately 74 to 92 gallons per acre).

B. Application

1. The fertilizer shall be spread or sprayed uniformly over the area to be grassed by use of the approved distributing device, except that on steep slopes or other areas where machine-spreading may not be practicable, spreading may be done by hand or by hose if the Engineer so directs.
2. Immediately after dry fertilizer is spread, it shall be harrowed in and mixed with the soil to a depth of approximately four inches.

3. When liquid fertilizer is sprayed, the soil, if dry, shall be moistened by sprinkling before the liquid fertilizer is applied not later than seven days after the seed is in place.

3.06 MULCHING

A. When Dry Mulch is Used:

1. When mulching is called for, approximately two inches, loose thickness, of the straw or hay material shall then be applied uniformly over the grassing area, and the mulch material cut into the soil with the equipment specified, so as to produce a loose mulch thickness of three to four inches.

2. Care shall be exercised so that the materials are not cut too deeply into the soil.

B. When Green Mulch is Used:

1. When green mulch is used, the green mulch shall be incorporated into the soil not later than two days after being cut, and not artificial watering shall be done before the mulch is applied.

2. It shall be spread in a layer of approximately two inches loose thickness, and cut into the soil with the equipment specified.

3. The material shall not be cut too deeply into the soil.

3.07 SEEDING

A. Soon after the mulch material has been cut into the soil, and while the soil is still loose and moist, the seed shall be scattered uniformly over the grassing area.

The rate of spread for the seed shall be as follows:

1. Where mulching is not called for, or where dry mulch is used, the rate shall be 60 pounds per acre. In the period from March 15 to October 15 the seed mixture shall be 30 pounds of Bahia and 30 pounds of Bermuda. In the remainder of the year, the mixture shall be 20 pounds each of Bahia, Bermuda and rye seed.

2. When green mulch is used, the required rate of spread shall be reduced to 45 pounds per acre, because of the faster growing rate of the green mulch as
compared with that of the seeds. The seed mixture shall be 22-1/2 pounds of Bahia and 22-1/2 pound of Bermuda, except that in the period October 15 to March 15 the mixture shall be 15 pounds each of Bahia, Bermuda and rye grass seed.

3. Seeding may be done in conjunction with the rolling if the equipment used is designed for that purpose.

4. Rolling. Immediately after completion of the seeding, the entire grassed or mulched area shall be rolled thoroughly with the equipment specified. At least two trips over the entire area will be required.

3.08 SODDING

A. Wherever sodding is indicated on the plans, it shall include all of the requirements of this section except "Mulching".

3.09 MAINTENANCE

A. The Contractor shall be responsible for keeping the ground moist by watering until an acceptable stand of grass is grown. He will also be required to repair at his own expense any damage due to washouts, erosion or other causes which might occur prior to final acceptance of this work.

END OF SECTION
SECTION 03300
CAST IN-PLACE AND Poured CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included under this section consists of furnishing all materials, forms, transportation and equipment, and performing all necessary labor to do all the plain and reinforced concrete work shown on the Drawings, or incidental to the proper execution of the work, or as herein specified.

B. Composition: Concrete shall be composed of cement, fine aggregate, coarse aggregate, and water so proportioned and mixed as to produce a plastic workable mixture in accordance with all requirements under this section suitable to the specific conditions of placement.

1.02 SUBMITTALS

A. All materials specified shall be certified by the producer or manufacturer that the furnished material meets the specific requirements of the specifications. Concrete mix designs shall be submitted for approval prior to placement.

1.03 CODES AND STANDARDS

A. ACI 301 "Specifications for Structural Concrete for Buildings", ACI 318” Building Code Requirements for Structural Concrete”, ACI 347 "Recommended Practice for Concrete Formwork"; ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete"; comply with applicable provisions except as otherwise indicated.

1.04 TESTING

A. Air content shall be in accordance with American Society for Testing Materials Standard Methods C 173, one for each set of compressive strength specimens.

B. Sampling of freshly mixed concrete shall be in accordance with ASTM C172.

C. Slump: ASTM C-143

D. Test results will be reported in writing to Engineer, Contractor, Owner and Concrete producer on same day tests are made.

E. Laboratory Reports: Submit 2 copies of laboratory test or evaluation reports for concrete materials and mix designs.
PART 2 - MATERIALS AND EQUIPMENT

2.01 PORTLAND CEMENT

A. Shall comply with the standard specifications for Portland Cement, A.S.T.M. designation C-150, Type II, or Type III (high-early), where indicated on drawings.

2.02 CONCRETE AGGREGATE

A. Shall conform to standard specifications for concrete aggregate, A.S.T.M. Designation C-33 or to ASTM C-330. Maximum size of aggregate shall not exceed one-fifth of the narrowest dimension between reinforcing bars.

B. Fine Aggregate - Fine aggregate shall be clean, hard, strong, durable, uncoated particles of natural sand known as Lake Wales, Interlachen, or approved equal. The source, composition, quality and gradation of the fine aggregate shall be subject aid the approval of the Engineer. Samples of the sand shall be furnished, together with certified copies of the gradation and analysis from the recognized testing laboratory.

1. The weight of extraneous or deleterious substances shall not exceed the following percentages:

   Loss by Decantation           3%
   Shale                         1%
   Clay Lumps                    1%
   Coal and Lignite              1%

2. The fine aggregate shall be reasonable well graded from coarse to fine and when tested by means of laboratory sieves shall meet the following requirements in percent of total weight:

<table>
<thead>
<tr>
<th>Total Retained On</th>
<th>Percent Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 4 Sieve</td>
<td>0 - 5</td>
</tr>
<tr>
<td>No. 10 Sieve</td>
<td>3 - 30</td>
</tr>
<tr>
<td>No. 30 Sieve</td>
<td>30 - 70</td>
</tr>
<tr>
<td>No. 50 Sieve</td>
<td>65 - 95</td>
</tr>
<tr>
<td>No. 100 Sieve</td>
<td>95 - 100</td>
</tr>
</tbody>
</table>

C. Deficiencies in the percentages of the fine aggregates passing the No. 50 and No. 100 Sieves may be remedied by the addition of pozzolanic or cementitious materials excepting Portland cement. Such materials must meet the approval of the Engineer.
D. Coarse Aggregate.

1. Coarse aggregate shall consist of hard, tough, durable components free from adherent coatings and vegetable matter, and shall not contain soft, friable, thin or elongated particles in quantities considered deleterious by the Engineer. Coarse aggregate shall be properly graded from fine to coarse to produce concrete of desired strength, density, and workability. The source, composition, quality and gradation of the coarse aggregate shall be subject to the approval of the Engineers. Samples of the coarse aggregate shall be furnished together with certified copies of the gradation and analysis from a recognized testing laboratory.

2. All coarse aggregate shall be washed and shall be free from disintegrated pieces, salt, alkali, vegetable matter and adherent coatings. The total percentage of all deleterious substances shall not exceed 5 percent by weight. The substances designated shall not be present in excess of the following amounts.

   Loss by Decantation                  1%
   Clay Lumps or Other Soluble Materials 3%
   Soft Fragments                      5%

3. Where the cover over reinforcing is 2 inches or more, the maximum size of aggregate shall be 12 inches. Where the cover over reinforcing is less than 2 inches, the maximum size of aggregate shall be 3/4 inch. The maximum size of aggregate shall not exceed one-fifth of the narrowest dimension between forms nor three-fourths of the minimum clear spacing between reinforcing bars. The grading of the coarse aggregate in the concrete shall be within the following limits.

   Percent Passing

   Maximum Size Square Mesh Screen     97 - 100%
   2 Maximum Size Square Mesh Screen    40 - 70%
   No. 4 Sieve                          0 - 6%

2.03 WATER

   A. Water shall be clean and free from oil, acids, alkalis, organic materials or other injurious substances.

2.04 REINFORCEMENT

   A. Reinforcing Bars: ASTM A615, Grade 60, deformed bars of USA manufacture.

   B. Welded Wire Fabric: ASTM A185, gauges, spacing and dimensions as indicated.
C. Metal Bar Supports: CRSI MSP-1, Chapter 3, Class 2, Type B, Stainless Steel Protected Bar Supports, or otherwise approved by the Engineer. Use concrete supports for reinforcement in concrete placed on grade.

D. Tie Wire: 16 gauge minimum, black, soft annealed.

E. Coupler Splice Devices: Cadweld tensions couplers, capable of developing the ultimate strength of the bar as manufactured by Erico Products, Incorporated, Solon, Ohio, or equal.

F. Epoxy coated or FRP rebar shall be used for all marine applications.

2.05 FORM WORK

A. Lumber: Douglas Fir or Larch, No. 2 grade, seasoned and surfaced on four sides.

B. Plywood: Plyform, Class 1, BB-Exterior type, mill oiled and edge sealed, with thickness not less than 3/4 inch.

C. Medium Density Overlay (MDO) Plywood Forms: PS-1, B-B High Density Concrete Form Overlay, Class I, unoiled.
   1. Butt form panels, make contact surface fully flush and seal butting holes with sponge form tape. Chamfer edges of beams and ceilings.
   2. Where MDO plywood is used to form beams, do not use MDO plywood that has been patched or damaged.

D. Drip Forms: Varnished ponderosa pine or equally rigid non-staining plastic, 2 inch wide on each leg.

E. Steel Forms. Uncoated steel, 3/16 inch minimum thickness, fabricated to close tolerances, protected only by the specified release agent, braced so as not to bend, dent, or dimple under wet concrete load, vibrator impact, and tool impact. Maintain steel form in rust-free condition by use of steel wood and light grinding, followed by coats of specified release agent. Use forms that can be adjusted into true alignment without stops or ridges.

F. Glass Fiber Reinforced Plastic (FRP) Forms: Smooth coated forms, braced so as not to bend, dent or dimple under wet concrete loads, vibrator impact and tool impact, and at least 0.11 inch thick. Design forms for external bracing at piers and columns, without use of form ties.

G. Plugged Cone Form Ties: Rod type, with ends or end fasteners which can be removed without spalling the concrete and which leave a hole equal in depth to the required reinforcement clearance. Form ties shall be of a design in which the hole left by the removed end or end fastener is easily filled to match the surface of the
hardened concrete. Provide removable cones 13 inches in diameter by 12 inches deep. Provide preformed mortar plugs to match the color of the concrete, recessed 3 inch, adhered with an approved two part epoxy.

H. Weep Hole Forms: PVC polyethylene, or ABS pipe, matching color of the concrete, 4 inch inside diameter, with outlet projecting 12 inches form wall and cutoff in a plane parallel to it.

I. Circular and Elliptical Column Forms: Fabricate of two pieces, clamped watertight using gaskets and without horizontal joints. Install horizontal construction joints only where indicated or as directed by the Engineer.

J. Beam Forms: Provide in one length without form joints and suitable for cambering up to 1/160 of span without distortion of profile or opening of seams.

K. Forms of Hammerhead Pier Caps: Provide in one length with adjustable soffits, bulkheads and screens as necessary to accommodate different hammerhead beam configurations. Provide no construction joints in hammerhead pier caps. Where three or fewer identical hammerhead pier caps occur within a line section, steel braced HDO plywood forms may be substituted for steel forms if:

1. Working drawings of formwork are submitted.

2. Internal form ties are regularly spaced no less than 48 inches each way, and are made watertight.

3. Form ties have removable cones, which are filled to match concrete.

4. Joints in panels are fully watertight.

5. The resulting surface matches the appearance of steel formed hammerhead caps, with no visible discoloration due to form leakage.

L. Styrofoam Board: Expanded polystyrene extruded into board form, closed cell, moisture resistant, capable of maintaining indicated clear space between concrete structures.

M. Control Joint Filler: Use epoxy joint filler equal to BurkEpoxy Joint Filler to fill voids left by saw cuts and to resist against spalling caused by vehicle traffic in concrete slabs.

N. Inserts: Galvanized cast steel or galvanized welded steel, complete with anchors to concrete and fittings such as bolts, wedges and straps. Provide hanger inserts spaced to match grid of suspended ceilings.

O. Shoring: As designed and executed by Contractor to support all loads.
P. Chamfer Strips: Polyvinyl strips designed to be nailed in the forms to provide a 3/4 inch chamfer at exposed edges of concrete members.

Q. Form Release Agent: A blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms, and equal to Eucoslip, by the Euclid Chemical Company, or Release #1, by The Burke Company. Use a non-staining release agent that leaves the concrete with a paintable surface.

2.06 ADMIXTURES

A. Air Entraining Admixture: ASTM C260.

B. Water Reducing and Retarding Admixture:

1. Concrete Without Superplasticizer:


   b. Water Reducing and Retarding Admixtures: ASTM C494, Type D, equal to Eucon Retarder-75 by the Euclid Company, Pozzolith 100 XR by Master Builders, Plastiment by Sika Chemical Corporation, and containing no calcium chloride.

   c. Accelerating Admixtures: ASTM C494, Type C or E, equal to Accelguard 80 by the Euclid Company, Darex Set Accelerator by W.R. Grace, and containing no calcium chloride.

2. Concrete with Superplasticizer:

   a. Water Reducing, High Range Admixtures: ASTM C494, Type F or G, equal to Eucon 37 by the Euclid Company, Rheobild 716 by Master Builders, Daracem 100 by W.R. Grace, Sikament by Sika Chemical Corporation, and consisting of a second generation admixture, free of chlorides and alkalis (except for those attributable to water) composed of a synthesized sulfonated complex polymer, enabling the concrete to maintain its rehplastic state in excess of two hours if necessary.

   b. Manufacturer's Job Site Representation: Provide the services of a competent field service representative from the manufacturer of each of the admixtures selected for use to provide at the job site advice and consultation on the use of the admixture materials, including the effect on the concrete in place, including recommending maximum
discharge time for superplasticizer method and procedure to induce superplasticizer into mixer, quantities of admixtures to be used if variations are required because of temperature/humidity, wind or other environmental considerations, and to be available on short call at any time requested by the Owner, Contractor, or concrete producer.

3. Concrete used in Marine Applications:
   a. Micro Silica admixtures shall be used for concrete installed in marine and coastal applications. Concrete designs shall met the appropriate requirements of EN206-1, BS 8500 and BS 5075. Contractor shall provide plant certification for all mix designs used in marine and coastal applications.

2.07 GROUT

A. Nonshrink, Nonmetallic Grout: The Burke Company's Non-Ferrous, Non-Shrink Grout, Sauereisen F-100 Level Fill, Master Builders Masterflow 713, Euclid NS Grout, or equal pre-mixed type.

B. Nonshrink Metallic Grout: The Burke Company's Metallic Spec Grout, Master Builders Embeco 636 Grout pre-mixed type, or equal.

C. Epoxy Grout: Sikadur 42 Grout-Pak, or equal, for grouting sleeves for anchor bolts, etc.

D. Clarifier Basin Grout: Class B concrete of coarse aggregate shall pass the 3/4 inch sieve.

2.08 MEMBRANE CURING COMPOUND.

A. Membrane curing compound shall be wax-free, pigmented, 100 percent resin base compound such as A.C. Horn's "Horncure 30 C", Hunt Process Corporation; Southern's "All-Resin", or equal.

2.09 BONDING AGENT.

A. Bonding agent shall be Colma Fix, as manufactured by Sika Chemical Corporation, of Passaic, New Jersey or equal. To be considered equal, the material must be a two-component epoxy-polysulphide resin system, and it must have a demonstrated record of strong adhesion to both wet and dry concrete in either the hardened or the plastic state. It must also be of equal strength.

2.10 ACCESSORIES

A. Precast Concrete Block Supports for Reinforcing Bars: Comply with ACI 315. Provide blocks with No. 4 dowels bent 90° to support top bars.
B. Membrane: 6 mil polyethylene film.

C. Water Stops: Polyvinyl chloride meeting all requirements of U.S. Army Corps of Engineer's Specification CRD-C-572 and equal to Burke Water Stops as manufactured by The Burke Company. Provide flat dumbbell type and center bulb type, 9 inches x 3/8 inch at wall thickness of 12 inches or greater, and 6 inches x 3/8 inches at wall thickness less than 12 inches. Provide 6 inch split-ribbed with center bulb type at connections of new concrete structures with existing concrete. Provide water stops as indicated on the Drawings.

D. Preformed Expansion Joint Filler:

1. Bituminous type conforming to the requirements of ASTM D994.

2. Nonextruding type, self expanding cork, 3/4 inch thick or as otherwise shown on the Drawings, conforming to the requirements of ASTM D1752, Type III, and compatible with the specified joint sealant compound.


F. Tongue and Groove Joint Forms: 24 gauge steel forms complete with steel stakes and splice plates, designed for joints not to receive a poured seal, and equal to Burke Keyed Kold Joint as manufactured by The Burke Company.

G. Inserts: Galvanized steel to fit the proposed hanger or support.

H. Mortar for Repair of Concrete: Same materials as used for concrete, except omit coarse aggregate and use not more than one part cement to two and on-half parts sand by damp loose volume. Use no more mixing water than is necessary for handling and placing.

I. Burlap Mats: Conform to AASHTO Specification M182.

J. Epoxy Bonding Agent: Euco #452, BurkEpoxy MV, Sikadur Hi Mod, Concresive 1001-LPL, or equal.

2.11 CONDUITS AND PIPES EMBEDDED IN CONCRETE

A. Conduits, pipes and sleeves of any material not harmful to concrete shall be permitted to be embedded in concrete with approval of the engineer, provided they are not considered to replace structurally the displaced concrete.

B. Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent electrolytic action between aluminum and steel.

C. Conduits and pipes, with their fittings, embedded within a column shall not displace more than 4% of the area of cross section on which strength is calculated or which is required for fire protections.

D. Conduits, pipes, sleeves passing through a slab, wall or beam shall not impair significantly the strength of the construction.

E. Except when plans for conduits and pipes are approved by the engineer, conduits and pipes embedded within a slab, wall, or beam shall satisfy the following:
   1. They shall not be larger in outside dimension than one-third overall thickness of slab, wall, or beam in which they are embedded.
   2. They shall not be spaced closer than three diameters or widths on center.

2.12 PIPES CONTAINING LIQUID, GAS, OR VAPOR

A. Pipes that will contain liquid, gas or vapor may be embedded in structural concrete under the following conditions:
   1. Pipes and fittings shall be designed to resist effects of the material, pressure, and temperature to which they will be subjected.
   2. No liquid, gas, or vapor, except water not exceeding 90°F (32°C) nor 50 psi (345 kPa) pressure, shall be placed in the pipes until the concrete has attained its design strength.
   3. Concrete cover for pipes, conduits and fittings shall be not less than 12 inches (38 mm) for concrete exposed to earth or weather or in contact with ground.
   4. Reinforcement with an area of not less than 0.002 times area of concrete section shall be provided normal to piping.
   5. Piping and conduit shall be so fabricated and installed that cutting, bending or displacement of reinforced from its proper location will not be required.
PART 3 - EXECUTION

3.01 PROPORTIONING

A. The proportions of aggregate to cement shall be such as to produce a thoroughly plastic mixture which will work readily into the corners and angles of the forms and around the reinforcement but without permitting the materials to segregate or excess free water to collect on the surface. The percentage of sand shall not be less than thirty (30) nor more than fifty (50) percent of the total weight of the aggregate.

B. The total content, including the surface water contained in the aggregate, shall not exceed 5.7 gallons per sack of cement. The slump shall not exceed four (4) inches. Air-entraining admixture shall be Darex AEA as manufactured by the Dewey and Almy Chemical Company.

C. The amount of air entrained in the freshly mixed concrete shall not be less than three (3) percent nor more than six (6) percent. The minimum cement content in sacks per cubic yard of concrete shall not be less than six (6) sacks per cubic yard for Class "A" concrete.


1. Class "A" concrete for all structures shall have minimum compressive strength of 4000 psi at 28 days.

2. Class "B" concrete for sidewalks shall have minimum compressive strength of 3000 psi at 28 days.

3. All concrete shall be Class "A" unless otherwise shown on the drawings.

3.02 MIXING AND PLACING

A. Concrete shall be mixed, conveyed and deposited in accordance with the "A.C.I. Building Code" (A.C.I. 318).

B. Prior to placing any concrete, the Contractor shall submit for the Engineer's approval a design mix, calculated by a recognized testing laboratory, and using the approved aggregates to produce a workable mix of the desired strength, together with certified copies of 7 days and 28 day tests of cylinders taken from concrete made according to the design mix. The mixes shall be designed to secure concrete having a minimum compressive strength at age 28 days.

C. Ready-mixed concrete delivered shall be accompanied by delivery tickets showing the following:
1. Date and time leaving plant   Additives (if any)
2. Type of cement and weight   Site arrival time
3. Quantity of water and time added   Site leaving time

D. Concrete.

1. Ready-mixed concrete shall be used. All mixing requirements specified herein shall be enforced, and the Owner's laboratory representative and the Engineer shall have free access to the mixing plant at all times.

2. Except for materials and/or procedures otherwise specified herein, ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C 94.

3. No water shall be added to the concrete after it leaves the plant except where part of the design water was purposely omitted at the plant, and then only as approved by the Engineer.

E. Mixer Speed.

1. Neither the speed of any mixer nor the quantity of material loaded into any mixer shall exceed the recommendations of the manufacturer.

2. Excessive over-mixing, required additions of water to preserve the required consistency, shall be cause for rejection of the batch.

3. Concrete shall not remain in a transit mixer or agitator truck more than 90 minutes after the water has been introduced, and not for more than 45 minutes if any approved retarding agent is not used.

4. Minimum mixing time shall be 50 revolutions of drum at rated speed.

F. Measurement.

1. Equipment necessary to determine and control the actual amounts of all materials entering the concrete shall be provided by the concrete manufacturer.

2. All materials shall be measured by weight, except that water may be measured by volume calculated at 8-1/3 pounds per gallon. One bag of cement will be considered as 94 pounds in weight.

G. Mixes.

1. Mix Design: Conform to ACI 318, Section 4.3. Submit data on consecutive tests and standard deviation.
2. Maximum Water-Cement Ratio:

- .37 (lbs/lb) - Concrete with superplasticizer
- .38 (lbs/lb) – Concrete in Marine Environments
- .45 (lbs/lb) - Class A concrete without superplasticizer
- .55 (lbs/lb) - Class B concrete without superplasticizer
- .65 (lbs/lb) - Class C concrete without superplasticizer

3. Air Content: 5 percent plus or minus 1.5 percent (Class A and B).

4. Slump: 4 inches plus or minus 1 inch for Class A and B without superplasticizer.
   
   7 inches plus or minus 1 inch for Class A and B with superplasticizer.
   
   8 inches plus or minus 1 inch for tremie concrete or as specified by details.

H. Placing Concrete.

1. All concrete shall be placed in clean, damp forms that are not hot to the touch.

2. To prevent segregation, concrete shall be deposited as nearly as practicable in final position and not allowed to drop freely more than necessary and in no case more than five feet, except in an approved funnel or tremie. All concrete shall be placed during daylight unless otherwise authorized at least four hours in advance. Where the reinforcing steel above the top of the concrete being placed becomes coated with laitance or partially set-up concrete, all such concrete shall be removed from the reinforcing steel prior to placing concrete around the bars.

3. Concrete shall be packed carefully and tightly around pipe and other items to secure maximum adhesion.

4. Concrete shall be placed in layers not over 12 inches deep before compacting. Concrete shall be compacted by internal vibrating equipment supplemented by spading and hand-rodding between reinforcing steel and form to eliminate air bubbles and honeycomb. Vibrators shall not be used to move the concrete laterally inside the forms. Duration of vibration shall be limited to the time necessary to provide satisfactory consolidation without causing segregation, not less than five and not more than 15 seconds per square foot of exposed top surface. The vibrator shall be constantly relocated and shall be placed in each specific spot only once for each layer. The Contractor shall take steps to assure that sufficient personnel are available to devote full time to operating vibrator, spading and rodding.
5. Wall concrete shall be placed in layers as indicated above, with the first lift preceded by a 1-inch minimum layer of 1:2-1/2 cement-sand grout, with a 6-inch to 8-inch slump, placed on existing concrete not more than 20 minutes before concrete placement. The surface of previously placed hardened concrete shall be clean and wet before grouting, or shall be treated with a bonding agent as required. Puddles of water in horizontal recessed keys shall be avoided by the use of drain recesses to outside edge of concrete. Concrete in walls and deep beams shall be placed in lifts not to exceed three layers at 12 inches each for the full length of the pour before proceeding higher. The placing of concrete shall not be delayed more than 20 minutes between layers or lifts.

6. Slab forms shall be thoroughly cleaned after placing wall concrete below. Concrete in beams or walls shall be placed to bottom of floor slab. After concrete in walls below floor slab has been in place for approximately 30 minutes, the concrete for the floor slab and upper portion of the beam shall be placed and vibrated.

7. When concrete is conveyed by chutes, the equipment shall be of proper size and design to insure a continuous flow in the chute. The chutes shall be metal or metal lined, and the different portions shall have approximately the same slope. The slope shall not be less than one vertical to three horizontal or more than one vertical to two horizontal, and there shall be provision for a baffle at the discharge end of the chute to prevent segregation. If the vertical distance between the discharge end of the chute and the surface of the concrete is more than five feet, a spout shall be used. The lower end of the spout shall be kept as near the surface of the deposit as is practicable. All chutes and spouts shall be thoroughly cleaned before and after each run. All debris and water shall be discharged outside the forms.

3.03 CURING AND PROTECTION

A. Curing:

1. Immediately after surface defects have been repaired, apply a spray coat of curing compound to all exposed surfaces, including slabs, walls, beams and columns in accordance with the manufacturer's recommendations. Protect exposed steel keyways and other embedded items from the curing compound. Water cure, as specified in paragraph B hereunder, all concrete surfaces that are to be exposed to wastewater, surfaces that are to be coated with a coal tar epoxy system, and concrete floors requiring a bond for special finishes.

2. Do not apply compound during periods of rainfall. Should the film become damaged from any cause within the required curing period, immediately repair the damaged portions with additional compound. Upon removal of forms, immediately coat the newly exposed surfaces to provide a curing treatment equal to that provided for the surface.
3. Curing and Sealing Compound: Use clear compound conforming to Federal Specification TT-C-800A, 30% solids content minimum, having test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq. cm. when applied at a coverage rate of 300 sq. ft per gallon, and equal to Super Floor Coat or Super Pliocure by The Euclid Chemical Company or Masterseal 66 by Master Builders. Furnish manufacturer's certification as required.

4. Apply specified clear curing and sealing compound to all horizontal areas so noted on the Drawings or in the Specifications. Apply immediately after final finishing. Apply this compound to non-structural construction joints of slabs on grade to act as a bond breaker prior to placement of adjacent concrete.

B. Water Curing Method: Cure all concrete that is to be water cured by either the wet burlap method, by continuous fogging or by covering with waterproof sheet.

1. Wet Burlap Method: Cover concrete surface with a double thickness of burlap, cotton mats, or other approved material, kept thoroughly saturated with water. Keep the forms wet until removed and upon removal, start the curing specified herein immediately. Cure the concrete for a period of 7 days for normal Portland cement or 4 days for high early strength cement. Do not submerge concrete poured in the dry until it has attained sufficient strength to adequately sustain the stress involved and do not subject it to flowing water across its surface until it has cured 4 days.

2. Continuous Fogging: Perform continuous fogging by fogging with a nozzle which so atomizes the flow of water that a mist, and not a spray, is formed. Fog the concrete surface regularly without allowing any part of the surface to become dry. Take all necessary precautions to prevent erosion of the concrete surface by the water.

3. Covering with Waterproof Sheets: Keep the entire area to be cured continuously wet by fogging, as specified in the fogging paragraph above, for at least 18 hours and then immediately cover with waterproof curing sheet conforming to ASTM C171, waterproof paper and polyethylene film, free of holes or tears. Keep sheet fully flat, without wrinkles or air bubbles, held down tautly at all edges. Do not use this method on slabs which will be exposed to view.

3.04 PLACING REINFORCEMENT

A. All reinforcement shall be detailed, fabricated and erected in accordance with the A.C.I. "Manual of Standard Practice for Detailing Reinforced Concrete Structure", (A.C.I. 315), including bar supports and spacers. At splices all reinforcing bars shall be lapped a minimum of twenty-four (24) bar diameters but not less than twelve (12) inches.
B. The reinforcing shall be fabricated to the shapes and dimensions shown and shall be placed where indicated on the drawing. Before placing, all reinforced steel shall be thoroughly cleaned of rust, mill scale or coatings, which would reduce or destroy the bond. Reinforcing bars shall conform to the requirements of the latest editions of the A.C.I. Code and the CRSI Manuals.

C. Wire mesh, unless otherwise shown on the drawings or specified, shall be 6" x 6" No. 10 woven or electrically welded wire fabric conforming to the requirements of ASTM Designation A185, latest revision.

D. Space chairs and bolsters in accordance with ACI 315 and 318 using height to furnish cover over reinforcing required. Chairs with plastic feet or stainless steel shall be used in all beams and elevated slabs. Chairs for other concrete adjacent to or on the ground may be pieces of concrete block or concrete brick compressed into subgrade with the rebars bearing directly on the pointed edge of the masonry supports, or chairs set on precast concrete pads compressed into the subgrade.

E. When placed in the forms, reinforcement shall be clean and free of all loose rust, scale, dust, dirt, paint, oil or other foreign material, and shall be accurately and securely positioned both laterally and vertically before placing concrete. Minimum clearances between the steel and face of concrete shall be maintained as shown.

F. The rebars shall be fastened together at every intersection or at intervals not greater than 24 bar diameters by wire ties or by some alternate method acceptable to the Engineer. In areas where large bars are closer together, the wire ties may be spaced not more than 30 bar diameters apart, rather than as specified above.

3.05 FORMS

A. Installation and erection shall be in accordance with ACI 347 and as specified hereinafter.

B. Forms shall conform to shape, lines and dimensions of numbers indicated, and shall be sufficiently tight to prevent leakage of mortar. They shall not deflect under dead load weight of construction as a liquid or of construction load. Forms shall be properly braced or tied together so as to maintain position and shape within specified tolerances. Construct forms so that they can be removed steadily without hammering or prying against the concrete. Forms for exposed concrete shall be carefully made and accurately placed to obtain correct shape and line.

C. Forms shall be of wood, metal, or other approved materials. Metal forms shall be of a type and manufacture acceptable to the Engineer. Plywood, fiberboard, or absorptive type form linings may be used where appropriate. Sectional forms shall produce a uniform surface and shall be assembled in a modular pattern. Pours will not be scheduled until all erection and bracing is complete. Walers, ties and braces shall be required for all forms.
Chamfer strips made from nominal dimensional 1" x 1" lumber cut on the diagonal shall be installed at the top of the forms on all exposed edges of walls, slabs, beams and other structures above grade.

D. Drip edge shall be made from wood quarter round and installed where shown. Extruded plastic fillets shall be used where detailed. Circular structures shall be formed with special care, and attention to the appearance of the finished structure. Random location of fillers, non-modular sections, and excessive deviations from true circular segments shall be cause for rejection of the forms.

E. The Contractor shall be fully responsible for the adequacy of formwork in its entirety. Forms shall support required loads and shall maintain their dimensional and surface correctness to produce members required by drawings.

F. Slots, chases, recesses or other openings as shown on the drawings or as needed for the work of any other trades shall be boxed out.

G. Box out for all temporary openings and build forms to seal them up when and as required.

H. After sealing and immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form releasing agent, applied in compliance with the Manufacturer's instructions.

I. Reused forms shall be thoroughly cleaned out of dirt, debris, concrete and foreign matter. Forms shall not be reused if they have developed defects which would affect their tightness and strength or desired surface finish. Used forms shall not be used for architectural concrete.

J. Forms shall be removed in a manner that will prevent injury to concrete. Supporting forms or shoring shall not be removed until the members have acquired sufficient strength to support their weight and any load thereon.

K. Removal shall be in sequence as approved by the Engineer. Unless test cylinders warrant another procedure, the forms shall not be removed from members prior to the time listed in the schedule hereinafter unless otherwise directed.

L. Bonding To Existing Surfaces: Clean existing concrete surfaces that are to have new concrete bonded thereto of all grease, oil, dust, dirt and loose particles and coat with an epoxy bonding agent just prior to placing of the new concrete. Apply the bonding agent as recommended by the manufacturer and allow the agent to become tacky before the new concrete is placed. Do not allow the bonding agent to overlap or be spilled on the surfaces to be exposed after the work is completed.
3.06 FORM REMOVAL

A. Maintain formwork in place for the following structural conditions until the concrete has attained the minimum percentage of indicated design compressive strength or for the period of time specified in the following table.

Note: Time periods in the table include all days except those in which the temperature falls below 40 degrees F.

<table>
<thead>
<tr>
<th>Structural Member or Condition</th>
<th>Normal Concrete</th>
<th>Normal Strength</th>
<th>Minimum Compressive Strength for Form Removal (% Design Strength)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantilevers</td>
<td>12 days</td>
<td>7 days</td>
<td>90</td>
</tr>
<tr>
<td>Over 20 feet between supports</td>
<td>12 days</td>
<td>7 days</td>
<td>90</td>
</tr>
<tr>
<td>Stairway</td>
<td>10 days</td>
<td>5 days</td>
<td>80</td>
</tr>
<tr>
<td>Floor Slabs</td>
<td>5 days</td>
<td>3 days</td>
<td>70</td>
</tr>
<tr>
<td>Free standing walls, column and piers</td>
<td>5 days</td>
<td>3 days</td>
<td>70</td>
</tr>
<tr>
<td>Walls, piers columns, sides of beams, footings slabs on grade, and vertical surfaces</td>
<td>24-48 hours</td>
<td>12-24 hours</td>
<td>70</td>
</tr>
<tr>
<td>Front face form of curbs</td>
<td>6-24 hours</td>
<td>6 hours</td>
<td>70</td>
</tr>
</tbody>
</table>

3.07 CONCRETE FINISHINGS

A. Repair of Surface Defects:

1. General: Repair surface defects, including tie holes immediately after form removal. Dampen the area to be patched and an area at least 6 inches wide surrounding it to prevent absorption of water from the patching mortar. Notify the Engineer prior to commencing operations.
2. Removal of Defective Concrete: Remove all honeycombed and other defective concrete down to sound concrete. Cut edges perpendicular to the surface or slightly under cut. Sand blast surfaces to receive repair.

3. Bonding Grout: Thoroughly dampen surfaces to be patched and apply a coat of bonding grout consisting of one part cement to one part fine sand passing a No. 30 sieve and having the consistency of thick cream.

4. Placing Patching Mortar: After the bonding grout begins to lose its water sheen, apply a premixed patching mortar, thoroughly consolidating it into place and striking it off so as to leave the patch slightly higher than the surrounding surface. Leave mortar undisturbed for one hour to permit initial shrinkage and then finally finish.

5. Tie Holes: After being cleaned and thoroughly dampened, fill the tie holes solid with patching mortar.

B. Concrete Finishes:

1. Formed Surfaces: After removal of forms, chip off all irregular projections, grind flush with adjacent surfaces and finish concrete surfaces in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Finish Designation</th>
<th>Area Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-1</td>
<td>Exterior walls below grade not exposed to water: Repair defective concrete, fill depressions deeper than 2 inch, and fill tie holes.</td>
</tr>
<tr>
<td>F-2</td>
<td>Exterior and interior walls exposed to water: Repair defective concrete, remove fins, fill depressions 3 inch or deeper, and fill tie holes.</td>
</tr>
<tr>
<td>F-3</td>
<td>Walls of structures of buildings exposed to view and underside of formed floors or slabs: In addition to Finish F-2, fill depressions and airholes in mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-half parts sand by damp loose volume on the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.</td>
</tr>
<tr>
<td>F-4</td>
<td>Tops of walls, beams and similar unformed surfaces occurring adjacent to formed surfaces: Strike smooth after concrete is placed and float to a texture reasonably consistent with that of formed surfaces.</td>
</tr>
</tbody>
</table>
2. Slab Surfaces:
   a. General: After concrete has been consolidated, finish all concrete slabs with a floated finish. After floating, trowel finish all concrete slabs, except for areas to receive roofing, insulation, tile or topping, and immediately light broom finish. Where a finish is not indicated, provide a troweled finish.

<table>
<thead>
<tr>
<th>Finish Designation</th>
<th>Area Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>Slabs and floors not water bearing: Smooth steel trowel finish.</td>
</tr>
<tr>
<td>S-2</td>
<td>Slabs and floors which are water bearing and slab surfaces on which mechanical equipment moves: Steel trowel finish free from trowel marks and all irregularities.</td>
</tr>
<tr>
<td>S-3</td>
<td>Slabs, floors and stair treads of structures or buildings exposed to view: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.</td>
</tr>
<tr>
<td>S-4</td>
<td>Slabs and floors at slopes greater than 10%: Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage.</td>
</tr>
<tr>
<td>S-5</td>
<td>Exposed edges of slabs, floors and tops of walls: Finish with a 3 inch radius edge if a chamfer is not indicated.</td>
</tr>
</tbody>
</table>

C. Floated Finish: After concrete has been placed, consolidated, struck off and leveled, do not work the surface further until water sheen has disappeared and the surface has hardened sufficiently to permit floating. During the first floating, check the planeness of the slab with a 10 foot straightedge applied at no less than two angles. Cut down all high spots and fill all low spots to produce a surface having the required tolerance. Then refloat the slab to a uniform sandy texture.

D. Light Broomed Finish: After floating, power trowel slabs to receive a light broomed finish to produce a smooth surface, relatively free of defects. Before the surface sets, pass a soft broom drag over the surface to produce a surface uniform in texture and appearance.

E. Troweled Finish: After floating, power trowel slabs to receive a troweled finish to produce a smooth surface, relatively free of defects. Hand trowel after the surface has hardened sufficiently. When a ringing sound is produced as the trowel is moved over the surfaces, perform final troweling by hand to produce a surface which is thoroughly consolidated, free from trowel marks, uniform in texture and appearance.
and plane to a tolerance of 1/8 inch in 10 feet as determined by a 10 foot straightedge placed anywhere on the slab in any direction.

F. Hardener Finish: Where indicated to receive a troweled hardener finish, water cure slabs without application of curing and sealing agent. When slab is at least 20 days old and thoroughly dry, apply the hardener in accordance with the manufacturer's recommendations. Where dry-shake hardener or slip resistant finish is required, apply the hardener or slip-resistant product prior to complete curing and finishing, in accordance with the requirements and recommendations of the product manufacturer.

G. Saw Cut Joints: Cut joints that are to be saw cut not sooner than 2 hours after the concrete is poured and not later than 8 hours after the pour.

3.07 TESTS

A. Compressive strength tests shall be made by breaking standard 6-inch diameter by 12-inch high test specimens prepared, cured and broken in accordance with the American Society for Testing Materials Standard Methods C-31 and C-39, latest revision. Four specimen test cylinders shall be taken from each pour of five (5) cubic yards or more. One additional test shall be taken from each thirty (30) cubic yards or fraction thereof in each pour in excess of thirty (30) cubic yards.

B. Test specimens shall be taken from manhole bottom pours of less than five (5) cubic yards as directed by the Engineer. Test specimens shall be taken in the presence of the Engineer. One cylinder from each pour shall be broken at seven (7) days, the remainder at twenty-eight (28) days. Additional test cylinders may be ordered for determining the characteristics of a new design mix or changes in equipment or methods, and under adverse weather or curing conditions.

C. Slump test shall be made in accordance with ASTM C143, latest revision, and shall be made with each load and at time of cylinders.

D. The Contractor shall supply all cylinder molds, slump cones, tools and labor for preparing specimen, and shall provide clean, moist sand or burlap for curing. Cylinder shall not be shipped to the testing laboratory until the third day following preparation, and shall be protected from accidental damage at all times.

E. The test cylinders shall be tested in a recognized commercial testing laboratory at the expense of the Contractor.

3.08 EXPANSION JOINTS, CONSTRUCTION JOINTS AND WATER STOPS

A. Expansion Joints shall be placed as indicated on the drawings. Joint materials for surfaces exposed to water and sewage shall conform to ASTM D175, Preformed Joint Filler, non-extruding and resilient (bituminous type), thickness as shown on the drawings. Joint materials for isolation joints, slab-on-grade joints and wall joints not
exposed to water and sewage shall conform to ASTM D994, preformed expansion joint filler for concrete (bituminous type), thickness as shown on the drawings.

B. Construction Joints shall be located in accordance with a schedule of pours which shall be prepared and submitted by the Contractor. Vertical construction joints shall be held to the minimum number consistent with good standard practice.

C. Water Stops. Material for water stops shall be 9-inch PVC multi-rib center-bulb type for expansion joints, and 1/4" x 4" and 1/8" x 4" structural steel sheets for construction joints. PVC joint material shall be as manufactured by The Burke Company, or approved equal.

END OF SECTION
SECTION 03600
GROUT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, tools and equipment and perform all grouting as specified hereinafter and indicated on the Drawings.

1.02 RELATED WORK

A. Section 03300: Cast-In-Place and Poured Concrete

1.03 SUBMITTALS

A. Submit manufacturer's literature for review on the following items:

1. Nonshrink grout data including grout properties, mixing, surface preparation and installation instructions.

1.04 DELIVERY AND STORAGE

A. Deliver and store grouting materials in unbroken containers with seals and labels intact as packaged by the manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Nonshrink, Nonmetallic Grout: The Burke Company's Non-Ferrous, Non-Shrink Grout, Sauereisen F-100 Level Fill, Master Builders Masterflow 713, Euclid NS Grout, or equal pre-mixed type.

B. Nonshrink Metallic Grout: The Burke Company's Metallic Spec Grout, Master Builders Embeco 636 Grout pre-mixed type, or equal.

C. Epoxy Grout: Sikadur 42 Grout-Pak, or equal, for grouting sleeves for anchor bolts, etc.
PART 3 - EXECUTION

3.01 PREPARATION

A. Clean all bonding surfaces or dust and oil.

3.02 INSTALLATION

A. Nonshrink Grout:

1. Use nonshrink, nonmetallic grout for grouting precast concrete wall panel connections, column base plates, anchor bolts, reinforcing bars, pipe sleeves, machinery supports and pump base plates. Use epoxy grout for anchor bolts, etc., where indicated on the Drawings.

2. Mix and place nonshrink grout as recommended by the manufacturer.

3. Mix grout as close to the work area as possible and transport quickly to its final position in a manner which will not permit segregation of materials.

4. Cure nonshrink grout with water saturated burlap for at least three days or with an application of Super Rez Seal cure and seal compound applied immediately after grout placement.

5. Do not operate machinery set on grout pads until the grout has cured for at least 24 hours.

END OF SECTION
SECTION 03700  
MODIFICATIONS AND REPAIR TO EXISTING CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Furnish all labor, materials, equipment and incidentals required to cut, repair, demolish, excavate or otherwise modify parts of existing structures or appurtenances as shown on the Drawings and as specified herein, including connecting new concrete to existing concrete, as necessary to complete the work under this Contract.

1.02 RELATED WORK DESCRIBED ELSEWHERE
A. Section 03300: Cast-In-Place and Poured Concrete

1.03 QUALITY ASSURANCE
A. Do not cut, remove, or otherwise alter existing structures or concrete until authorization is given by the Engineer.
B. When removing materials or portions of existing structures, and when making openings in existing structures, take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work, nor to damage the structures or contents by falling or flying debris. Unless otherwise permitted, line drilling will be required in cutting existing concrete.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Epoxy Bonding Compound: Two component, moisture insensitive, heavy viscosity, high strength, rigid epoxy system that will bond under dry, damp or wet conditions, and is equal to BurkEpoxy MV or BurkEpoxy Mortar as manufactured by The Burke Company, Sikadur Hi-Mod as manufactured by Sika Chemical Corp., or Eurco 615 Epoxy as manufactured by Euclid Chemical Company.

PART 3 - EXECUTION

3.01 INSTALLATION
A. Take field measurements in the required structures to determine the amount of concrete to be removed and/or repaired and the amount of patching to be done.
3.02 CONSTRUCTION METHODS

A. Where new concrete is to be made integral with existing concrete, use the methods shown in the Drawings.

B. Mix and apply all bonding and patching materials in accordance with the manufacturer's instructions and recommendations.

3.03 MODIFYING OR REPAIRING EXISTING CONCRETE

A. Remove concrete to the depths shown or required. Roughen contact surface by chipping, sandblasting, scarifying or other approved methods. Thoroughly clean the surface, removing loose particles and dust.

B. Cut off projecting reinforcement when required to provide at least 2 inch cover. Where shown, bend reinforcement across cut face and cover with new concrete.

C. Thoroughly wash the roughened concrete surfaces and keep the surfaces saturated for at least 6 hours before placing new concrete. Remove all free water prior to placing the concrete. An epoxy bonding compound, as specified, may be used in lieu of saturating surface for 6 hours.

D. Place cement mortar, where required, to a thickness slightly in excess of the finished surface, and steel-trowel-finish, flush with the adjacent surface.

E. When the finish surface of new concrete in exposed surfaces is not specified to be coated, match the color of the existing adjoining concrete as closely as possible.

F. Mix cement mortar in the proportions of 1 part Portland cement to two parts of sand by volume. Do not use accelerating admixtures in surface treatment. Where shown on the Drawings, use a non-shrink grout for patching and filling.

3.04 CONNECTIONS, NEW CONCRETE TO EXISTING CONCRETE

A. Make connections to existing concrete as shown on the Drawings.

B. Where it is necessary to expose existing reinforcement, clean the reinforcing rods or wire mesh by wire brushing and hook new reinforcement into existing reinforcement and lap or weld as directed. Provide at least 3/4 inch clearance around each bar.

C. Mix and apply the epoxy in strict accordance with the printed instructions of the approved manufacturer.

D. Preparation of Concrete Surfaces:
1. Surfaces must be clean and sound. Surfaces may be dry, damp, or wet, but free of standing water. Remove dust, laitance, grease, during compounds, impregnations, waxes, foreign particles, and disintegrated materials by mechanical abrasion methods such as sandblasting. Sandblast steel to appropriate finish.

2. If the concrete surfaces are sound and it is only necessary to remove laitance, grease or dust, the Contractor may, with the prior written approval of the Engineer, forego sandblasting and wash the concrete with a degreasing and etching chemical applied in accordance with the manufacturer's written instructions and as stipulated in these Specifications hereinafter.

3. Degreasing and Etching Chemical: ProSoCo, Inc., Sure-Klean Degreaser & Etch, or equal, with water white color, flash point above 150F, and consisting of a blend of organic and inorganic acids with a special solvent system incorporating wetting agents for emulsification.

4. Application of Degrease and Etching Compound: Prewet concrete surfaces with clean water. Brush concentrated cleaner onto concrete surface. Let stand 3 to 4 minutes and reapply, brushing stained areas vigorously. Rinse off with fresh water applied at a minimum volume of five gallons per minute.

E. Application of Bonding Compound:

1. Cover the area to be overlayed with one coat of the epoxy compound applied with long-nap paint rollers, brushes, brooms or by spray as per manufacturer's instructions.

2. Place the concrete while the epoxy compound is still tacky. If the bonding compound should harden before the concrete is placed, apply a fresh coat over the hardened coat and proceed.

F. Application of Grouting: To prepare a grout for anchor bolts or to level base plates, mix the compound as recommended by the manufacturer.

G. Weather Limitation: Place the epoxy compound only when both the concrete surface temperature and the ambient temperature are as recommended by the manufacturer.

3.05 OPENINGS IN CONCRETE

A. Where openings are required for pipes, thimbles for gates, gate stems or other installations in existing concrete structures, cut the existing concrete within the limits required, as shown on Drawings or specified, expose the existing reinforcing steel and perform the work in such a manner as to prevent damage to the existing adjacent structures or equipment.
B. Unless otherwise permitted, line drilling will be required.

C. Where concrete is cut to provide openings for gate stems, accurately install pipe sleeves and grout in place in an approved manner.

1. Clean the exposed reinforcement by wire brushing, then cut and bend to permit the installation and finally bend around the new pipe or thimble. Provide additional reinforcement as shown on the drawings for typical reinforcing details of openings in walls and slabs, otherwise shown, specified or required.

2. After installation of pipelines and thimbles, etc., prepare the existing concrete as specified above and fill the void between the outside of the pipe or thimble and the existing concrete with non-shrink non-metallic grout.

END OF SECTION
PART 1 – GENERAL

1.01 Scope

A. This specification defines the methods of surface preparation, coating systems, and methods of application for painting as outlined herein.

B. The Contractor shall furnish all supervision, labor, tools, materials, equipment, scaffolding or other structures, and supervision required for the transportation, unloading, storage, and application of the paint and associated products covered by this specification.

C. The work includes painting and finishing of interior and exterior exposed items above and below grade surfaces, such as structural steel, miscellaneous metals, ceilings, walls, floors, doors, frames, pipe, handrails, posts, fittings, valves, pumps, tanks, equipment, and all other work obviously required to be painted unless otherwise specified herein or on the drawings. The omission of minor items in the schedule of work shall not relieve the contractor of his obligation to include such items where they come within the general intent of the specification as stated herein.

D. The following items will not be painted:

1. Any code requiring labels, such as Underwriters’ Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated.

3. Aluminum handrails, walkways, windows, louvers, and grating unless otherwise specified herein.

4. Signs and nameplates.

5. Finish hardware.

6. Stainless steel angles, tubes, pipe, etc.

7. Products with polished chrome, aluminum, nickel, or stainless steel finish.


10. Sprinkler heads.

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E. All work shall be done in strict accordance with this specification, the design drawings and the painting package, including manufacturer’s printed instructions.

F. The Contractor will obtain, at its own expense, all permits, licenses and inspections and shall comply with all laws, codes, ordinances, rules, and regulations promulgated by authorities having jurisdiction, which may bear on the work. This compliance will include Federal Public Law 91-596 more commonly known as the “Occupational Safety and Health Act of 1970.”

G. Wherever the word “Engineer” occurs in this specification, it shall apply to the authorized representative of QLH, A Mead & Hunt Company. Where the word “Contractor” occurs in this specification, it shall apply to the contractor performing any part of or all of this work.

H. Surfaces to be painted: (Refer to 17.0 Coating Schedule for description of surfaces to be painted and their specified coating systems and colors).

1.02 Definitions

A. Field Painting is the painting of new or rebuilt items at the job site. Field painting shall be the responsibility of the Contractor.

B. Shop Painting is the painting of new or rebuilt items in the shop prior to delivery to the jobsite.

1.03 Abbreviations

A. The abbreviations and definitions listed below, when used in this specification, shall have the following meanings:

1. SSPC – Society for Protective Coatings
2. Exterior – Outside, exposed to weather
3. Interior Dry – Inside, not subject to immersion service
4. Interior Wet – Inside, subject to immersion service
5. ASTM – American Society of Testing Materials
6. NACE – National Association of Corrosion Engineers
7. NSF – National Sanitation Foundation (Standard 61)
8. AWWA – American Water Works Associates (AWWA D102-97)

PART II - RESOLUTION OF CONFLICTS

A. It shall be the responsibility of the Contractor to arrange a meeting prior to the start of painting, or flooring installation between the Contractors, the Paint Manufacturer whose products are to be used, and the Engineer. All aspects of surface preparation, application and coating systems as covered by this specification will be reviewed at this meeting.

B. Clarification shall be requested promptly from the Engineer when instructions are lacking, conflicts occur in the specification, or the procedure seems improper or inappropriate for any reason.
C. Copies of all manufacturer’s instructions and recommendations shall be furnished to the Engineer by the Painting Contractor.

D. It shall be the responsibility of the Coating Manufacturer to have their factory representative meet in person with the Contractor and Engineer a minimum of three times during the job as a consultant on surface preparation, mil thickness of coating and proper application of coating unless meeting is determined to be unnecessary by the Engineer.

PART III - INSPECTION OF SURFACES

A. Before application of the prime coat and each succeeding coat, all surfaces to be coated shall be subject to inspection by the Engineer. Any defects or deficiencies shall be corrected by the Contractor before application of any subsequent coating.

B. Samples of surface preparation and of painting systems shall be furnished by the Contractor to be used as a standard throughout the job, unless omitted by the Engineer.

C. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the Engineer, and where, in his opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the Contractor’s expense. Recoating times of manufacturer’s printed instructions shall be adhered to.

D. Coating thickness shall be determined by the use of a properly calibrated “Nordson-

E. Mikrotest” “Positest” Coating Thickness Gauge (or equal) for ferrous metal or an OG232 “Tooke” Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note that use of the “tooke” gauge is classified as a destructive test.

PART IV - EQUIPMENT

A. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used. Separators shall be placed as far as practical from the compressor.

B. All equipment for application of the paint and the completion of the work shall be furnished by the Contractor in first-class condition and shall comply with recommendations of the paint manufacturer.

C. Contractor will provide free of charge to the Engineer a “Nordson-Mikrotest” or “Positest” dry film thickness gauge for ferrous metal and an OG232 “Tooke” gauge or equal for non-ferrous and cementitious surface, to be used to inspect coatings by the Engineer and Contractor. The gauges may be used by the Contractor and returned each day to the Engineer. Engineer will return gauges to Contractor at completion of job.

PART V - MATERIALS

A. All materials specified herein are manufactured by the TNEMEC Company, Inc., Xypex Chemical Corporation, or Chemprobe Technologies, Inc. These products are specified to establish standards of quality and are approved for use on this project.
B. Equivalent materials of other manufacturers may be substituted on approval of the Engineer. Requests for substitution shall include Manufacturer’s literature for each product giving the name, generic type, descriptive information and evidence of satisfactory past performance and an independent laboratory certification that their product meets the performance criteria of the specified materials.

1. Abrasion – Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load
2. Adhesion – Elcometer Adhesion Tester
3. Exterior Exposure – Exposed at 45 degrees facing the ocean (South Florida Marine Exposure)
4. Hardness – ASTM D3363-74
5. Humidity – ASTM D2247-68

C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the Engineer at least ten (10) days prior to the bid opening. Substitutions which decrease the film thickness, the number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.

D. All coatings to be shop applied must meet the requirements for volatile organic compounds (VOC) of not more than 3.5 lbs/Gallon after thinning.

E. Colors, where not specified, shall be as selected by the Owner or their Representative.

F. All coatings in contact with potable water need to be NSF Certified in accordance with ANSI/NSF Standard 61.

PART VI - WORKMANSHIP AND MATERIALS

A. Surface Preparation

1. The surface shall be cleaned as specified for the paint system being used. All cleaning shall be as outlined in the Steel Structures Painting Council’s Surface Preparation Specification, unless otherwise noted. If surfaces are subject to contamination, other than mill scale or normal atmospheric rusting, the surfaces shall be pressure washed, and acid or caustic pH residues neutralized, in addition to the specified surface preparation.

B. Standards for Surface Preparation

1. SSPC-SP1 Chemical and/or Solvent Cleaning
<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.</td>
<td>Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter, and contaminants, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning.</td>
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<tr>
<td>2. SSPC-SP2 Hand Tool Cleaning</td>
<td>Removal of loose rust, loose mill scale, and loose paint to a clean sound substrate by hand chipping, scraping, sanding, and wire brushing.</td>
</tr>
<tr>
<td>3. SSPC-SP3 Power Tool Cleaning</td>
<td>Removal of loose rust, loose mill scale, and loose paint to a clean sound substrate by power tool chipping, descaling, sanding, wire brushing, and grinding.</td>
</tr>
<tr>
<td>4. SSPC-SP4 Flame Cleaning</td>
<td>Dehydrating and removal of rust, loose mill scale, and some light mill scale by use of flame, followed by wire brushing.</td>
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<tr>
<td>5. SSPC-SP5 (NACE-1) White Metal Blast Cleaning</td>
<td>Complete removal of all mill scale, rust, rust scale, previous coating, etc., leaving the surface a uniform gray-white color.</td>
</tr>
<tr>
<td>6. SSPC-SP6 (NACE-3) Commercial Grade Blast Cleaning</td>
<td>Complete removal of all dirt, rust scale, mill scale, foreign matter, and previous coatings, etc., leaving only shadows and/or streaks caused by rust stain and mill scale oxides. At least 66% of each square inch of surface area is to be free of all visible residues, except slight discoloration.</td>
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<tr>
<td>7. SSPC-SP7 (NACE-4) Brush-Off Blast Cleaning</td>
<td>Removal of rust scale, loose mill scale, loose rust, and loose coatings, leaving tightly bonded mill scale, rust and previous coatings. On concrete surfaces, brush-off blast cleaning shall remove all laitance, form oils, and solid contaminants. Blasting should be performed sufficiently close to the surface so as to open up surface voids, bug holes, air pockets, and other subsurface irregularities, but so as not to expose underlying aggregate.</td>
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<td>8. SSPC-SP8 Pickling</td>
<td>Complete removal of rust and mill scale by acid pickling, duplex pickling or electrolytic pickling (may reduce the resistance of the surface to corrosion, if not to be primed immediately).</td>
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</table>
| 9. SSPC-SP10 (NACE-2) Near-White Blast Cleaning | Removal of all rust scale, mill scale, previous coating, etc., leaving only light stains from rust, mill scale, and small specks of previous coating. At
least 95% of each square inch of surface area is to be free of all visible residues and the remainder shall be limited to slight discoloration.

10. SSPC-SP11-87 Power Tool Cleaning to Bare Metal
   a. Complete removal of rust, rust scale, mill scale, foreign matter, and previous coatings, etc., to a standard as specified on a Commercial Grade Blast Cleaning (SSPC-SP6, NACE-3) by means of power tools that will provide the proper degree of cleaning and surface profile.

11. SSPC-SP13 (NACE-6) Surface Preparation of Concrete
   a. Surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.

C. Visual standards


   2. Oil, grease, soil, dust, etc., deposited on the surface preparation that has been completed shall be removed prior to painting according to SSPC-SP1 Solvent Cleaning.

   3. Weld flux, weld spatter and excessive rust scale shall be removed by Power Tool Cleaning as per SSPC-SP11-87T.

   4. All weld seams, sharp protrusions, and edges shall be ground smooth prior to surface preparation or application of any coatings.

   5. All areas requiring field welding shall be masked off prior to shop coating, unless waived by the Engineer.

   6. All areas which require field touch-up after erection, such as welds, burnbacks, and mechanically damaged areas, shall be cleaned by thorough Power Tool as specified in SSPC-SP11-87T.

   7. “Touch-up systems will be same as original specification except that approved manufacturer’s organic zinc-rich shall be used in lieu of inorganic zinc where this system was originally used. Also strict adherence to manufacturer’s complete touch-up recommendations shall be followed. Any questions relative to compatibility of products shall be brought to the Engineer’s attention; otherwise, Contractor assumes full responsibility.

PART VII – PRE-TREATMENTS

A. When specified, the surface shall be pretreated in accordance with the specified pretreatment prior to application of the prime coat of paint.
PART VIII - STORAGE

A. Materials shall be delivered to the job site in the original packages with seals unbroken and with legible unmutilated labels attached. Packages shall not be opened until they are inspected by the Engineer and required for use. All painting materials shall be stored in a clean, dry, well-ventilated place, protected from sparks, flame, and direct rays of the sun or from excessive heat. Paint susceptible to damage from low temperatures shall be kept in a heated storage space when necessary. The Contractor shall be solely responsible for the protection of the materials stored by himself at the job site. Empty coating cans shall be required to be neatly stacked in areas designated by the Engineer and removed from the job site on a schedule determined by the Engineer. Engineer may request a notarized statement from contractor detailing all materials used on the project.

PART IX - PREPARATION OF MATERIALS

A. Mechanical mixers, capable of thoroughly mixing the pigment and vehicle together, shall mix the paint prior to use where required by manufacturer’s instructions; thorough hand mixing will be allowed for small amounts up to one gallon. Pressure pots shall be equipped with mechanical mixers to keep the pigment in suspension, when required by manufacturer’s instructions. Otherwise, intermittent hand mixing shall be done to assure that no separation occurs. All mixing shall be done in accordance with SSPC Vol. 1, Chapter 4, “Practical Aspects, Use and Application of Paints” and/or with manufacturer’s recommendations.

B. Catalysts or thinners shall be as recommended by the manufacturer and shall be added or discarded strictly in accordance with the manufacturer’s instruction.

PART X - APPLICATION

A. Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather, unless otherwise allowed by the paint manufacturer. Except as provided below, painting shall not be permitted when the atmospheric temperature is below 50° F, or when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or when it can be anticipated that these conditions will prevail during the drying period.

B. No coatings shall be applied unless surface temperature is a minimum of 5° above dew point; temperature must be maintained during curing.
DEW POINT CALCULATION CHART

Ambient Air Temperature – Fahrenheit

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SURFACE TEMPERATURE AT WHICH CONDENSATION OCCURS

C. Dew Point

1. Temperature at which moisture will condense on surface. No coatings should be applied unless surface temperature is a minimum of 5°C above this point. Temperature must be maintained during curing.

D. Example

1. If air temperature is 70°C F and relative humidity is 65%, the dew point is 57°C F. No coating should be applied unless surface temperature is 62°C F minimum.

E. No coatings shall be applied unless the relative humidity is below 85%.

F. Suitable enclosures to permit painting during inclement weather may be used if provisions are made to control atmospheric conditions artificially inside the enclosure, within limits suitable for painting throughout the painting operations.

G. Field Painting in the immediate vicinity of, or on, energized electrical and rotating equipment, and equipment and/or pipes in service shall not be performed without the approval of the Engineer.

H. Extreme care shall be exercised in the painting of all operable equipment, such as valves, electric motors, etc., so that the proper functioning of the equipment will not be affected.

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I. The Contractor’s scaffolding shall be erected, maintained, and dismantled without damage to structures, machinery, equipment or pipe. Drop cloths shall be used where required to protect buildings and equipment. All surfaces required to be clear for visual observations shall be cleaned immediately after paint application.

J. Painting shall not be performed on insulated pipe within three (3) feet of insulation operations or on insulation where covering and surface coat have not had time to set and dry. Painting shall not be performed on uninsulated pipe within one (1) foot of any type of connection until the connection has been made, except as directed by the Engineer.

K. The prime coat shall be applied immediately following surface preparation and in no case later than the same working day. All paint shall be applied by brushing, paint mitt and roller, conventional spraying, or airless spraying, using equipment approved by the paint manufacturer.

L. Each coat of paint shall be recoated as per manufacturer’s instructions. Paint shall be considered recoatable when an additional coat can be applied without any detrimental film irregularities such as lifting or loss of adhesion.

M. Surfaces that will be inaccessible after assembly shall receive either the full specified paint system or three shop coats of the specified primer before assembly.

N. Finish colors shall be in accordance with the COLOR SCHEDULE and shall be factory mixed (i.e., there shall be no tinting by the Contractor, unless authorized by the Engineer).

O. All edges and weld seams in immersion service shall receive a “stripe coat” (applied by brush) of the 1st coat prior to application of the full 1st coat.

P. All open seams in the roof area of tanks shall be filled after application of the topcoat with a flexible caulking such as Sika Flex 1A.

PART XI - WORKMANSHIP

A. The Contractor must show proof that all employees associated with this project shall have been employed by the Contractor for a period not less than six (6) months.

B. Painting shall be performed by experienced painters in accordance with the recommendations of the paint manufacturer. All paint shall be uniformly applied without sags, runs, spots, or other blemishes. Work, which shows carelessness, lack of skill, or is defective in the opinion of the Engineer, shall be corrected at the expense of the Contractor.

C. The Contractor shall provide the names of at least 6 other projects of similar size and scope that they have successfully completed under their current company name.

D. Application Of Paint

1. BY BRUSH AND/OR ROLLERS
a. Top quality, properly styled brushes and rollers shall be used. Rollers with a baked phenohl core shall be utilized.

b. The brushing or rolling shall be done so that a smooth coat as nearly uniform in thickness as possible is obtained. Brush or roller strokes shall be made to smooth the film without leaving deep or detrimental marks.

c. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or sheepskins, and paint mitt.

d. It may require 2 coats to achieve the specified dry film thickness if application is by brush and roller.

E. Air, Airless, Or Hot Spray

1. The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied and shall be equipped with suitable pressure regulators and gauges.

2. Paint shall be applied in a uniform layer, with a 50% overlap pattern. All runs and sags should be brushed out immediately or the paint shall be removed and the surface resprayed.

3. High build coatings should be applied by a crosshatch method of spray application to ensure proper film thickness of the coating.

4. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or sheepskins shall be used, as authorized by the manufacturer.

5. Special care shall be taken with thinners and paint temperatures so that paint of the correct formula reaches the receiving surface.

6. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer of the paint being sprayed.

7. The first coat on concrete surfaces in immersion service should be sprayed and backrolled.

PART XII - PROTECTION AND CLEAN-UP

A. It shall be the responsibility of the Contractor to protect at all times, in areas where painting is being done, floors, materials of other crafts, equipment, vehicles, fixtures, and finished surfaces adjacent to paint work. Cover all electric plates, surface hardware, nameplates, gauge glasses, etc., before start of painting work.

B. At the option of the Engineer during the course of this project, the Contractor will contain all spent abrasives, old paint chips, paint overspray and debris by means suitable to the Engineer, including but not limited to, full shrouding of the area.

C. If shrouding is required, the Contractor must provide a complete design of the intended shroud or cover. Care must be taken not to modify or damage the structure during the use of the shroud. If damage should occur, the Contractor is held responsible for all repairs.
D. At completion of the work, remove all paint where spilled, splashed, splattered, sprayed or smeared on all surfaces, including glass, light fixtures, hardware, equipment, painted, and unpainted surfaces.

E. After completion of all painting, the Contractor shall remove from job site all painting equipment, surplus materials, and debris resulting from this work.

F. The Contractor is responsible for the removal and proper disposal of all hazardous materials from the jobsite in accordance with Local, State, and Federal requirements as outlined by the Environmental Protection Agency.

G. A notarized statement shall be presented to the Engineer that all hazardous materials have been disposed of properly including but not limited to: Name of disposal company, disposal site, listing of hazardous materials, weights of all materials, cost per pound and EPA registration number.

PART XIII - TOUCH-UP MATERIALS

A. The Contractor shall provide at the end of the project at least one (1) gallon of each generic topcoat in each color as specified by the Engineer for future touch-up. Two gallons may be required for (2) component materials.

PART XVI - ON-SITE INSPECTION

A. During the course of this project the Engineer will reserve the option of incorporating the services of a qualified inspection service. The inspection service will be responsible for assuring the proper execution of this specification by the successful contractor.

PART XV - COATING SYSTEM SCHEDULE

A. STEEL – STRUCTURAL, TANKS, PIPES, AND EQUIPMENT

1. EXTERIOR EXPOSURE (NON-IMMERSION)

A.1 System No. 73-1 Epoxy/High Build Urethane

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

<table>
<thead>
<tr>
<th>Coat</th>
<th>Description</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>66-1255 Epoxoline Primer</td>
<td>3.0 – 4.0</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>66-Color Hi-Build Epoxoline</td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td>3rd Coat</td>
<td>73-Endura-Shield</td>
<td>2.0 – 3.0</td>
</tr>
</tbody>
</table>

Minimum 8.0 Mils

NOTE: This system is highly resistant to abrasion, wet conditions, corrosive fumes, and chemical contact. Provides 2-3 times the color and gloss retention of conventional paints. Second coat to be same color or close to finish color. Specify Series 1074 Endura-Shield for a gloss finish. Specify Series 161 in lieu of the 66 for faster recoats or lower temperature curing.
A.2 System No. 73-2 High Build Urethane For Marginally Cleaned Surfaces or Topcoating Existing Systems.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning or SSPC-SP3 Power Tool Cleaning Feather all edges.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shop Coat:</td>
</tr>
<tr>
<td>Manufacturer Standard Primer (or existing coating)</td>
</tr>
<tr>
<td>Tie Coat:</td>
</tr>
<tr>
<td>Topcoat:</td>
</tr>
</tbody>
</table>

Minimum 6.5-10.0

NOTE: This system can be used over factory finish paint or over non-sandblasted steel and offer the high performance of a urethane coating. Specify Series 1074 Endura-Shield for gloss finish. A test patch is always recommended to insure proper application.

A.3 System No. 82-1 Silicone Alkyd Enamel – Gloss

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat:</td>
</tr>
<tr>
<td>37H-77 Chem-Prime H.S.</td>
</tr>
<tr>
<td>2nd Coat:</td>
</tr>
<tr>
<td>3rd Coat:</td>
</tr>
</tbody>
</table>

Minimum 4.5 – 8.5

Minimum 5.5 Mils

A.4 System 90-97 Zinc/Epoxy/Urethane

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primer:</td>
</tr>
<tr>
<td>90-97 Tneme-Zinc</td>
</tr>
<tr>
<td>2nd Coat:</td>
</tr>
<tr>
<td>3rd Coat:</td>
</tr>
</tbody>
</table>

Minimum 8.0 Mils

NOTE: This system offers the added corrosion protection of a zinc rich primer. Series 90-97 Tneme-Zinc is an organic zinc-rich primer that can be used for field touch up of a zinc primer or for touch up of galvanized surfaces that are damaged. You can substitute Series 91-H2O Hydrozinc for the 90-97. You can substitute Series 1074 for the Series 73 if a gloss finish is desired.
A.5  System No. 30-1 DTM Acrylic Overcoat System

Surface Preparation: Pressure Clean @ 3500 PSI
Spot SP2, SP3, SP6, or SP7
Feather all edges.

<table>
<thead>
<tr>
<th>Spot Primer</th>
<th>135 Chembuild</th>
<th>DFT-Mils</th>
<th>2.0 – 4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Coat:</td>
<td>30 Spra-Saf EN</td>
<td>2.0 – 4.0</td>
<td></td>
</tr>
<tr>
<td>3rd Coat:</td>
<td>30 Spra-Saf EN</td>
<td>2.0 – 4.0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4.0 – 8.0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>6.0 –12.0 (Spots)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** This is an excellent coating system to overcoat existing unknown coating systems with limited surface preparation, using a non-stressful coating with excellent color and gloss retention. This coating should be spray applied and has excellent dry fall properties. The brush and roller version of Series 30 with a SG finish is the Series 29 Tufcryl. A test patch is always recommended to assure proper adhesion.

B. INTERIOR EXPOSURE (NON-IMMERSION)

B.1  System No. N69-1 High Solids Epoxy

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

| 1st Coat:         | N69-Color Hi-Build Epoxoline II | DFT Mils | 5.0 – 7.0 |
| 2nd Coat:         | N69-Color Hi-Build Epoxoline II | 5.0 – 7.0 |
|                   |                              | Minimum 10.0 –14.0 |

**NOTE:** This coating will provide maximum protection. It offers chemical and corrosion resistance for long-term protection against salt spray, moisture, corrosive fumes, and chemical attack. Series N69 is a polyamidoamine cured epoxy. Primer coat must be touched-up before 2nd coat is applied.

B.2  System No. 66-2 Polyamide Epoxy

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

| 1st Coat:         | 66-Color Hi-Build Epoxoline | DFT-Mils | 3.0 – 5.0 |
| 2nd Coat:         | 66-Color Hi-Build Epoxoline | 4.0 – 6.0 |
|                   |                              | 7.0 –11.0 |
|                   |                              | Minimum 9.0 Mils |

**NOTE:** This system will provide chemical and corrosion resistance against abrasion, moisture, corrosive fumes, chemical contact, and immersion in non-
potable water. Primer coat must be touched-up before 2\textsuperscript{nd} coat is applied. Substitute Series 161 for low temperature cure or quick recoats.

B.3 **System No. 66-6 High Build Epoxy (Over OEM Finishes)**

Surface Preparation: Spot SSPC-SP6 Commercial Blast Cleaning or SSPC-SP11 Power Tool Cleaning To Bare Metal

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st} Coat: Manufacturer’s Standard (or existing coating)</td>
</tr>
<tr>
<td>2\textsuperscript{nd} Coat: 135 Chembuild</td>
</tr>
<tr>
<td>3\textsuperscript{rd} Coat: 66-Color Hi-Build Epoxoline</td>
</tr>
</tbody>
</table>

Minimum 7.0 Mils

**NOTE:** This system is to be used over standard manufacturer’s primer to offer a high performance epoxy finish. Excellent for areas of rust not able to be completely cleaned.

B.4 **System No. 23-1 Alkyd Enamel – Semi-Gloss**

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st} Coat: 37H-77 Chem-Prime H.S.</td>
</tr>
<tr>
<td>2\textsuperscript{nd} Coat: 23-Color Enduratone</td>
</tr>
<tr>
<td>3\textsuperscript{rd} Coat: 23-Color Enduratone</td>
</tr>
</tbody>
</table>

Minimum 6.0 Mils

C. **IMMERSION**

C.1 **System No. N69-2 High Solids High Build Epoxy (Non-Potable Water)**

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stripe Coat: N69-Color Hi-Build Epoxoline II by brush and roller to all weld seams and plate edges</td>
</tr>
<tr>
<td>1\textsuperscript{st} Coat: N69-Color Hi-Build Epoxoline II</td>
</tr>
<tr>
<td>2\textsuperscript{nd} Coat: N69-Color Hi-Build Epoxoline II</td>
</tr>
</tbody>
</table>

10.0 -14.0 (Excluding stripe coat) Minimum 12.0 Mils

**NOTE:** This system provides maximum protection in immersion service. Scarify the surface before topcoating if the Series N69 has been exterior-exposed for 60 days or longer. If primer coat is damaged, it must be touched-up before 2\textsuperscript{nd} coat is applied.
C.2 System No. 66-2 High Build Epoxy (Non-Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

<table>
<thead>
<tr>
<th>Stripe Coat</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>66-Color to all weld seams and plate edges</td>
<td>2.0 – 4.0</td>
</tr>
<tr>
<td>1st Coat:</td>
<td>66-Color Hi-Build Epoxoline</td>
</tr>
<tr>
<td>2nd Coat:</td>
<td>66-Color Hi-Build Epoxoline</td>
</tr>
<tr>
<td>3rd Coat:</td>
<td>66-Color Hi-Build Epoxoline</td>
</tr>
</tbody>
</table>

Minimum 9.0 – 15.0 (Excluding stripe coat)

NOTE: This system will provide chemical and corrosion resistance for protection against abrasion, moisture, corrosive fumes, chemical contact, and immersion. Primer coat must be touched-up before 2nd coat is applied. Scarify the surface before topcoating if the Series 66 has been exterior-exposed for 60 days or longer. Substitute Series 161 for low temperature cure or quick recoats.

C.3 System No. 20-1 Epoxy-Polyamide (Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

<table>
<thead>
<tr>
<th>Stripe Coat</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-1255 Pota-Pox (Beige) to all weld seams and plate edges</td>
<td>2.0 – 4.0</td>
</tr>
<tr>
<td>1st Coat:</td>
<td>20-15BL Pota-Pox (Tank White)</td>
</tr>
<tr>
<td>2nd Coat:</td>
<td>20-1255 Pota-Pox (Beige)</td>
</tr>
<tr>
<td>3rd Coat:</td>
<td>20-15BL Pota-Pox (Tank White)</td>
</tr>
</tbody>
</table>

11.0 – 17.0 (Excluding stripe coat)

Minimum 12.0 Mils

Caulk: Seal all open roof seams with a flexible NSF Certified caulking such as Sika Flex 1A

NOTE: This system meets American Water Works Association AWWA D 102 Inside Paint System Number 1. Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series FC20 for low temperature cure or quick recoats.
C.4  **System No. N140 High Solids Epoxy (Potable Water)**

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

<table>
<thead>
<tr>
<th>Stripe Coat</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>N140-15BL Pota-Pox Plus</td>
<td>3.0 – 5.0</td>
</tr>
<tr>
<td>(by brush and roller to all weld seams and plate edges)</td>
<td></td>
</tr>
<tr>
<td>1st Coat: N140-1255 Pota-Pox Plus (Beige)</td>
<td>6.0 – 8.0</td>
</tr>
<tr>
<td>2nd Coat: N140-15BL Pota-Pox Plus (Tank White)</td>
<td>6.0 – 8.0</td>
</tr>
<tr>
<td></td>
<td>12.0 -16.0 (Excluding stripe coat)</td>
</tr>
<tr>
<td>Minimum</td>
<td>14.0 Mils</td>
</tr>
</tbody>
</table>

**NOTE:** Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61.

C.5  **System No. 446 Hydrophobic Polyurethane (Non-Potable Water)**

Surface Preparation: SSPC-SP10 Near White Blast Cleaning*

<table>
<thead>
<tr>
<th>One Coat: 446 Perma-Shield</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16.0 – 20.0</td>
</tr>
</tbody>
</table>

**NOTE:** May be applied in a two-coat application. Review critical recoat time if utilized.

*SSPC-SP6 Commercial Blast Cleaning may be used for non-immersion service.

C.6  **System No. 91-H\textsubscript{2}O Zinc/Epoxy (Potable Water)**

Surface Preparation: SSPC-SP10 Near White Metal Blast

<table>
<thead>
<tr>
<th>Stripe Coat</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>91-H\textsubscript{2}O Hydrozinc 2000</td>
<td>2.5 – 3.5</td>
</tr>
<tr>
<td>(by brush &amp; roller to all weld seams and plate edges.)</td>
<td></td>
</tr>
<tr>
<td>1st Coat: 91- H\textsubscript{2}O Hydrozinc 2000</td>
<td>2.5 – 3.5</td>
</tr>
<tr>
<td>2nd Coat: 20-1255 Pota-Pox (Beige)</td>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td>3rd Coat: 20-15BL Pota-Pox (Tank White)</td>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td></td>
<td>10.5 -15.5</td>
</tr>
<tr>
<td>Minimum</td>
<td>12.0 Mils</td>
</tr>
</tbody>
</table>

**Caulk:** Seal all open roof seems with a flexible NSF Certified caulking such as Sika-Flex 1A.

**NOTE:** Can substitute Series N140, or FC20 for Series 20 if preferred. Meets AWWA D102-97 Inside Coating System No. 3.
OVERHEAD METAL DECKING, JOIST

D. INTERIOR EXPOSURE

D.1 System No. 115-1 Uni-Bond DF

Surface Preparation: Surfaces must be dry, clean, and free of oil, grease, and other contaminants. Allow concrete to cure 28 days. Galvanized metal decking must be scarified.

Coating: 115-Color Uni-Bond DF

DFT-Mils


NOTE: This system should be used on ceiling areas where a one-coat system is desired. Can be applied over steel, galvanized, and aluminum decking, joist, beams, conduits, and concrete.

E. EXTERIOR EXPOSURE

E.1 System No. 135-5 Epoxy/DTM Acrylic

Surface Preparation: Pressure clean to remove all dirt, oil, grease, chemicals, and foreign contaminants. Remove loose paint and all rust by hand and power tool cleaning (SSPC-SP 2 & 3). Feather all edges.

Dry Film-Mils

Spot Primer: 135 Chembuild
1st Coat: 30 Spra-Saf EN
2nd Coat: 30 Spra-Saf EN

TOTAL 4.0 – 8.0 (For 2 Coats)

NOTE: This system can be applied over a wide variety of coatings and factory finishes. It can also be applied direct to galvanized aluminum decking, joists, conduits, and tight rust.

MILL COATED STEEL PIPE

F. EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)

F.1 System No. 66-3 Epoxy-Polyamide

Surface Preparation: Surface shall be clean and dry. Scarify by Brush Blasting if surface is hard and glossy.

DFT-Mils

1st Coat: 66-Color Hi-Build Epoxoline
2nd Coat: 66-Color Hi-Build Epoxoline

*3rd Coat: 73 Endura-Shield

Minimums

11.0 Mils for 3 coats
9.0 Mils for 2 coats
*Optional topcoat for exterior exposure

**NOTE:** This system can be applied directly to mill coated steel pipe without sandblasting for use in non-immersion. There may be some bleed through with the 1st coat. Do not apply over glossy varnish type mill coatings without thorough scarification.

15.4 **GALVANIZED STEEL – PIPE AND MISCELLANEOUS FABRICATIONS**

**G. EXTERIOR/ (NON-IMMERSION)**

**G.1 System No. 73-2 Epoxy/High Build Urethane**

Surface Preparation: SSPC-SP1 Solvent Cleaning and Scarify by Brush Off Blasting, Hand Sanding, or Chemical Treatment

<table>
<thead>
<tr>
<th>Coats</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>66-Color Hi-Build Epoxoline</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>73-Color Endura-Shield</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum 5.0 Mils

**NOTE:** Series 66 has excellent adhesion to galvanized steel. This system is highly resistant to abrasion, wet conditions, corrosive fumes, and chemical contact. Provides 2-3 times the color and gloss retention of conventional paints. First coat to be same color as or close to the finish color. Specify Series 1074 Endura-Shield for gloss finish.

**H. INTERIOR EXPOSURE (NON IMMERSION)**

**H.1 System No. 66-6 Polyamide Epoxy**

Surface Preparation: SSPC-SP1 Solvent Cleaning and Scarify by Brush Off Blasting, Hand Sanding, or Chemical Treatment

<table>
<thead>
<tr>
<th>Coats</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>66-Color Hi-Build Epoxoline</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>66-Color Hi-Build Epoxoline</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum 5.0 Mils

**I. IMMERSION (POTABLE WATER)**

**I.1 System No. 20-1 Epoxy-Polyamide (Potable Water)**

Surface Preparation: Solvent Clean Per SSPC-SP1 & Abrasive Blast per SSPC-SP7

<table>
<thead>
<tr>
<th>Coats</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>20-1255 Pota-Pox Primer</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>20-15BL Pota-Pox Finish</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum 10.0 Mils
NOTE: Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series FC20 for low temperature cure or quick recoat.

15.5 CHAIN-LINK FENCES

J. GALVANIZED STEEL & NON-FERROUS METAL

J.1 System No. 6-2 Oil Based Enamel

Surface Preparation: Surface shall be clean and dry

<table>
<thead>
<tr>
<th></th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat:</td>
<td>80 Galv-Gard</td>
</tr>
<tr>
<td></td>
<td>2.5 – 4.0</td>
</tr>
<tr>
<td>2nd Coat:</td>
<td>80 Galv-Gard</td>
</tr>
<tr>
<td></td>
<td>2.5 – 4.0</td>
</tr>
<tr>
<td></td>
<td>5.0 – 8.0</td>
</tr>
</tbody>
</table>

Minimum 5.0 Mils

15.6 CONCRETE

K. EXTERIOR – ABOVE GRADE

K.1 System No. 180-1 High Build Acrylic Emulsion – Smooth

Surface Preparation: Surface shall be clean and dry.

<table>
<thead>
<tr>
<th></th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat:</td>
<td>180-Color W.B. Tneme-Crete</td>
</tr>
<tr>
<td></td>
<td>4.0 – 6.0*</td>
</tr>
<tr>
<td>2nd Coat:</td>
<td>180-Color W.B. Tneme-Crete</td>
</tr>
<tr>
<td></td>
<td>4.0 – 6.0*</td>
</tr>
<tr>
<td></td>
<td>8.0 – 12.0 Mils</td>
</tr>
</tbody>
</table>

Minimum 10.0 Mils

*This coating should be spray applied to achieve the recommended DFT. Application by roller would possibly require additional coats to achieve the recommended DFT for the system.

NOTE: Series 180 is a high build decorative acrylic coating in a smooth finish. Substitute Series 181 if a sand texture finish if desired.

K.2 System No. 6-1 Acrylic Emulsion

Surface Preparation: Surface must be clean and dry.

<table>
<thead>
<tr>
<th></th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat:</td>
<td>6-Color Tneme-Cryl</td>
</tr>
<tr>
<td></td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td>2nd Coat:</td>
<td>6-Color Tneme-Cryl</td>
</tr>
<tr>
<td></td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td></td>
<td>4.0 – 6.0</td>
</tr>
</tbody>
</table>

Minimum 5.0 Mils
NOTE: If semi-gloss finish is desired, use Series 29 Tuf-Cryl as the 2nd coat @ 1.5 – 2.0 mils DFT.

K.3 System No. 156-1 Modified Acrylic Elastomer

Surface Preparation: Surface must be clean and dry.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
<th>1st Coat: 156-Color Enviro-Crete</th>
<th>2nd Coat: 156-Color Enviro-Crete</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.0 – 8.0</td>
<td>4.0 – 8.0</td>
</tr>
<tr>
<td>Minimum</td>
<td>8.0 – 16.0</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: If texture is needed, use 157 Enviro-Crete TX (medium texture). For application over previously applied coatings, use TNEMEC Series 151 Elasto-Grip at 1.0 – 2.5 mils DFT prior to the application of Series 156 Enviro-Crete.

K.4 System No. 100 Concrete Stain

Surface Preparation: The surface must be clean, dry, sound, and free of cracks, and paint.

<table>
<thead>
<tr>
<th>SF/Gal/Ct</th>
<th>Sealer: Chemprobe Prime A Pell H₂O</th>
<th>Concrete Stain: Two coats of Chemprobe Conformal Stain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65-200</td>
<td>75-200</td>
</tr>
</tbody>
</table>

L. EXTERIOR – BELOW GRADE

L.1 System No. 46-61 Coal Tar Pitch Solution

Surface Preparation: Surface must be clean and dry. Allow new concrete to cure at least 28 days.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.0 – 12.0</td>
<td>8.0 – 12.0</td>
</tr>
<tr>
<td></td>
<td>16.0 – 24.0</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>16.0 Mils</td>
<td></td>
</tr>
</tbody>
</table>

L.2 System No. 46-31 Coal Tar Epoxy

Surface Preparation: Surface shall be clean and dry. Allow New concrete to cure at least 28 days.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
<th>One Coat: 46H-413 Hi-Build Tneme-Tar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14.0-20.0</td>
</tr>
</tbody>
</table>
L.3 **System No. 100-1 Crystalline Waterproofing**

Surface Preparation: Surface to be clean and opened up by Brush Blasting, Acid Etching, or Water Blasting w/Turbo Tips. Surface must be pre-wetted prior to application.

1st Coat: XYPEX Concentrate @ (1.5 #/SY)
2nd Coat: XYPEX Modified @ (1.5 #/SY)

**NOTE:** This system can be applied to concrete that is still wet or hasn’t developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure. Application shall be per XYPEX specification manual.

M. **INTERIOR EXPOSURE (NON-IMMERSION)**

M.1 **System No. 6-1 Acrylic Emulsion (Interior/Exterior)**

Surface Preparation: Surface shall be clean and dry. Allow concrete to cure for 28 days.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat: 6-Color Tneme-Cryl</td>
</tr>
<tr>
<td>2nd Coat: 6-Color Tneme-Cryl</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Minimum</td>
</tr>
</tbody>
</table>

**NOTE:** This system will provide a decorative coating with good exterior durability, color retention, and a high vapor transmission rate. For Semi-Gloss finish, substitute Series 29 Tuf-Cryl for the 2nd coat at 1.5 – 2.0 mils DFT. Apply both the Series 6 & 29 in the same color.

M.2 **System No. 66-4 Epoxy-Polyamide (Interior)**

Surface Preparation: Surfaces shall be clean and dry. Allow concrete to cure for 28 days.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat: 66-Color Hi-Build Epoxoline</td>
</tr>
<tr>
<td>2nd Coat: 66-Color Hi-Build Epoxoline</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Minimum</td>
</tr>
</tbody>
</table>

M.3 **System No. 84-1 High Solids Glazed Epoxy (Interior)**

Surface Preparation: Surfaces shall be clean and dry. Allow concrete to cure for 28 days.
**M.4 System No. 113-2 Acrylic Epoxy Semi-Gloss**

Surface Preparation: Surface must be clean and dry.

<table>
<thead>
<tr>
<th>Coats</th>
<th>DFT-Mils</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>113-Color Tneme-Tufcoat</td>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>113-Color Tneme-Tufcoat</td>
<td>4.0 – 6.0</td>
</tr>
</tbody>
</table>

Minimum 8.0 Mils

**NOTE:** Substitute Series 114 Tneme-Tufcoat for gloss finish. Multiple coats may be required if application is by roller.

**N. IMMERSION – POTABLE & NON-POTABLE WATER**

**N.1 System No. 66-4 Epoxy-Polyamide (Non-Potable Water)**

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

<table>
<thead>
<tr>
<th>Coats</th>
<th>DFT-Mils</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat: 66-Color Hi-Build Epoxoline</td>
<td>4.0 – 6.0</td>
<td>8.0 – 12.0</td>
</tr>
<tr>
<td>2nd Coat: 66-Color Hi-Build Epoxoline</td>
<td>4.0 – 6.0</td>
<td>8.0 – 12.0</td>
</tr>
</tbody>
</table>

Minimum 10.0 Mils

**NOTE:** Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. First coat should be spray applied and backrolled.

**N.2 System No. 104-5 High Solids Epoxy (Non-Potable Water)**

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

<table>
<thead>
<tr>
<th>Coats</th>
<th>DFT-Mils</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat: 104-1255 H.S. Epoxy Primer</td>
<td>6.0 – 10.0</td>
<td>12.0 - 20.0</td>
</tr>
<tr>
<td>2nd Coat: 104-Color H.S. Epoxy</td>
<td>6.0 – 10.0</td>
<td>12.0 - 20.0</td>
</tr>
</tbody>
</table>

Minimum 14.0 Mils

**NOTE:** Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. First coat should be spray applied and backrolled.
N.3 System No. 46-31 Coal Tar-Epoxy (Non-Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

DFT-Mils

One Coat: 46H-413 Hi-Build Tneme-Tar 14.0 – 20.0

NOTE: May be applied in a two-coat application. Review critical recoat time if utilized. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer.

N.4 System No. 20-2 Epoxy-Polyamide (Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

DFT-Mils

1st Coat: 20-1255 Pota-Pox 4.0 – 6.0
2nd Coat: 20-15BL Pota-Pox Finish 4.0 – 6.0

Minimum 10.0 Mils

NOTE: This system meets American Water Works Association AWWA D 102Inside System No. 1. Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. (NSF Standard 61 approved). Substitute Series FC20 for low temperature cure or quick recoats.

N.5 System No. N140-2 Epoxy-Polyamidoamine (Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

DFT-Mils

1st Coat: N140-1255 Pota-Pox Plus 6.0 – 8.0
2nd Coat: N140-15BL Pota-Pox Plus 6.0 – 8.0

Minimum 14.0 Mils

NOTE: Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. (NSF Standard 61 approved). First coat should be sprayed and backrolled.
N.6  **System No. 264-1 Elastomeric Polyurethane**  

**Surface Preparation:** Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13 (Surface Preparation of Concrete)

<table>
<thead>
<tr>
<th></th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primer:</strong></td>
<td>5.0 Mils</td>
</tr>
<tr>
<td><strong>Coating:</strong></td>
<td>60.0 Mils ± 65.0 Mils</td>
</tr>
</tbody>
</table>

**NOTE:** This system is NSF Certified for Potable Water. This flexible liner can be used to rehab tanks with leaks. Multiple passes may be required to achieve the desired thickness that can range from 50-100 mils. See Elasto-Shield Application Guide for detailed instructions.

O.  **INTERIOR EXPOSURE (NON-IMMERSION) OVER EXISTING COATINGS**

O.1  **System No. 6-1 Acrylic Emulsion**

**Surface Preparation:** Surface must be clean and dry.

<table>
<thead>
<tr>
<th></th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Coat: 6-Color Tneme-Cryl</td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Coat: 6-Color Tneme-Cryl</td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td></td>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td>Minimum</td>
<td>5.0 Mils</td>
</tr>
</tbody>
</table>

**NOTE:** If semi-gloss finish is desired, use Series 29 Tuf-Cryl as the 2<sup>nd</sup> Coat @ 1.5 – 2.0 mils DFT.

O.2  **System No. 113-1 Acrylic-Epoxy Semi-Gloss**

**Surface Preparation:** Surface must be clean and dry.

<table>
<thead>
<tr>
<th></th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Coat: 113-Color Tneme-Tufcoat</td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Coat: 113-Color Tneme-Tufcoat</td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td></td>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td>Minimum</td>
<td>5.0 Mils</td>
</tr>
</tbody>
</table>

**NOTE:** This system will provide high performance and can be applied directly over existing coatings without lifting. Can be used when low odor is required during application. Specify Series 114 Tneme-Tufcoat for Gloss Finish. This coating can be spray applied in a single coat at 4.0 – 6.0 mils DFT.
15.7 CONCRETE FLOORS

**P. EPOXY FLOOR COATING**

**P.1 System No. 205-1 Epoxy-Polyamide**

Surface Preparation: Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
<th>1st Coat</th>
<th>2nd Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 – 5.0</td>
<td>205 Terra-Tread FC</td>
<td>205 Terra-Tread FC</td>
</tr>
<tr>
<td>3.0 – 5.0</td>
<td></td>
<td>6.0-10.0</td>
</tr>
</tbody>
</table>

Minimum 6.0 Mils

**NOTE:** This system will provide a durable, longwearing coating that bonds tightly to concrete and stands up under heavy foot traffic, frequent cleaning, and spillage of water, oil, grease, or chemical. For floors exposed to the sun, add a 3rd coat of Tnemec Series 291 CRU at 2.0 – 3.0 mils DFT.

**NOTE:** For a skid resistant finish broadcast 50 mesh dry washed silica sand into the 1st coat.

**P.2 System No. 287-1 Waterborne Epoxy-Amine**

Surface Preparation: Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
<th>1st Coat</th>
<th>2nd Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 – 4.0</td>
<td>287-Color Enviro-Tread</td>
<td>287-Color Enviro-Tread</td>
</tr>
<tr>
<td>2.0 – 4.0</td>
<td></td>
<td>4.0 – 8.0</td>
</tr>
</tbody>
</table>

Minimum 5.0 Mils

**NOTE:** For a non-skid finish, add 287-300C skid resistance sand into the first coat. For floors exposed to the sun add a 3rd coat of Tnemec Series 291-CRU at 2.0 – 3.0 mils DFT.

**P.3 System No. 291-12 Epoxy/Urethane**

Surface Preparation: Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
<th>1st Coat</th>
<th>2nd Coat</th>
<th>3rd Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 – 3.0</td>
<td>66-Color Hi-Build Epoxoline</td>
<td>66-Color Hi-Build Epoxoline</td>
<td>291-Color CRU</td>
</tr>
<tr>
<td>2.0 – 3.0</td>
<td></td>
<td></td>
<td>2.0 – 3.0</td>
</tr>
<tr>
<td>6.0 – 9.0</td>
<td></td>
<td></td>
<td>6.0 – 9.0</td>
</tr>
</tbody>
</table>

Minimum 7.0 Mils
NOTE: This system offers a hard, chemically resistant floor coating with excellent flow properties and color and gloss retention.

P.4 System No. 280-1 High Build Polyamine-Epoxy Glaze Floor

Surface Preparation:Allow concrete to cure 28 days. Abrasive Blast Cleaning (Refer to Installation Guide of manufacturer.)

<table>
<thead>
<tr>
<th>Coats</th>
<th>Product</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>201 Epoxoprime</td>
<td>6.0 – 8.0</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>280 Tneme-Glaze</td>
<td>6.0 – 8.0</td>
</tr>
<tr>
<td>3rd Coat</td>
<td>280 Tneme-Glaze</td>
<td>6.0 – 8.0</td>
</tr>
</tbody>
</table>

Minimum 18 Mils

Please refer to manufacturer’s Installation Guide and Technical Data for proper installation.

P.5 System No. 237/281 Double Broadcast Flooring (Non-Slip)

Surface Preparation: Abrasive Blast Cleaning (Refer to Installation Guide of manufacturer.)

<table>
<thead>
<tr>
<th>Coats</th>
<th>Product</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>201 Epoxoprime</td>
<td>6.0 – 8.0</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>237 Power-Tread</td>
<td>1/8&quot; (2 cts. @ 1/16&quot; each)</td>
</tr>
<tr>
<td>3rd Coat</td>
<td>280 Tneme-Glaze</td>
<td>8.0 –12.0</td>
</tr>
</tbody>
</table>

Minimum ¼"+

Please refer to manufacturer’s Installation Guide and Technical Data for proper installation.

P.6 System No. 222/284 Multi-Color Quartz Broadcast Floor and Cove Base

Surface Preparation: Abrasive blast cleaning (Refer to Tnemec Surface Preparation and Installation Guide).

<table>
<thead>
<tr>
<th>Coats</th>
<th>Product</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>222 Deco-Tread</td>
<td>1/8&quot; (2 cts. @ 1/16&quot; each)</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>284 Deco-Clear</td>
<td>8.0-10.0</td>
</tr>
</tbody>
</table>

Total 1/8" +

15.8 POROUS MASONRY

Q. EXTERIOR/INTERIOR EXPOSURE

Q.1 System No. 180-2 Acrylic Emulsion – Smooth

Surface Preparation: Surface shall be clean and dry.
Block Filler: 54-562 Modified Epoxy
Masonry Filler

1st Coat: 180-Color W.B. Tneme-Crete
2nd Coat: 180-Color W.B. Tneme-Crete

DFT-Mils
80 SF/Gal
4.0 – 8.0
4.0 – 8.0
8.0 -16.0*

*Total DFT of topcoats only

**NOTE:** Also available in Series 181 in a sand finish. The Series 180 has to be spray applied to achieve recommended dry film thickness application; by roller would require additional coats.

Q.2 System No. 6-2 Acrylic Emulsion, Low Sheen

Surface Preparation: Surface shall be clean and dry.

Block Filler: 54-562 Modified Epoxy
Masonry Filler

1st Coat: 6-Color Tneme-Cryl
2nd Coat: 6-Color Tneme-Cryl

DFT-Mils
80 SF Gal
2.0 – 3.0
2.0 – 3.0
*4.0 – 6.0

*Total dry film thickness of topcoats only.

**NOTE:** This system will fill the block and provide a sealed surface. For semi-gloss finish, use Series 29 Tufcryl (SG) for the 2nd coat @ 1.5 – 2.0 mils DFT.

Q.3 System No. 66-15 Epoxy-Polyamide (Interior)

Surface Preparation: Surface shall be clean and dry.

Block Filler: 54-660 Epoxy Masonry Filler

1st Coat: 66-Color Hi-Build Epoxoline
2nd Coat: 66-Color Hi-Build Epoxoline

DFT-Mils
100 SF Gal
4.0 – 6.0
4.0 – 6.0
*8.0–12.0

*Total dry film thickness of topcoats only.

**NOTE:** Block filler is a polyamide epoxy designed for high moisture.
Q.4  **System No. 104-6 High Solids Epoxy (Interior Only)**

**Surface Preparation:** Surface to be clean and dry.

| DFT-Mils |  
|----------|----------|
| **1st Coat:** | 104-Color H.S. Epoxy | 6.0 – 10.0 |
| **2nd Coat:** | 104-Color H.S. Epoxy | 6.0 – 10.0 |
| | | 12.0 – 20.0 |
| Minimum | 14.0 Mils |

**NOTE:** The surface will be tile-like for easy cleaning and will provide protection against chemical attack, corrosive fumes, and high humidity and wash down. Spray and backroll first coat to fill porosity.

Q.5  **System No. 113-1 Acrylic-Epoxy Semi-Gloss (Interior Only)**

**Surface Preparation:** Surface must be clean and dry.

| Block Filler: | 54-562 Modified Epoxy | 80 SF/Gal |
| Masonry Filler | | |
| **1st Coat:** | 113-Color Tneme-Tufcoat | 4.0 – 6.0 |
| **2nd Coat:** | 113-Color Tneme-Tufcoat | 4.0 – 6.0 |
| | | 8.0-12.0 |

**NOTE:** Series 113 can be spray applied @ 4.0 – 6.0 mils DFT. Application by brush and roller will require additional coats.

**NOTE:** Series 113 Tneme-Tufcoat has very low odor and can be used when painting in occupied areas. Specify Series 114 Tneme-Tufcoat for a gloss finish.

Q.6  **System No. 156-1 Modified Acrylic Elastomer (Exterior)**

**Surface Preparation:** Surface must be clean and dry.

| Block Filler: | 54-562 Modified Epoxy | 80 SF/Gal |
| Masonry Filler | | |
| **1st Coat:** | 156-Color Enviro-Crete | 4.0 – 8.0 |
| **2nd Coat:** | 156-Color Enviro-Crete | 4.0 – 8.0 |
| | | 8.0–16.0 |
| Minimum | 10.0 Mils |
| (For 2nd & 3rd Coats) | | |

**NOTE:** If texture is needed, use 157 Enviro-Crete TX (medium texture). For application over previously applied coatings, use TNEMEC 151 Elasto-Grip at 1.0 – 2.5 mils DFT in place of the 54-562 block filler.
15.9 GYPSUM WALLBOARD

R. INTERIOR EXPOSURE

R.1 System No. 113-5 Acrylic-Epoxy

Surface Preparation: Surface must be clean and dry.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat: 51-792 PVA Sealer</td>
</tr>
<tr>
<td>2nd Coat: 113 H.B. Tneme-Tufcoat</td>
</tr>
<tr>
<td>3rd Coat: 113 H.B. Tneme-Tufcoat</td>
</tr>
<tr>
<td>Minimum 5.0 Mils</td>
</tr>
</tbody>
</table>

NOTE: Series 113 can be spray applied in a single coat at 4.0 – 6.0 mils DFT. Substitute Series 114 if a gloss finish is desired.

R.2 System No. 66-22 Hi-Build Epoxoline

Surface Preparation: Surface must be clean and dry.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat: 51-792 PVA Sealer</td>
</tr>
<tr>
<td>2nd Coat: 66-Color Hi-Build Epoxoline*</td>
</tr>
<tr>
<td>5.0 – 8.0</td>
</tr>
<tr>
<td>Minimum 5.0 Mils +</td>
</tr>
</tbody>
</table>

NOTE: *Two coats may be required if applied by roller.

R.3 System No. 6-1 Acrylic Emulsion, Low Sheen
(Interior / Exterior Exposure)

Surface Preparation: Surface must be clean and dry.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat: 6-Color Tneme-Cryl</td>
</tr>
<tr>
<td>2nd Coat: 6-Color Tneme-Cryl</td>
</tr>
<tr>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td>Minimum 5.0 Mils</td>
</tr>
</tbody>
</table>

NOTE: This system is designed for mild use areas like office walls, laboratory ceilings, stairwells, etc. For semi-gloss finish, use Series 29 Tufcryl at 1.5 – 2.0 mils DFT.

15.10 WOOD

S. EXTERIOR/INTERIOR EXPOSURE

S.1 System No. 23-4 Alkyd Semi-Gloss

Surface Preparation: Surface shall be clean and dry.

09900-29
DFT-Mils

1<sup>st</sup> Coat: 36-603 Undercoater 2.5 – 3.5
2<sup>nd</sup> Coat: 23 Enduratone 1.5 – 3.5
3<sup>rd</sup> Coat: 23 Enduratone 5.5 – 10.5

Minimum 6.0 Mils

NOTE: Specify Series 2H Hi-Build Tneme-Gloss for High Gloss finish.

S.2  **System No. 6-5 Acrylic Latex**

Surface Preparation: Surface shall be clean and dry.

DFT-Mils

1<sup>st</sup> Coat: 36 Undercoater 2.0 – 3.5
2<sup>nd</sup> Coat: 6-Color Tneme-Cryl 2.0 – 3.0
3<sup>rd</sup> Coat: 6-Color Tneme-Cryl 6.0 – 9.5

Minimum 7.5 Mils

NOTE: Substitute Series 29 Tufcryl for the third coat at 1.5 – 2.0 mils DFT if semi-gloss finish is desired.

15.11  **PVC PIPE**

T.  **EXTERIOR OR INTERIOR**

T.1  **System No. 73-23 Epoxy-Polyamide**

Surface Preparation: Solvent clean per SSPC-SP1 & Scarify by Brush Blast or Hand Sanding.

DFT-Mils

1<sup>st</sup> Coat: 66-Color Hi-Build Epoxoline 2.0 – 3.0
2<sup>nd</sup> Coat: 73 Endura-Shield 2.0 – 3.0
Total 4.0 – 6.0
Minimum 5.0 Mils

15.12  **INSULATED PIPE**

U.  **INTERIOR EXPOSURE**

U.1  **System No. 6-1 Acrylic Emulsion, Low Sheen**

Surface Preparation: Surface shall be clean and dry.
DFT-Mils

1st Coat: 6-Color Tneme-Cryl 2.0 – 3.0
2nd Coat: 6-Color Tneme-Cryl 2.0 – 3.0

Minimum 4.0 – 6.0

NOTE: For semi-gloss finish, use Series 29 Tufcryl for the 2nd coat.

15.13 HIGH HEAT COATING

V. EXTERIOR/INTERIOR EXPOSURE

V.1 System No. 39-2 Silicone Aluminum (1200° F Maximum)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning – 1.0 Mil Surface Profile

DFT-Mils

1st Coat: 39-1261 Silicone Aluminum 1.0 – 1.5
2nd Coat: 39-1261 Silicone Aluminum 1.0 – 1.5

Minimum 2.0 – 3.0

NOTE: Coating must be heat cured @ 400°F for 1 hour.

V.2 System No. 39-4 Silicone Aluminum (600° F Maximum)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning – 1.0 Mil Surface Profile

DFT-Mils

1st Coat: 39-661 Silicone Aluminum 1.0 – 1.5
2nd Coat: 39-661 Silicone Aluminum 1.0 – 1.5

Minimum 2.0 – 3.0

NOTE: Coating must be heat cured @ 400°F for 1 hour.

V.3 System No. 90E-92 Inorganic Zinc (750°F Max)

Surface Preparation: SSPC-SP10 Near White Metal Blast Cleaning

Coating: 90E-02 Tneme-Zinc 2.0 – 3.5

NOTE: Coating will have a greenish gray color but will not require curing at elevated temperatures.
15.14 SURFACES EXPOSED TO H₂S/H₂SO₄ (SEVERE EXPOSURE/IMMERSION)

W. CEMENTITIOUS SURFACES

W.1 System No. 120-1 Vinyl Ester (Concrete)
Surface Preparation: Abrasive blast clean per SSPC-SP13 to remove all laitance, fines, and contamination.

<table>
<thead>
<tr>
<th>Coats</th>
<th>Description</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>120-5002 Vinester Primer</td>
<td>6.0 – 10.0*</td>
</tr>
<tr>
<td>2nd</td>
<td>120-5003 Vinester F&amp;S</td>
<td>As Required**</td>
</tr>
<tr>
<td>3rd</td>
<td>120-5002 Vinester Primer</td>
<td>12.0 – 18.0</td>
</tr>
<tr>
<td>4th</td>
<td>120-5001 Vinester Topcoat</td>
<td>12.0 – 18.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30.0 – 46.0</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>36.0 Mils +</td>
</tr>
</tbody>
</table>

NOTES:

*First coat to be applied by roller application or spray applied followed by backrolling.

**All surface voids, cracks, pinholes, and other defects must be filled flush with the adjacent surfaces by putty knife, trowel, float, squeegee, or other suitable method.

X. FERROUS METAL SURFACES

X.1 System No. 120-2 Vinyl Ester (Steel)
Surface Preparation: SSPC-SP5 White Metal Blast Cleaning (3.0 Mil Profile)

<table>
<thead>
<tr>
<th>Coats</th>
<th>Description</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>120-5002 Vinester Primer</td>
<td>12.0 – 18.0</td>
</tr>
<tr>
<td>2nd</td>
<td>120-5001 Vinester Topcoat</td>
<td>12.0 – 18.0</td>
</tr>
<tr>
<td>Minimum</td>
<td></td>
<td>30.0 – 36.0</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>30.0 Mils</td>
</tr>
</tbody>
</table>

NOTE: Application of a stripe coat to all weld seams and plate edges is recommended.

15.15 EXTERIOR OF Prestressed Concrete Tanks

Z.1 System No. 156-3 (New Tanks)
Surface Preparation: Surface to be clean and dry.
### Z.2 System No. 180-3 (New Tanks)

**Surface Preparation:** Surface to be clean and dry.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Type</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>156-Color Envirocrete</td>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>156-Color Envirocrete</td>
<td>4.0 – 6.0</td>
</tr>
<tr>
<td>Minimum</td>
<td></td>
<td>8.0–12.0</td>
</tr>
</tbody>
</table>

### Z.3 System No. 6-6 (New Tanks)

**Surface Preparation:** Surfaces to be clean and dry.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Type</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>Thoroseal or equal</td>
<td>1/16&quot;</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>180 W.B. Tneme-Crete</td>
<td>2.0–4.0</td>
</tr>
<tr>
<td>3rd Coat</td>
<td>180 W.B. Tneme-Crete</td>
<td>2.0–4.0</td>
</tr>
</tbody>
</table>

### Z.4 System No. 156-4 Existing Tanks (Previously Painted)

**Surface Preparation:** Remove all dirt, oil, grease, chalk, and loose paint per High Pressure Water Blast (Min 3500 PSI).

<table>
<thead>
<tr>
<th>Layer</th>
<th>Type</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>151 Elasto-Grip</td>
<td>1.0–2.5</td>
</tr>
<tr>
<td><em>Stripe Coat:</em></td>
<td>Stripe all hairline cracks with a Brushed coat of Series 156 Envirocrete</td>
<td>3.0–5.0</td>
</tr>
<tr>
<td>Topcoat</td>
<td>156-Envirocrete</td>
<td>4.0–6.0</td>
</tr>
<tr>
<td>(Cracks)</td>
<td></td>
<td>8.0–13.5</td>
</tr>
<tr>
<td>(Other)</td>
<td></td>
<td>5.0–8.5</td>
</tr>
</tbody>
</table>

### Z.5 System 180-4 Existing Tanks (Previously Painted)

**Surface Preparation:** Remove all dirt, oil, grease, chalk, and loose paint per High Pressure Water Blast (Min 3500 PSI).
**Stripe Coat:** 180 W.B. Tneme-Crete
Applied by roller to all
Visible cracks

1st Coat: 180 W.B. Tneme-Crete 2.0-4.0
2nd Coat: 180 W.B. Tneme-Crete 2.0-4.0
                        4.0-8.0
Minimum 5.0 mils (2 coats)

**NOTE:** May be spray applied in a single coat at 4.0 – 8.0 mils.

15.16 SECONDARY CONTAINMENT AREAS

**AA.1 System No. 61-4 Epoxy Polyamide (For Fuel Oils)**

Surface Preparation: Surface shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP7 (Brush Off Blast).

**DFT-Mils**

Primer: 61-5002 Tneme-Liner (Beige) 4.0 – 6.0
Topcoat: 61-5001 Tneme-Liner (Gray) 4.0 – 6.0
                        8.0–12.0
Minimum 10.0 Mils

**NOTE:** This system will provide excellent resistance to most chemicals including petrochemicals. Use Tnemec Series 63-1500 between coats as a filler and surfacer wherever it is required.

**AA.2 System No. 61-1 Amine Epoxy (For Caustics)**

Surface Preparation: Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP6 (Brush Off Blast).

**DFT-Mils**

Primer: 61-5002 Tneme-Liner (Beige) 8.0 – 12.0
Topcoat: 61-5001 Tneme-Liner (Gray) 8.0 – 12.0
                        16.0 - 24.0

**NOTE:** This system offers superior chemical resistance to a wide range of chemicals. Use Tnemec Series 63-1500 between coats as a filler and surfacer wherever it is required.

**AA.3 System 262-1 Flexible Polyurethane**

Surface Preparation: Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP7 (Brush Off Blast).
DFT-Mils

Primer: 66 Hi-Build Epoxoline 5 Mils
Coating: 262 Elasto-Shield (Black) 50 Mils
Total 55

NOTE: Multiple passes may be required to achieve recommended film thickness. See Elasto-Shield Application Guide for additional instructions. This product is only available in black. Repair all cracks, bugholes, and spalled areas with Series 265 Elasto-Shield TG prior to application of Series 262.

AA.4 System No. 120-3 Vinyl Ester (For Acids)

Surface Preparation: Abrasive blast clean per SSPC-SP13.

DFT-Mils

Filler Surfacer: 120-5003 Vinester F & S as Required
1st Coat: 120-5002 Vinester Primer 15.0-18.0
2nd Coat: 120-5001 Vinester Topcoat 15.0-18.0
30.0-36.0
Minimum 30.0 Mils

NOTES: Use 120-5003 Vinester F & S to fill all cracks, bugholes, and other surface voids, and smooth all rough areas.

AA.5 System No. 275 Fiber Reinforced Novolac Epoxy

Surface Preparation: Allow new concrete to cure 28 days. Abrasive blast clean per SSPC-SP13.

Filler Surfacer: Fill all voids with Tnemec Series 201 Epoxoprime mixed with fumed silica.

Prime Coat: Tnemec Series 201 Epoxoprime @ 6.0 – 8.0 mils DFT.

Body Coat: Tnemec Series 275 Stranlok (Fiber Reinforced Novolac Epoxy) applied by spray or trowel at 30-35 mils DFT.

Topcoat: Tnemec Series 282 Tneme-Glaze (Novolac Epoxy) applied at 6.0 – 8.0 mils DFT.

15.17 CLEAR WATER REPELLENT FOR CONCRETE, MASONRY & BRICK

BB.1 Silane/Siloxane Sealer (Water Based)

Surface Preparation: Allow new concrete to cure 28 days. Clean surfaces to be sealed by abrasive blasting or waterblasting.
COATING: BRICK, CONCRETE
Chemprobe PRIME A PELL H₂O . . . . . . 125-200 SF/GAL

SPLIT FACED OR POROUS MASONRY
Chemprobe PRIME A PELL H₂O, . . . . . . 65-100 SF/GAL

BB.2 Silane/Siloxane Sealer w/Concrete Stain

Sealer: Chemprobe Prime A Pell H₂O 65-200 SF/Gal
Concrete Stain: Two Coats of Chemprobe 75-200 SF/Gal/Ct

Conformal Stain

15.18 MANHOLES, WET WELLS & LIFT STATIONS

CC.1 System No. 120-1 Vinyl Ester

Surface Preparation: Abrasive blast clean to remove all laitance, fines, and contamination.

<table>
<thead>
<tr>
<th>Coats</th>
<th>Description</th>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Coat</td>
<td>120-5002 Vinester Primer</td>
<td>6.0 – 10.0*</td>
</tr>
<tr>
<td>2nd Coat</td>
<td>120-5003 Vinester F&amp;S</td>
<td>As required**</td>
</tr>
<tr>
<td>3rd Coat</td>
<td>120-5002 Vinester Primer</td>
<td>12.0 – 18.0</td>
</tr>
<tr>
<td>4th Coat</td>
<td>120-5001 Vinester Topcoat</td>
<td>30.0 – 46.0</td>
</tr>
</tbody>
</table>

Minimum 36.0 Mils +

*First coat to be applied by roller application or spray applied followed by backrolling.

**All surface voids, cracks, pinholes, and other defects must be filled flush with the adjacent surfaces by putty knife, trowel, float, squeegee, or other suitable method.

CC.2 System No. 100-1 Crystalline Waterproofing

Surface Preparation: Surface to be clean and roughened by Brush Blasting, Acid Etching, or High Pressure Water Blasting (3500 PSI) with turbo tips.

1st Coat: XYPEX Concentrate @ (1.5#/SY) – 1/16"±
2nd Coat: XYPEX Modified @ (1.5#/SY) – 1/16"±

NOTE: This system can be applied to concrete that is still wet or hasn’t developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure.

15.19 CANAL PIPE CROSSINGS

DD.1 System 90-97 Zinc/Epoxy/Urethane for New Pipe or Pipe Requiring Removal of Existing Coatings

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

09900-36
DD.2 System No. 135-2 High Build, High Gloss Urethane for Marginally Cleaned Surfaces or Topcoating Over Existing Systems

Surface Preparation: High Pressure Water Blast (Min 3500 PSI) or Solvent Clean (SSPC-SP1) and Spot Hand and Power Tool Clean (SSPC-SP2 & 3) or Brush Blast (SSPC-SP7). Existing coatings must be clean, dry, and tightly adhering prior to application of coatings.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Primer:</td>
</tr>
<tr>
<td>Tie Coat:</td>
</tr>
<tr>
<td>2nd Coat:</td>
</tr>
</tbody>
</table>

Minimum 5.0 Mils

NOTE: A test Patch is always recommended to insure proper adhesion to existing coatings without lifting of existing coatings.

15.20 Repainting of Metal Building Panels

EE.1 Exterior of Metal Building Panels

Surface Preparation: Pressure clean (3000 PSI) and spot SP2 & 3 Hand and Power Tool Cleaning.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Primer:</td>
</tr>
<tr>
<td>1st Coat:</td>
</tr>
<tr>
<td>2nd Coat:</td>
</tr>
</tbody>
</table>

Minimum 4.0 Mils

NOTE: Test patch is strongly recommended.

EE.2 Exterior Miscellaneous Metal Trim

Surface Preparation: Pressure clean (3000 PSI) or solvent clean per SSPC-SP1. Spot SP2 & 3 Hand & Power Tool Cleaning.

<table>
<thead>
<tr>
<th>DFT-Mils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Primer:</td>
</tr>
<tr>
<td>Tie Coat:</td>
</tr>
<tr>
<td>Topcoat:</td>
</tr>
</tbody>
</table>

Total 4.0 – 7.0

NOTE: Test patch is strongly recommended.
### Belzona Coating

<table>
<thead>
<tr>
<th>SYSTEM #</th>
<th>SUBSTRATE &amp; SERVICE</th>
<th>SURFACE PREPARATION</th>
<th>COAT (SERIES #/DFT-MILS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1st CT</td>
</tr>
<tr>
<td>F.1</td>
<td>Above Grade Pipe</td>
<td>Clean and Dry</td>
<td>5811 (10 mills) or 5812DW (10-12mills)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N.5</td>
<td>Chlorine Contact and Parshall Flume Interior</td>
<td>SP-13</td>
<td>To repair bottom substrate of partial flume 4111 Bulk w/ 4911 cond. or 4131 Magma screed Bulk w/4911 cond. Then 1st coat 5811(10mills) or 5812DW(10-12mills)</td>
</tr>
<tr>
<td>BB.1</td>
<td>Exterior Chlorine Contact</td>
<td>Clean and Dry</td>
<td>5811(10 mills) or 5812DW(10-12mills)</td>
</tr>
<tr>
<td>C.5</td>
<td>Steel and Pipe Immersion</td>
<td>SP10 Sandblast to bare metal all surfaces to be clean, free from dust and rust prior to coating.</td>
<td>5811(10 mills) or 5812DW(10-12mills)</td>
</tr>
<tr>
<td>SYSTEM #</td>
<td>SUBSTRATE &amp; SERVICE</td>
<td>SURFACE PREPARATION</td>
<td>COAT (SERIES #/DFT-MILS)</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>N/A</td>
<td>Chlorine Contact and Parshall Flume</td>
<td>Existing Coal tar lining: pressure wash at a minimum 3500 psi, followed by an SSPC SP7 to achieve a minimum 1.5 mil profile. Existing and new concrete (uncoated): pressure wash at a minimum 3500 psi, followed by abrasive blast to ICPRI CSP5 New Concrete Exterior exposed: Pressure wash at a minimum 3500 psi.</td>
<td>Existing Coal tar epoxy: Use Series 215 to repair any damaged concrete or coal tar. Level. Existing and new concrete: Surface concrete with Series 218 surfacer at min 1/16” Prime with Series 20HS-1211 Pota-Pox (4.0-6.0) on existing coal tar and surfaced concrete with</td>
</tr>
</tbody>
</table>

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The work included under this Section consists of furnishing and installing submersible mixers, motors, and related equipment, fully tested, complete and in operating condition.

2. Equipment furnished and installed under this Section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer as approved by the Engineer.

3. The basis of design for this project is xylem, model #4640 submersible mixer.

1.02 QUALITY ASSURANCE

A. Unit Responsibility: The mixers, motors, control panel, crane arm assembly and guide bars shall be supplied by the mixer supplier to insure unit responsibility.

B. Factory Tests: The mixer manufacturer shall perform the following tests on each mixer before shipment from the factory:

1. Propeller, motor rating and electrical connections shall be checked for compliance with specifications.

2. A motor and cable insulation test for moisture content and insulation defects shall be made.

3. The mixer shall be run dry to establish correct rotation and mechanical integrity.

4. The mixer shall be run for 30 minutes submerged a minimum of 9 feet under water. A control measurement of electrical current on all phases shall be made.

5. After the 30 minute operational test the insulation test is to be performed again.
1.03 SUBMITTALS

A. Shop Drawings and Manufacturer's Literature: For all mixers to be furnished under this Section, the Contractor shall submit shop drawings, including at least the following, to the Engineer for approval in accordance with the provisions of Section 01340:

1. Manufacturer's literature and illustrations.

2. Shop Drawings - including details of mixer assembly and installation layouts and procedures, motor control wiring diagrams, types of materials used in construction, details of all accessories, and dimensions of major components.

B. Operating Instructions: For all mixers furnished under this Section, the Contractor shall submit operation and maintenance manuals to include the following in accordance with the provisions of Section 01730:

1. General - equipment function, description and normal and limiting operating characteristics.

2. Installation instructions - assembly procedures and alignment and adjustment procedures.

3. Operation instructions - start-up procedures, normal operating conditions, emergency and normal shutdown procedure.

4. Lubrication and maintenance instructions including a list of at least three acceptable lubricants in each case.

5. Troubleshooting guide.

6. Parts list, the predicted life of parts subject to wear and normal delivery times of such parts.

7. Drawings - cross-sectional view, assembly and wiring diagrams.

8. Recommended spare parts inventory.

C. Factory Representative: A factory representative of all major component manufacturers, who has complete knowledge of proper operation and maintenance, shall be provided for one (1) day to instruct representatives of the Owner and the Engineer on proper operation and maintenance. With the permission of the Owner, this work may be conducted in conjunction with the inspection of the installation and test run as provide under PART 3. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional services shall be provided at no cost to the Owner.
D. Certifications: The Contractor shall furnish the Engineer with a written certification signed by the manufacturer's representative that the equipment has been properly installed and lubricated, is in accurate alignment, is free from undue stress imposed by piping or mounting bolts, and has been operated under full load conditions and that satisfactory operation has been obtained.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver a complete system ready to install as job progress requires.

B. Store in weathertight building or suitable covering to protect against damage of any nature.

C. Handle during delivery, storage, and installation in a manner to prevent damage of any nature.

1.05 WARRANTY AND GUARANTEES

A. The mixer manufacturer shall warrant the mixers being supplied to the Owner against defects in workmanship and materials for a period of two (2) years commencing at time of final acceptance.

B. Refer to Section 01740 for additional requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Contractor shall furnish and install submersible mixers in the chlorine contact structure.

B. All parts shall be designed and proportioned for ample strength, stability and stiffness for their intended purpose.

C. Mixers shall be designed for continuous duty operation. They shall provide complete mixing and prevent settlement.

D. Mixers shall have the following operating characteristics:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CHLORINE CONTACT TANKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixers Required, #</td>
<td>1</td>
</tr>
<tr>
<td>Motor Rating, Shaft Hp</td>
<td>4.0</td>
</tr>
<tr>
<td>Voltage</td>
<td>460</td>
</tr>
<tr>
<td>Phase</td>
<td>3</td>
</tr>
<tr>
<td>---------</td>
<td>---</td>
</tr>
<tr>
<td>Frequency, Hertz</td>
<td>60</td>
</tr>
<tr>
<td>Propeller Dia., in.</td>
<td>14.57</td>
</tr>
<tr>
<td>Propeller RPM</td>
<td>860</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Flygt</td>
</tr>
<tr>
<td>Model</td>
<td>4640</td>
</tr>
</tbody>
</table>

2.02 MATERIALS AND EQUIPMENT

A. Mixer Design

1. The mixer(s) shall be capable of handling chlorinated effluent. The mixer(s) shall be able, with the exception for floor-mounted mixers, to be raised and lowered and shall be easily removed for inspection or service without the need for personnel to enter the mixing vessel. The mixer shall be mounted on a square guide bar system or on a fixed floor mount. A sliding guide bracket shall be an integral part of the mixer unit. The entire weight of the mixer unit shall be guided by a single bracket which must be able to handle all thrust created by the mixer. The standard mixer, with its appurtenances and cable, shall be capable of continuous submergence under water, without loss of watertight integrity, to a depth of 130 ft. FM approved mixers have a depth limit of 57 ft.

B. Mixer Construction

1. Each mixer shall be of the integral design, close coupled, submersible type. All components of the mixer, including motor, shall be capable of continuous underwater operation. Major mixer components shall be of 316L Stainless Steel construction. The oil housing cover plate shall be of corrosion resistant composite. All exposed fasteners shall be of stainless steel. In order to insure that the low velocity area around the motor remains impervious to low PH solids and or liquid attack, the motor housing exterior shall be made of 316 Stainless Steel. All metal surfaces coming into contact with the mixed media, other than stainless steel, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with an epoxy finish coat on the exterior of the mixer.

C. Motor

1. The multi-pole motor shall be directly connected to the propeller (gearbox designs are not acceptable) to produce a propeller speed of 860 RPM. The mixer motor shall be squirrel cage, induction, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor
shall be inverter duty rated in accordance with NEMA MG1, Part 31. The motor shall be designed for continuous duty, capable of no less than 30 evenly spaced starts per hours. The rotor bars and short circuit rings shall be made of aluminum.

Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches embedded in the end coils of the stator winding and set for 284°F (140°C). These shall be used in conjunction with, and supplemental to, external motor overload protection, and wired to the control panel.

D. Elastomers

1. All mating surfaces where watertight sealing is required shall be machined and fitted with a double set of Nitrile rubber or Viton O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This will result in controlled compression of the O-rings without requiring a specific torque limit. No secondary sealing compounds, rectangular gaskets, elliptical O-rings, grease or other devices shall be used.

E. Propeller

1. The propeller shall be of 316 stainless steel dynamically balanced, non-clogging backward curved design. Each blade shall be laser cut and welded to the hub to ensure that the propeller is properly balanced. The propeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in normal sewage applications. The propeller shall have either two or three vanes 14.57 inches in diameter.

F. Cable Entry

1. The cable entry housing shall be an integral part of the back plate. The cable entry shall have a double set of elastomer grommets in order to ensure a redundant system in the event of a cable entry failure. Single sealing systems will not be deemed acceptable. The cable entry shall be comprised of two cylindrical elastomer grommets, each flanked by washers and a ferrule designed with close tolerance fit against the cable outside diameter and the entry inside diameter. This will provide a leak proof seal at the cable entrance without the need for specific torque requirements. The assembly shall bear against a shoulder in the stator casing opening and be compressed by a gland nut threaded into it. Interaction between the gland nut and the ferrule should move the grommet along the cable axially instead of with a rotary motion. The junction chamber and motor compartment shall be separated by a terminal board which shall protect the motor interior from foreign material gaining access into the mixer top. Connection shall be made between the threaded compressed type binder posts thus securely affixing the cable wires to the terminal board. The use of the terminal compressed type post and a terminal
board O-ring shall render the motor compartment leak proof from any liquid which may enter the terminal compartment. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

G. Bearings

1. All bearings shall have a minimum B-10 or L-10aa rated life of 100,000 hours and shall have inner and outer races of metal construction. Bearings with races made of nonmetallic construction will not be deemed acceptable or meeting the load handling and environmental requirements of this application. The outboard propeller bearing shall be an angular contact bearing. The motor shaft end shall be supported by two bearings. A roller and an angular contact ball bearing shall take up the axial and radial loads while an angular contact ball bearing shall take up the axial loads. The bearings shall be pre-loaded by a bearing loading nut located on the motor end of the shaft in order to reduce shaft deflection and increase bearing life and seal life. Mixers without pre-loaded bearings will not be considered acceptable or equal.

H. Oil Housing

1. The oil housing shall contain two compartments consisting of an inner and an outer section with four ports to connect and facilitate oil flow. In the event that the mixed media bypasses the other seal, this design will allow the outer compartment to collect the heavier (denser) fluids by means of a simple gravity process. Mixers which require propeller removal for oil change shall not be acceptable. Separate fill and drain plugs shall be provided to facilitate oil replacement.

I. Mechanical Seals

1. Each mixer shall be provided with two sets of lapped end face type mechanical seals running in oil reservoirs for cooling and lubrication.

J. Optional:

1. The inner mechanical seal is corrosion resistant Tungsten Carbide/Aluminum Oxide. The outer seal faces are Silicon Carbide/Silicon Carbide. One face of the inner seal ring pair shall have spiral grooves laser etched in it, to provide a pumping action to move leakage from the stator housing back into the oil chamber. In order to avoid seal failure due to sticking, clogging, and misalignment from elements contained in the mixed media, only the seal faces of the outer seal assembly and its retaining clips shall be exposed to the mixed media. All other components shall be contained in the oil housing.

K. Seal Shield

1. The mixer shall be equipped with a seal shield that prevents fibrous material
from winding up around the shaft and outer seal. The shield shall be welded to the propeller hub and extend towards the motor. The shield shall rotate with the propeller and there shall be a radial micro-gap between the shield and oil-housing.

L. Mixer Test

1. The mixer manufacturer shall perform the following inspections and tests on each mixer before shipment from the factory:

a. Propeller, motor rating, and electrical connections shall first be checked for compliance to the customer's purchase order.

b. A dielectric test shall be carried out in accordance to IEC 60034-1 (two times rated voltage plus 1000 V). This test shall be done after assembly but before any performance tests. No records shall normally be provided.

c. Prior to shipment, the mixer shall be run dry to establish correct rotation and mechanical integrity.

2.03 SPARE PARTS

A. None Required.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All materials and equipment shall be installed as shown on the Drawings and as recommended by the manufacturer.

3.02 FIELD QUALITY CONTROL

A. Field Tests: A qualified representative of the mixing system supplier shall inspect the installation and supervise start-up performed by the Contractor's personnel. All components of the systems shall be tested for proper operation during the start-up operation.

B. Maintenance Procedures: After the equipment has been placed into operation, the qualified representative of the mixing system supplier shall instruct the Owner's personnel in proper operating and maintenance procedures without additional cost to the Owner.

END OF SECTION
PART 1   GENERAL

1.01 EQUIPMENT OVERVIEW

A. These specifications provide the requirements to furnish, deliver and place into operation reservoir circulation equipment at WWTP AND RIB IMPROVEMENTS.

1.02 REFERENCES

A. Occupational Safety and Health Administration, OSHA
B. Department of Transportation, DOT
C. Underwriters Laboratories Inc., UL 1989 and UL 1703
D. International Electrotechnical Commission, IEC #896-2
E. Hunt Water Adsorption Test
F. United States Food and Drug Administration, FDA title 21

1.03 QUALITY ASSURANCE

A. Continuous Operation Equipment. The circulation equipment shall operate continuously, all day and all night, during all seasons including winter.

B. No Visual Defects. The circulation equipment shall have no visual defects, and shall have high quality welds and assembly, corrosion resistant finish, and site specific operational controls.

C. Qualified US Manufacturer. The manufacturer of the equipment shall have extensive experience in the production of such equipment, and the equipment shall be manufactured in the continental United States.

D. Factory Startup Services. Delivery, placement and startup services shall be included in the bid, and performed by full time factory employees experienced in the operation of this equipment and who have completed OSHA safety trainings applicable to this type of work.

E. Warranty. The circulation equipment shall be warranted to be free of defects in materials and workmanship for a period of 2 years. In addition the motor shall be warranted for a period of 10 years, and the photovoltaic module performance for 25 years. A copy of the warranty shall be included with the submittal. This equipment warranty would run directly from the manufacturer of the equipment to the owner. The equipment warranty would not be part of the contract or any required bond.

1.04 SUBMITTALS
A. The awarded Bidder shall provide [5] copies of the following documents. Upon acceptance of these documents by the Engineer, the Bidder will be issued a Notice to Proceed, and may then proceed to furnish the equipment.

1. A qualification statement demonstrating compliance with Section 1.03.

2. Shop drawings for the circulation equipment.

3. Manufacturer’s literature, illustrations and specification sheets.

B. Following equipment placement, additional Submittals shall include:

1. A complete operation and maintenance manual.

2. Within 30 days of equipment placement, the manufacturers report including:
   a. Aerial photograph with labeling of pond, cell or reservoir data.
   b. Work summary.
   c. Customer contact information.
   d. Climate / weather conditions.
   e. Circulation machine information.
   f. Technician field notes.
   g. GPS location of each circulation machine and test point.
   h. Secchi depth at a minimum of two 2 locations per pond, cell or reservoir.
   i. Water quality testing information (water temperature, specific conductance, dissolved oxygen and pH) at a minimum of 2 locations per pond, cell or reservoir at 1 foot increments down to 25 feet water depth and at 5 feet increments from 25 feet water depth down to 100 feet water depth.
   j. Free water, slurry and sludge / sediment depths at a minimum of 2 locations per pond, cell or reservoir.
1.05 FIELD SERVICES

A. Factory Personnel. The placement and startup shall be performed by full time factory employees trained in the operation of the circulation equipment.

B. Safety. Technicians shall have received job-specific safety training on (a) Working over Water, (b) Boating Safety, (c) Disinfecting Procedures, (d) Confined Space Entry, (e) Fall Protection, and (f) DOT Compliance.
PART 2 PRODUCT SPECIFICATIONS

2.01 MANUFACTURER

A. Specified Equipment. The circulation equipment shall be manufactured by Medora Corp. of Dickinson, ND, or be a pre-approved alternative.

B. Pre-approved Alternative(s). Alternatives to the specified equipment will be considered on the following basis only.

1. Ten (10) Days Before Bid. To offer equipment as a pre-approved alternative, written application from the alternative supplier shall be made to the Engineer at least 10 days in advance of the bid opening.

2. No Material Difference in Quality of Equipment or in Vendor Support. The application should include:

   a. A brief description of how the offered alternative does or does not meet each of the specifications in this document.

   b. An analysis of how acceptance of the alternative equipment would likely affect the overall water quality goals of the project.

   c. A statement of the science and support background of the supplier of the alternative equipment, so that the benefits and costs of the alternative equipment to the Owner can be estimated by the Engineer.

3. Five (5) Days Notice to Bidders. If the alternative equipment is accepted by the Engineer, an informational addendum to these specifications shall be distributed by the Engineer to plan holders at least 5 days in advance of the bid opening.

2.02 PERFORMANCE AND FEATURES

A. The Solar Bee Aerator shall provide sufficient flow capacity to mix a 1-acre x 8’ deep reclaimed water storage pond.

B. Continuous Operation With Solar Power Only. The circulation equipment shall operate continuously during day, night, and extended overcast conditions, 365 days per year. Continuous operation when used in this section shall be defined as operating a minimum of 90% of the total hours during the course of one year, on solar power, without reliance on any connection to the A.C. power grid.

C. Stainless Steel Construction. The circulation equipment shall be constructed primarily of Type 316 stainless steel metal for strength and superior corrosion
resistance. Each machine shall also undergo a passivation bath, also known as stainless steel pickling, to restore corrosion resistance to the welds and other areas of imperfections.

D. Motor. The circulation equipment shall be mechanically operated by a motor that meets the following criteria.

1. Brushless, brush motors requiring brush replacement not accepted.
2. Hall effect commutation for motor control.
3. Direct Drive, with no gearbox, to avoid lubrication maintenance.
4. Stainless Steel Bearings, requiring no scheduled lubrication, rated bearing life expectancy greater than 100,000 hours continuous operation.
5. Designed for marine, outdoor environment by having a sealed housing with polymeric encapsulated internal windings for superior corrosion resistance. Capable of withstanding the following environment conditions.
   a. -40°F to 140°F (-40°C to 60°C) ambient temperature range, freeze resistant
   b. 100% humidity
   c. Condensation resistant
   d. Splash resistant
6. Designed for Continuous Operation without overheating or compromising motor life expectancy.
7. Less Than 48 volts DC power requirement, to avoid risk of electrocution.
8. 10 Year Replacement Warranty.

E. Controller. The circulation equipment shall be supplied with a motor controller and power management with the following features.

1. Digital Electronic Control System, with firmware and software that is easily re-programmable to optimize the level of water quality achieved in the reservoir.
2. Anti-Jam Reverse, automated self-clearing for locked rotor triggered by high current occurrences caused from jammed impeller.
3. Operation Schedule, with daily and seasonal scheduling for motor speed and direction.
4. Scheduled Reverse Cycles, with daily reverse impeller cycling for self-clearing of impeller to minimize fouling.
5. Motor Health Status Monitoring and Recording, including scheduled speed, commanded speed, actual speed, motor current, motor voltage, and motor controller errors.

6. Fully Potted And Encapsulated Motor Control Circuit, for superior corrosion resistance in marine environment.

7. SD (Secured Digital) Card Reprogrammable features, so digital controller is capable of being field programmable using an SD card for uploading new firmware and changing programmed operations.

8. Manual On/Off Switch, to shut power off to the motor. On/Off switch shall be rated for marine environment and have yellow and red color markings for indicating emergency shut off.

9. Fused Main Power Line, for added protection against power surge through motor controller and motor.

10. Temperature Compensated Charging, so that battery charging parameters are automatically adjusted based on battery temperature.

11. Maximum Power Point Tracking (MPPT), so the charging algorithm is automatically adjusted for optimum results based on solar power input and battery capacity.

12. Power Conservation & Continued Operation Mode, a programmed algorithm for reducing motor load and continuing operation by incremental speed reduction. This feature to be automatically enabled when extended low sunlight conditions occur or battery reserve power is reduced.

13. Low Voltage Shut Off, a programmed shut off switch to disconnect motor load before reaching damaging depth of battery discharge. The motor load automatically re-connects when battery capacity is restored.

14. NEMA 4 Enclosure, for protection against condensation and moisture in a marine environment. The internal circuit boards shall be conformal coated for added protection against moisture.

F. Battery. The battery power storage shall meet the following criteria.

1. Single Battery, multiple batteries are not allowed unless connected in series, to avoid charging problems leading to failed batteries.

2. Battery Capacity Rating, at a 24 hour discharge rate, in watt hours, shall be at
least 50 times the motor load in watts during normal operation (full speed, peak load).

3. Battery shall be Submerged, to avoid extremes in temperature and extend battery life.

4. Battery shall comply with DOT HMR49, non-spillable battery, for transport.

5. Battery shall be UL Listed, compliant to UL 1989.

6. Battery shall have a pressure relief Safety Valves for each cell that incorporates a flame-arrester for safety, and rated as Explosion Resistant.

7. Battery shall be Maintenance Free and not require re-watering.

8. Battery shall contain power conductors constructed of multi strand power wire having a flexible outer jacket, all contained inside stainless steel sheathing for protection from the elements and from rodents.

9. Battery shall be Freeze Tolerant for frigid conditions.

10. Battery shall have a Self-Discharge Rate of less than 1% per month.

11. Battery shall have a Temperature Sensor monitoring battery housing temperature, not ambient temperature, to optimize charging cycles and extend battery life.

12. Battery shall be encased in Double Wall Plastic, and mounted in a Stainless Steel Cage, for safety and battery protection purposes.

G. Photovoltaic Modules (PV modules, Solar Panels). The PV modules shall meet the following criteria.

1. To ensure continuous operation of the motor and impeller in all seasons, the total Nominal Wattage Rating of the PV modules shall be a minimum of 5 times the normal operating wattage of the motor.

2. To ensure adequate power collection during low sunlight conditions, photovoltaic modules shall be Mono-Crystalline, not multi-crystalline.

3. Photovoltaic modules shall contain power conductors constructed of multi strand power wire having a flexible outer jacket, and shall be contained inside stainless steel sheathing for protection from the elements and from rodents.

4. Photovoltaic modules shall be certified to the following quality and safety
Section 11860
Solar Bee Aerator

standards:
a. UL 1703, Class C
b. IEC 61215 and 60364

5. Photovoltaic modules shall have 25 Year Manufacturer Performance Warranty.

H. System Operation Monitoring. The digital controller shall have the following monitoring features.

1. LED (Light Emitting Diode) Flash Code, flashing LEDs in the control box readily accessible by service personnel shall provide continuous electrical diagnostics so the state of the power system can easily be determined.

2. SCADA (Supervisory Control and Data Acquisition), the digital controller shall output system state of health and operation monitoring using RS-232 serial communication (Modbus RTU), DB9 male connection point. A protocol document shall be provided for local network (PLC or RTU) programming assistance.

3. Operation Back Log, the digital controller shall store within controller memory a 30 day rolling log of all primary machine operation parameters.

I. Adjustable Horizontal Water Intake. The circulation equipment shall be supplied with an intake capable of being field adjusted to a set level below the water surface without requiring machine removal and redeployment. The intake shall bring a 1 ft (30 cm) thick horizontal layer of water into the machine. The intake shall include a singular hose of adequate length to reach the required intake depth setting. The flow through the hose and intake shall not exceed 1 foot per second (0.3 meter per second).

J. Maintenance Requirements. The circulation equipment shall operate normally with the following maintenance features.

1. No scheduled lubrication is required of any system components including motor and motor bearing.

2. No brush replacement, gearbox replacement, or motor replacement shall be expected or required during the 25 year expected life of the circulation equipment.

3. No spare parts shall be required to be kept on hand.

4. No tools beyond normal cleaning supplies and a few common hand tools shall be required for scheduled maintenance.
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Solar Bee Aerator

5. Circulator shall be equipped with swinging latched gates for easy access to digital controller, motor, and impeller assembly for inspection.

6. Impeller assembly shall be removable without requiring any tools and shall be easily accomplished out on the water where circulation equipment is deployed.

7. Circulator shall be equipped with a bird deterrent system to minimize bird roosting, droppings on photovoltaic modules.

K. Solids Handling: The circulation equipment shall be capable of passing up to 4 inch (10 cm) spherical solids through the intake and impeller.

L. Flotation: The circulation equipment shall contain a flotation system meeting the following criteria.

1. Adjustable Float Arms shall have a 1” (2.5 cm) diameter shaft and turnbuckle to achieve the optimal performance setting. The float arms shall be a closed frame to minimize torsion forces on the circulation equipment and provide balanced flotation.

2. Flotation Buoyancy shall be 1,350 pounds (620 kg) or more to support the weight of the assembled circulation equipment with a safety factor greater than 1.5. Each circulation machine shall weigh approximately 850 pounds (380 kg).

3. For Flotation Longevity, flotation shall contain Expanded Polystyrene Foam (EPS) beads that are steamed together to minimize water adsorption and provide a solid float core for structural strength. The EPS contents shall have a 0.9-1.2 pounds per cubic foot density with water adsorption not to exceed three pounds per cubic foot in accordance with the Hunt Water Adsorption Test. The flotation shall not sink should the float encasement be punctured.

4. Each Flotation Encasement shall be constructed of a linear polyethylene resin containing ultraviolet (UV) inhibitors to prevent accelerated deterioration in this marine environment. The float encasement shall offer a balance of toughness, rigidity, environmental stress-crack resistance and low temperature impact performance. Resin shall also be in compliance with FDA title 21. Resin shall be made of a food grade material that will not contaminate the waterways and is recyclable. Encasements shall be rotationally molded for seamless, one-piece construction and shall have a nominal minimum wall thickness of 0.15 inches (4 mm). Encasements shall be resistant to damage by animals, ice, bumps by watercraft, contact deterioration from petroleum products and suitable for marine use.
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Solar Bee Aerator

M. Anchoring. At the manufacturers recommendation, the circulation equipment shall be held in position by either (a) attachment to mooring blocks at the bottom of the reservoir, or (b) tethering the circulation equipment to shore.
PART 3  EXECUTION

3.01  PLACEMENT

A. The circulation equipment manufacturer shall provide Placement, Startup, and On-Site Water Testing Services to insure (a) proper machine spatial placement in the reservoir, and (b) proper intake depth setting.

B. The field services shall be performed by full time factory employees experienced in the operation of this equipment, and who have completed safety trainings required for this type of work in compliance with OSHA regulations including (a) Working over Water, (b) Boating Safety, (c) Disinfecting Procedures, (d) Confined Space Entry, (e) Fall Protection, and (f) DOT Compliance.

C. Within 30 days following equipment placement, the manufacturer shall provide an installation report detailing as described in submittal section.

D. The circulation equipment manufacturer shall have the following support team available for full service if ever needed following the equipment placement.

1. A minimum of (10) x (2)-member factory crews.

2. A full customer service staff including engineers and science personnel that are trained for assistance in this application.
SECTION 13300
INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and Install all instrumentation and controls hereinafter specified to perform the intended function. Work shall include all labor, materials, plant facilities and equipment, performance of all work necessary to complete the manufacturer, to make factory tests, to prepare and load for shipment, to deliver to the site, to provide programming, calibration, installation supervision, system start-up, services and incidentals required to completely furnish and install a control system as specified herein and shown on the Contract Drawings.

B. All equipment, materials, programming and services hereinafter termed "the system", shall be integrated by the control system integrator who, with the contractor, shall coordinate and have responsibility for interconnecting with equipment now existing and/or being installed under this or other contracts as shown on the drawings and loop diagrams.

C. Auxiliary and accessory devices necessary for system operation or performance such as transducers or relays to interface with existing equipment or equipment provided under other sections of this Specification shall be included whether specified or not.

D. Attention is directed to the fact that the Instrumentation and Control System shall be furnished by a single pre-qualified system integrator who shall provide all of the services, equipment and appurtenances required to achieve a fully integrated and operational system. To facilitate the owner's future operation and maintenance, products shall be of the same major instrumentation manufacturer with panel mounted devices of the same type and model as far as possible.

E. Substitutions on functions or equipment specified will not be acceptable. In order to ensure the interchangeability of parts, the maintenance of quality, the ease of interfacing between the various sub-systems and the establishment of minimums with regard to ranges and accuracy, strict compliance with the above requirements shall be maintained. In order to ensure compatibility between all equipment, it shall be the responsibility of the system supplier hereunder to coordinate all interface requirements with existing equipment and with mechanical and electrical system suppliers and furnish any signal isolation devices that might be required.
F. Equipment shall be fabricated, assembled, installed and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer as approved by the Engineer.

G. Equipment removed in the course of this work shall become the property of the owner.

H. All equipment and installations shall satisfy applicable national, state and local mechanical and electrical codes.

1.02 QUALIFICATIONS

A. The Contractor shall use only the approved system suppliers and must name his proposed system suppliers on the bid document.

1.03 SUBMITTALS

A. Following award of contract, shop drawings shall be submitted as outlined under the General Conditions and as described herein. Submittals shall be complete giving at least equipment specifications, details of connections, wiring, range and dimensions. Submittals consisting of only general sales literature shall not be acceptable.

B. Submit detailed information for each instrument or control device including manufacturer's descriptive literature and a specific data sheet for each device and its configuration which shall include as a minimum.

1. Tag number per the loop diagrams.
2. Product (item) name used herein and on the contract drawings.
3. Manufacturer's complete model number.
4. Location of the device.
5. Input/Output characteristics.
6. Range, size and graduations.
7. Physical size with dimensions, enclosure NEMA classification and mounting details.
8. Materials of construction of all components.
9. Instrument or control device sizing calculations, where applicable.
10. Certified calibration data on all flow metering devices.
11. Accuracy, resolution, hysteresis and frequency response.

C. Submit a detailed loop diagram on a single 8 1/2 inch x 11 inch sheet for each monitoring or control loop. The format shall be the Instrument Society of America Standard for Instrument Loop Diagrams, ISA-S5.4. Each wire shall be shown with all terminations as part of the loop diagram. Terminations furnished under other sections of this Specification shall be shown and completely identified on the as-built drawings in the submittal. The loop diagrams shall use the same numbers as used herein.
D. Submit detailed ladder diagrams of the relay and switch. The ladder diagram format shall be the same for all processes, systems, sub-systems and equipment. Diagram formats differing based on different manufacturers will not be accepted. Rungs of the ladders shall be cross-referenced. All functions shall be annotated and cross-referenced to loop drawings.

E. The data sheets shall be provided with an index and proper identification and cross-referencing. There shall be separate volumes for field/panel and in-line equipment. The in-line equipment shall be coordinated with the piping work. The detailed loop diagrams shall accompany the field/panel instrument submittal. Each volume shall be submitted in its entirety. Partial submittals will be rejected.

F. Submit detailed drawings concerning control panels and/or enclosures including:

1. Cabinet assembly and layout drawings to scale.
2. Fabrication and painting specifications.
3. Color selection samples for selection by the Engineer.
4. Point to point wiring diagrams depicting wiring within the panel as well as connections to external devices.
5. Where graphic screen displays are required, submit detailed color screen print displays including symbols icons and line widths, as well as color selection samples and details of fabrication.

G. Exceptions to the Specifications or drawings shall be clearly defined by the system supplier. Data shall contain sufficient details so a proper evaluation may be made by the Engineer.

1.04 FINAL DOCUMENTATION

A. Prior to final acceptance of the system, eight (8) sets of Operating and Maintenance manuals covering instructions and maintenance on each type of equipment shall be furnished as noted herein.

B. The instructions shall be bound in three-ring binders with drawings reduced or folded for inclusion and shall provide at least the following as a minimum.

1. A comprehensive index.
2. A complete "As Constructed" set of approved shop drawings.
3. A complete list of the equipment supplied including serial number, ranges and pertinent data.
4. Full specifications on each item.

5. System schematic drawings "As Constructed" illustrating all components, piping and electrical connections of the systems supplied under this section.

6. Detailed service, maintenance and operation instructions for each item supplied.

7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.

8. The operating instructions shall also incorporate a functional description of the entire system with references to the system's schematic drawings and instructions.

9. Complete parts lists with stock numbers and name, address and telephone number of the local supplier.

10.5 SOURCE QUALITY CONTROL

A. The manufacturers of the equipment and fabricators of panels and/or cabinets supplied under this section shall allow the engineer and/or owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems and other pertinent systems and/or devices. A minimum of ten (10) working days notification shall be provide to the Engineer prior to testing. No shipments shall be made without the Engineer's approval.

10.6 PRODUCT HANDLING

A. Shipping Precautions

1. After completion of shop assembly, factory test and approval all equipment, cabinets, panels and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at jobsite.

2. Special instructions for proper field handling, storage and installation required by the manufacturer for proper protection shall be securely attached to each piece of equipment prior to packaging and shipment.
B. Identification

1. Each component shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package.

2. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number as given in the tabulation, shall be provided on each piece of equipment supplied under this section.

C. Storage

1. Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters and shall be adequately protected against mechanical and corrosive damage. If any apparatus has been damaged, such damage shall be repaired by the Contractor at his own cost and expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such tests as directed by the Engineer. This shall be at the cost and expense of the Contractor or the apparatus shall be replaced by the Contractor at his own expense.

PART 2 - PRODUCTS

2.01 INSTRUMENTATION

A. All instrumentation supplied shall be of the manufacturer's latest design and shall produce or be activated by signals which are established standards for the water and wastewater industries.

B. All electronic instrumentation shall be of the solid state type and shall utilize transmission signals which conform to all FCC and local requirements.

C. Outputs of equipment that are not of the standard signals as outlined shall have the output immediately converted to compatible standard signal as for remote transmission.

D. All instruments shall be provided with mounting hardware and floor stands, wall brackets or instrument racks as shown on the drawings, or as required.

E. Equipment installed in a hazardous area shall meet Class, Group and Division as shown on the contract electrical drawings to comply with the National Electrical Code.

F. All indicators and readouts shall be linear in process units.
G. Electronic equipment shall be of the manufacturer's latest design utilizing printed circuitry and suitably coated to prevent contamination by dust, moisture and fungus. Solid state components shall be conservatively rated for their purpose to assure optimum long-term performance and dependability over ambient atmospheric fluctuations and 0 and 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions.

H. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type designed for continuous industrial service. The system shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.

I. All electronic equipment shall be provided with radio frequency interference protection.

2.02 ELECTRICAL

A. All equipment shall be designed to operate on a 60 hertz alternating current power source at a nominal 110 volts plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

B. All analog transmitter and controller outputs shall be 4-20 milliamps into a minimum load range of 0-750 ohms, unless specifically noted otherwise. All switches shall have double pole, double throw contacts rated at a minimum of 600 VA, unless specifically noted otherwise. Material and equipment used shall be UL approved wherever such approved equipment and materials are available. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored. UPS System shall be provided under this Division for control panel (CP). Refer to Division 16 Specifications for UPS requirements.

2.03 LIGHTNING/SURGE PROTECTION

A. General

1. Lightning/surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the analog and discrete signal and power supply lines. The protection systems shall be such that the protection level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level and be maintenance-free and self-restoring. Instruments shall be housed in a suitable metallic case, properly grounded. Ground wires for all surge protectors shall
be connected to a good earth ground and where practical, each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure or a separate NEMA 4X junction box coupled to the enclosure. The units shall be as manufactured by Innovation Technologies or approved equal.

B. Power Supply

1. Protection of all alternating current (AC) instrument power supply lines shall be provided. Cabinet(s)/panel(s) and groups of field instruments, as approved by the Engineer, shall be protected by isolation transformers and surge suppressors. Individual field instruments shall be protected by individual gas tube surge suppressors.

C. Signal Line

1. Protection of all field analog, discrete, digital and telemetered signal lines shall be provided. Protection devices shall be installed at both ends and as close to the instrument being protected as possible. Where signal lines enter control rooms through an interface cabinet, the protection devices shall be mounted in the interface cabinet.

D. Warranty

1. A five year warranty shall be provided by the surge/lightning suppression equipment manufacturer. The warranty shall cover the replacement of all protected equipment for a period of five years after the date of acceptance.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions. The locations of equipment, transmitters, alarms and similar devices shown on the drawing are approximate only. Exact locations shall be as approved by the Engineer during construction.

B. Obtain in the field all information relevant to the relevant to the placing of process control work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

C. The instrumentation loop diagrams indicate the intent of the interconnections between the individual instruments. Any exceptions should be noted.
D. The installation details on the drawings indicate the designed installation for the equipment specified. Where specific installation details are not specified or shown on the drawings, the American Petroleum Institute (API) Recommended Practice 550 shall be followed as applicable.

E. All work shall be executed in full accordance with codes and local rulings. Should any work be performed contrary to said rulings, ordinances and regulations, the Contractor shall bear full responsibility for such violations and assume all costs arising therefrom.

F. All equipment used in areas designated as hazardous shall be designed for the Class, Group and Division as required on the electrical drawings for the locations. All installation shall be in strict accordance with codes.

G. Unless specifically shown in the contract documents, direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands as detailed on the installation detail drawings. All instrumentation connections shall be provided with shut-off and drain valves. For the differential pressure transmitters, three-way stainless steel valve manifolds shall also be provided. For slurries, chemical or corrosive fluids diaphragm seals with flushing connections shall be provided.

H. All piping to and from field instrumentation shall be provided with necessary unions, test tees, couplings, adapters and shut-off valves.

I. Field instruments requiring power supplies shall be provided with local electrical shut-offs and fuses as required.

J. Brackets and hangers required for equipment mounting shall be provided. They shall be installed in a workmanlike manner and not interfere with any other equipment.

K. The system supplier shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the system supplier shall be required to ship his material in sections sized to permit passing through restricted areas in the building. The system supplier shall also investigate and make any field modifications to the allocated space for each cabinet, enclosure and panel to assure proper space and access (front, rear, side).

L. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded as directed by the manufacturer of the instrumentation equipment, but in no case shall more than one ground point be employed for each shield.

M. Lifting rings from cabinets/assemblies shall be removed. Hole plugs shall be provided for the holes of the same color as the cabinet.
3.03 INSTALLATION

A. The system supplier shall coordinate the installation, placing and location of system components, their connections to the process equipment panels, cabinets and devices subject to the Engineer's approval. He shall be responsible to insure that all field wiring for power and signal circuits are correctly done in accordance with best industry practice and provide for all necessary system grounding to insure a satisfactory functioning installation. The Contractor hereunder shall schedule and coordinate his work under with that of the electrical work specified under applicable sections Division 16.

3.04 TESTS

A. The Contractor shall furnish the services of the system supplier’s servicemen, all special tools, calibration equipment and labor to perform the tests. Certified copies of the tests shall be furnished in duplicate to the Engineer.

B. Following connections, check-out and final adjustment of all panels, instruments, meters, monitoring and control devices, a performance check shall be made on each. Analog instruments and system inputs shall be tested at 0 percent, 25 percent, 50 percent, 75 percent, 100 percent, and 1001 percent of scale, as required. All status and alarm switches as well as all monitoring and control functions shall also be checked. Each device on the loop/logic diagrams must be signed off by the Engineer as being acceptable. Testing shall be done from the signal source (transmitter) to the Data Acquisition and Process Control System including all field wiring.

C. If, during running of the tests one or more points appear to be out by more than the specified amount, the system supplier's servicemen shall make such adjustments or alterations as are necessary to bring equipment up to Specification performance. Following such adjustment, the tests shall be repeated for all specified points to insure compliance.

3.05 INSTRUCTION

A. The Contractor shall furnish a system supplier's representative for a field training program to be run at the owner's plant site and consist of up to two (2) days instruction for two (2) of the owner's personnel. The program shall cover instrumentation debugging, troubleshooting, calibration and maintenance procedures and system operation. This training program will be held at a time chosen by the owner and will be exclusive of any instruction given at the time of system start-up.

END OF SECTION

13300-9
SECTION 13310
INSTRUMENTATION AND CONTROLS
FIELD INSTRUMENTS AND PANELS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section covers work related to the furnishing, installation, and testing of the various field elements and panels to be supplied with the PICS. This work supplements the requirements of Section 13300 and it is to be included in the lump sum price for the PICS as provided through the PICS supplier in accordance with these specifications.

1.02 SUBMITTALS

A. Materials and Shop Drawings:

1. Furnish, as prescribed under the General Requirements, Shop Drawings covering the items included under this section or work.

2. Submit Shop Drawings at one time, as a package, for complete interface checking. Partial submittals will not be accepted. However, a separate submittal for the field instruments and the control panels will be allowed.

3. Specifically, include the following information:

   a. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all components of the field instruments.

   b. Individual data sheets for all components of the field instruments and control panels to supplement the above information by citing all specific features for each specific component (e.g., scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown in the Drawings and Specifications.

   c. Catalog information on all miscellaneous electrical and mechanical devices furnished under this section.

   d. Shop drawings and catalog material for all control panels and enclosures. Include panel elevation (front, side, interior), construction shop drawings, schedules, and sizing, calculations.

   e. Panel wiring diagrams of all control panels. Diagrams shall be complete electrical wiring diagrams showing all components and all
auxiliary devices such as relays, alarms, fuses, lights, fans, heaters, etc. All wires and terminals shall be numbered on the diagrams, and line cross references shall be labeled. Include wiring interface to I/O of the PLCs. Include on the drawings, a tag number to identify each component, referenced to a component identification list.

f. Loop diagrams, consisting of individual wiring and/or plumbing diagram for each analog loop showing all terminal numbers, the location of the DC power supply, the location of any booster relays or common dropping resistors, surge arrestors, etc. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus divide each loop diagram into three areas for identification of element locations: panel face, face-of-panel, and field, respectively. On each diagram present a tabular summary of: (1) the output capability of the transmitting instruments; (2) the input impedance of each receiving instrument; (3) an estimate of the loop wiring impedance based on the wire sizes and lengths shown; (4) the total loop impedance; and (5) reserve output capacity.

g. Power requirements and heat dissipation summary for all control panels. Power requirements shall state required voltages, currents, and phase(s). Heat dissipations shall be maximums and shall be given in BTU/HR. Summary shall be supplemented with calculations.

h. System interconnect diagram that shows all connections required between component parts of the items covered in this section and between the various other systems specified in this Contract. Number all electrical terminal blocks and field wiring. Identify each line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme. Coordinate the electrical interconnect wiring diagram with Division 16, Electrical.

i. Installation details for all field mounted devices and panels to show conformance with those shown on the Drawings.

j. Configuration documentation for all programmable devices to indicate actual settings used to set the device scale, range, trip points, and other control parameters.
k. Submit the proposed layout, wiring diagram, mounting details, color section, dimensional data, and materials data for the graphic panel.

4. Submit a list of manufacturer's recommended spare parts and expendables to be supplied with the field instruments and control panels, with the manufacturer's current price for each item.

B. Operating and Maintenance Manuals: See Section 13300 for general requirements. For each field device and panel mounted control device provided, assemble the fully updated approved submittal information plus all available service manuals for the devices in binders with identifying tabs and data sheets.

1.03 WARRANTY AND GUARANTEES

A. The PICS shall furnish to the Owner a written one year guarantee commencing with final acceptance, that all equipment and parts thereof, material and/or workmanship for the field elements, instruments, and control panels are of top quality and free from defects.

PART 2 - PRODUCTS

2.01 GENERAL

A. See Section 13300 for general requirements for name tags, corrosion protection, lightning/surge suppression, electronic transmission, and other electrical considerations.

2.02 CONTROL PANELS

A. PICS Control Panels: Provide the control panels shown on the drawings in materials and rating noted below. Size free-standing control panel(s) as shown on the Drawings. Smaller surface mount panels shall be sized to adequately dissipate heat generated by equipment mounted inside or on the panel face.

1. Finish:

a. Smoothly finish panel face openings for panel-mounted equipment. Cut with counter boring, and provide with trim strips as required to give a neat finished appearance.

b. After fabrication, provide all steel panel surfaces (excluding stainless steel) with a phosphatized treatment inside and out, and then finish with two coats of baked enamel. Paint the panel interiors white, ANSI No. 51. The exterior color shall be selected by the Engineer.
2. Access and Identification:

a. Provide a continuous piano hinge door for ease of access on all control panels. Expose a minimum of 80% of the panel interior for door openings. NEMA 12, 4, and 4X rated panel door openings shall be sealed and fully gasketed. Provide print pockets on each door. Two door enclosures shall have a removable center post. Sealed panel doors shall be equipped with quick release latches. NEMA 1 rated panel doors shall be equipped with a three point latching mechanism.

b. All components and terminals shall be accessible without removing other components except for covers.

c. Surface mounted panels shall have conduit entry from the bottom only. Freestanding, NEMA 1 panels shall have an open area in the bottom for conduit entry.

d. Provide fully gasketed glass window on the panel door when noted or shown to allow viewing of internally mounted devices without opening the door.

e. Provide laminated plastic nameplates for all front face panel mounted controls to completely define their use.

f. Provide identification tags and wire number tags as specified elsewhere for all internal components, wires, and terminals.

3. Corrosion Control: Protect all panels from internal corrosion by the use of corrosion inhibiting vapor capsules, Hoffman, model A-HCI, or equal. Provide sealed panels with combination drain/breathers, Crouse-Hinds model ECD18; or equal.

4. Temperature Control: Provide panels mounted in outdoor or unheated areas with thermostatically controlled space heaters to maintain internal temperatures above dew point. Provide outdoor panels with integral sun shields.

5. Construction: All panels shall be manufactured items, Hoffman Engineering, or equal. Minimum metal thickness shall be 14 gauge. Provided stiffeners as required to prevent deflection under instrument loading and permit lifting without racking or distortion. When required, provide removable lifting rings and fill plugs to replace rings after installation.
6. Electrical:

a. Provide a main circuit breaker and branch circuit breaker for each branch circuit as required to distribute power within each panel from the main power feed. Make provisions for bottom feeder conduit entry and provide terminal board for termination of all wiring. Provide access to the breakers when the panel door is open. The following rules apply for actual circuit wiring:

1) No more than 20 devices on any single circuit.

2) Do not group multiple units of parallel operations on the same board circuit.

3) Do not exceed an amp capacity of 12 amps for any branch circuit.

4) Panel (or site) lighting, receptacles, heaters, controls, telemetry, and fans shall be on a separate branch circuit.

b. The PICS supplier shall design, furnish and install all interior wiring within the control panels and furnish complete wiring diagrams showing the electrical circuits inside the panel and interconnections between the panel and the external instruments and components. Identify and number all terminals and wires. Attach plastic, snap on numbered tags to each panel wire for identification. Inside each panel, provide a copy of the panel wiring diagram. No power shall be applied until the PICS supplier has approved the installation.

c. Wiring within panels shall meet the following requirements:

1) Discrete wiring shall be 300 volt, type THWN stranded copper, sized for the current carried, but not smaller than No. 16 AWG.

2) Power wiring shall be 300 volt type, stranded copper No. 14 AWG size, for 120V service.

3) Analog signal wiring shall be 300 volt, stranded copper in twisted shielded pairs, no smaller than No. 16 AWG.

4) Restrain wiring with plastic ties or ducts. Hinge wiring shall be secured at each end with bend area protected with a plastic sleeve.
5) Separate analog or DC circuits at least six inches from any AC power or control wiring.

d. All relays shall be the compact, general purpose, plug in type. Contacts shall be rated for not less than 10 amperes at 120V. Provide relays with neon status lights and test buttons. Time delay relays shall have integral adjustment knob and rangeability of at least 10:1. All relays shall have permanent, legible identification.

e. Terminal blocks shall meet the following requirements:

1) Provide the greater of 20 percent of all connected terminals or four unused spare terminals for each type supplied.

2) Provide terminal blocks for DC and analog signals separate from AC circuit terminal blocks.

3) Screw type terminal connections shall be locking, fork-tongue or ring-tongue lugs crimped with proper sized anvil. Terminate no more than two plugs per terminal with no more than one wire per lug.

4) Compression clamp terminal connections shall be stripped and prepared per manufacturer's recommendations. Terminate no more than one wire per screw and yoke.

5) Use of aluminum connectors shall not be permitted without prior approval of the Engineer. Connectors shall be either copper or steel.

6) Terminate data highway and other communications cable connections per manufacturer's recommendations, located near the bottom of the panel at the point of entrance to the panel.

f. Provide power supplied as required to power instruments of circuits requiring DC power. Convert 120V AC to DC power of appropriate voltage, voltage regulation, and ripple control to operate within equipment tolerances. DC power supplies shall be of the linear type and design to eliminate switching RFI. Output over voltage and over current protection devices shall be provided. Provide NEMA 1 enclosures for all power supplies within panels.
g. Provide, when shown on the wiring diagrams, the indicated control panels with an internal, hand switch controlled, 40 watt fluorescent light and a 120V, 15 amp, duplex receptacle.

h. Provide all panels with an isolated copper grounding buss to ground all signal and shield connections. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices. Coordinate grounding system with Division 16, Electrical.

i. For 480V panels, provide a 120V dry type control transformer for the panel control and other 120V circuits. Transformers shall be sized to meet higher service rating than actually applied and shall be provided with fused primary and secondary.

j. Install surge suppression devices so that they may be easily identified and replaced. A permanent I.D. # or nameplate shall be affixed to each device.

2.03 MATERIALS AND EQUIPMENT

A. The following are the component specifications followed by specific device descriptions and unique settings or materials for specific devices identified on the drawings:

1. Alarm, Audible Horn:
   a. Provide audible horn that generates a loud audible alarm when activated by 115V AC power. The horn shall surface mount remotely as noted, suitable for outdoor use.
   b. Outdoor units with sealed conduit entry, shall be Ronon Model 350W, or equal.

2. Alarm, Visual Beacon:
   a. Warning lights shall be flashing type units that produce 360 degree beams of colored light. Flashing light shall be 60 to 80 flashes per minute. Unit shall be a solid state strobe source. Light color shall be red and unit shall have simple technique for re-lamping. Units shall be suitable for remote mounting, as note, and shall operate on 120V AC power, unless otherwise notes or shown. Housing shall be weatherproof, suitable for use in outdoor environments without other protection. General purpose units shall be Benjamin Electric Manufacturing, Series KL-4000; or equal.
3. Counter, Totalizer:
   a. Totalizers shall have counting rate, and other appropriate characteristics, to suit application. Unit shall be "silent" and non-mechanical, self-powered electronic type. Units shall accept speed counts up to 3000 cpm and be nominally 4" x 2" in size.
   b. Units shall be non-resettable and sealed suitable for panel mounting as shown. Units shall mount flush with the panel mounting front face. Units shall operate on self-contained battery power with a minimum of 10 year life. Units shall be labeled showing units and multipliers. Unit shall have a 6 digit, 2 inch LCD digital display and shall register unit digit values noted. Counter-Totalizers shall be Veeder-Root Series 7997, or equal.

4. Indicator, Digital Panel, Oil or Watertight:
   a. Units shall be oiltight NEMA 12, or watertight NEMA 4, as noted. Units shall surface mount as noted and indicate process variable value in engineering units on a 32 digit LCD, backlit display. Process indicators shall be horizontal digital indicators nominally 2.0 inches high by 4.0 inches wide with display digits nominally 0.5 inches in height. These indicators shall accept a 4 to 20 mA DC input signal and shall display the value of the represented analog variable in engineering units with scale range as noted. Decimal point shall be field selectable. Unit shall be provided with a permanent service legend to display the engineering units of the process variable. Unit shall operate loop power or on 120V line power.
   b. Digital panel indicators shall be mounted to the panel mounting front face. Units shall be Crompton Modutec Series 2000 or equal.

5. Indicator, Digital Field, Watertight:
   a. Units shall be watertight, mounted as shown and indicate process variable value in engineering units on 32 digit LCD display. Process indicators shall be horizontal digital indicators nominally 4.0 inches high by 6.0 inches wide with display digits not smaller than 0.8 inch in height. These indicators shall accept a 4 to 20 mA DC input signal and shall display the value of the represented analog variable in engineering units with scale range as noted. Decimal point shall be field selectable. Unit shall be provided with a permanent service legend to display the engineering units of the process variable. Unit shall be loop powered in 24V powered loop.
b. Digital field indicators shall be Action Instruments Model V560; or equal.

6. Indicating Light, Oiltight:

a. Units shall be heavy duty, oiltight, push to test industrial type with integral transformer for 120V AC application. The lights shall be rated for NEMA 1 service. Units shall have screwed on flat faced lenses in colors shown and factory engraved legend plates as noted. Units shall be Square D type K, Allen Bradley Type 800H, or approved equal.

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<tr>
<td>LT-1</td>
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<td>LT-2</td>
<td>Red</td>
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<tr>
<td>LT-3</td>
<td>Amber</td>
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7. Indicating Light, Watertight: Units shall be heavy duty, watertight, push to test, industrial type with integral transformer for 120 volt AC applications. The lights shall be rated for NEMA 4X service. Units shall have screwed on prismatic lenses in colors shown and factory engraved legend plates as and when shown. Units shall be Square D Type SK, Allen Bradley Type 800H or approved equal.

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8. Level Float Switch, Suspended:

a. Units shall be direct acting float type level switches consisting of a mercury switch enclosed in a float connected to a two conductor, combination support and signal cable. The entire assembly shall be watertight and impact resistant. Floats shall be formed of a chemical resistant plastic material. Cable shall be rugged and flexible with heavy neoprene or PVC jacket. The actuation/deactuation differential shall not exceed 1 inch. The switch shall be rated at 5 amperes at 120 volts. Units shall be stainless steel bracket suspended type. Provide each float with 10 feet of cable.
b. Units shall be supplied with integral weight assemblies for stabilization and positive operation of suspended units.

c. Units shall be Consolidated Electric Co., Model LS; Anchor Scientific, Inc., Model Roto-Float Type S; or approved equal.

9. Potentiometer, Oiltight: Units shall be three terminal potentiometers with a total resistance of 1000 ohms and a power dissipation rating of 2 watts. Units shall have oiltight construction, rated NEMA 13, resolution of 1 percent, and linearity of plus or minus 5 percent. Units shall be single hole, panel mounting accommodating panel thicknesses between 1/16 to 1/4 inch. Units shall have legend plates with markings as noted. Units shall be Allen-Bradley, Type 800T; or equal.

10. Potentiometer, Watertight: Units shall be three terminal potentiometers with a total resistance of 1000 ohms and a power dissipation rating of 2 watts. Units shall have watertight construction, rated NEMA 4X, resolution of 1 percent, and linearity of plus or minus 5 percent. Units shall be single hole, panel mounting accommodating panel thicknesses between 1/16 to 1/4 inch. Units shall have legend plates with marking as noted. Units shall be Allen-Bradley, Type 800H; or equal.

11. Switch, Maintained Contact, Oiltight:

   a. Units shall be heavy duty, oiltight, industrial type selector switches with contacts rated for 120 volt AC service at 10 amperes continuous. The switches shall be rated for NEMA 1 service. Units shall have factory engraved legend plates indicating position definition. Operators shall be black knob type. Units shall have the number of positions and contact arrangements as required. Units shall be single hole mounting in panel thicknesses of 1/16 or 1/4 inch.

   b. Units shall be Square D Class 9001, Type K, Allen Bradley Type 800H; or equal.

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12. Switch, Maintained Contact, Watertight:

a. Units shall be heavy duty, watertight, industrial type selector switches with contact rated for 120 volt AC service at 10 amperes continuous. The switches shall be rated for NEMA 4X service. Units shall have factory engraved legend plates indicating position definition. Operators shall be black knob type. Units shall have the number of positions and contact arrangements as required. Units shall be single hole mounting in panel thicknesses of 1/16 to 1/4 inch.

b. Units shall be Square D Class 9001, Type K, Allen Bradley Type 800H; or equal.

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13. Switch, Momentary Contact, Oiltight:

a. Units shall be heavy duty, oiltight, industrial type push buttons with momentary contact rated for 120 volt AC service at 10 amperes continuous. The push buttons shall be rated for NEMA 1 service. Units shall have factory engraved legend plates indicating service definition. Units shall have contact arrangements as required and be black. Units shall be single hole mounted in panel thicknesses of 1/16 to 1/4 inch.

b. Units shall be Square D Type K, Allen Bradley Type 800H, or equal.

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<td>PB-3</td>
<td>Black</td>
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B. The following are the general components descriptions for the miscellaneous components of the PICS that are required to implement the various control functions of the field elements and control panels that are not specifically identified on the drawings:
1. Converter, Current-to-Current, Isolator:
   a. Units shall receive a 4 to 20 mA DC input signal and shall produce a repeated, isolated, proportional 4 to 20 mA DC output signal into loads in the range of 0 to 1200 ohms without load adjustments for a 24V DC supply. Input impedance shall be less than or equal to 50 ohms. Unit accuracy shall be plus or minus 0.25 percent of span. Unit shall be provided with multi-turn span and zero adjustment.
   
   b. Units shall be housed in a NEMA 4X rated enclosure with integral supports suitable for wall mounting. Unit shall operate on an isolated 120 volt, 60 Hz power supply.
   
   c. Units shall be Moore Industries SCT, AGM Electronics PTA 4000, Rochester Instrument Systems Model SC1326, or equal.

2. Converter, Current-to-Pulse Frequency:
   a. Unit shall accept an analog input and utilize time integration to produce a pulse rate output proportional to the input. The computing relay shall be housed in a metallic dust cover with integral bracket for rear of panel mounting. Unit shall accept a 4 to 20 mA DC input with input impedance of 250 ohms or less.
   
   b. Pulse frequency scaling shall be provided so that each output pulse represents the unit digit value required. Unit shall operate on 24 volt DC and be provided with power supply operation. Output shall be provided with adjustable dropout of 0 to 5 percent of input span.
   
   c. Accuracy shall be plus or minus 0.25 percent of span with temperature stability of 0.01 percent per degree F. Unit shall have multi-turn zero and span adjustment. Units shall be Moore Industries, LIT; AGM Electronics, PTA 4011; Rochester Instrument Systems, Model SC-1356; or equal.

3. Current Switch, Isolator:
   a. Units shall receive an isolated 4 to 20 mA DC input signal and shall provide an adjustable contact closure on the selected setpoint. The set point shall be continuously adjustable over the full input span and shall be repeatable within plus or minus 0.1 percent of span. Activation on rising or falling setpoint shall be internally adjustable. Dead band shall be continuously adjustable from 1 to 100 percent of full scale.
b. The contact output shall be an isolated DPDT contact rated for 5 amps at 120V AC. Units shall be housed in a NEMA 1 rated enclosure. Unit shall operate on an isolated 120 volt, 60 Hz power supply.

c. Units shall be Moore Industries DCA, AGM Electronics PTA 4034 or 4035, Rochester Instrument Systems Model 1218 or 1219, or equal.

4. Miscellaneous Mechanical Components:

a. Manifold, Three valve Equalizing: Shall be of stainless steel construction for isolation and equalization of differential transducers. Units shall be Anderson, Greenwood and Co., Type M1, Evans Equalizing Valve Manifolds, or equal.

b. Test Tap: Shall consist of Crawford Fitting Co., Swagelock quick connects Series QC4 and caps QC4-DE, or equal.

c. Tubing, Stainless Steel: Shall be ASTM A312, TP 316, seamless soft annealed with 0.065 inch wall. Fittings shall be ASTM A276, TP 316 compression or socket weld type.

d. Valve, Ball: Shall be stainless steel ball valves, Whitey Series 40, Hoke Flamite Series 7100, or equal.

e. Valve, Check: Shall be stainless steel NUPRO 4CP Series, or equal.

f. Valve, Needle: Shall be stainless steel, 0.020 inch orifice, Whitey Model 21RF2, or equal.

5. Radio Telemetry Unit

a. The remote terminal unit shall be a microcomputer-based data collection and dissemination subsystem. The remote terminal unit shall communicate with the central site (or forwarding terminal unit) via a two-way radio link or Ethernet and shall be designed to accommodate plug-in function modules. Function module card connectors shall be gold-over-nickel plated to inhibit corrosion. The system shall be capable of being outfitted, at any time, with RTUs capable of being configured with up to fifteen (15) function modules per RTU, with no software or firmware changes to the system. All sheet metal utilized inside the enclosure shall be anodized. An interlock system shall be provided to prevent the removal of function...
modules with the power applied. The RTU shall be enclosed in a NEMA 4X-316 stainless steel enclosure, acid-dipped and painted white. The RTU shall be capable of operating in a temperature ranging from -10 to 60 Degrees Celsius (14 to 140 Degrees Fahrenheit). The RTUs shall meet or exceed the quality, reliability, performance and versatility of those manufactured by Data Flow Systems, Inc. of Melbourne, Florida.

b. SERVICE PORT - The remote terminal unit shall support a local serial interface. The local serial interface shall provide local access to all the functions of the remote terminal unit. The local serial interface shall support the monitoring of the radio communications link. The system shall support an automatic antenna alignment function utilizing the local serial interface.

c. POWER SUPPLY - All function modules in the remote terminal unit shall run off DC voltage from +7.5 volts to +13 volts. The power supply module shall supply +12 volts. A battery backup shall be provided to operate the system for a minimum of 120 minutes in event of power failure. The power supply shall be surge protected. The power supply shall be short circuit protected by current limiting. Normal operation shall automatically resume when the short circuit overload is removed. The power supply shall be sized to operate the system with the battery removed. The power supply module shall provide a battery backed, isolated bias voltage source. The isolated bias voltage source shall be utilized to monitor the high well alarm so as to make sure the alarm is detected and reported during power outages. The circuit breaker for the power supply module shall be part of the power supply module. Neither the use of tools nor the disconnection of any wires shall be required to replace the power supply module.

d. SURGE PROTECTION - Multiple staged surge protection shall be provided for all power supply and power monitoring circuits. One stage of protection shall be equipped with both energy limiting and clamping circuits with slow blow fuses designed for overload conditions. This design shall provide a very high level of non-destructive transient immunity. With the exception of a direct lightning strike, the device shall protect the RTU power supply and power monitoring circuits from damage due to voltage transients. The unit shall provide circuit protection to withstand multiple transients in excess of 6,500 volts, 3,250 amps, without damage.
Damage shall be limited to a blown fuse when exposed to larger transients. The device shall be transient-tested to ANSI standard C62.41. The unit shall meet or exceed the quality, reliability and performance of the Transient Filter Shield TFS001 as manufactured by Data Flow Systems. The AC power input protection shall meet or exceed the quality, reliability and performance of the Single Phase Suppressor, SPS001 (or, if three phase power is in use, the Three Phase Suppressor, TPS001) as manufactured by Data Flow Systems.

e. BATTERIES - The HSS central site server, and all RTUs, shall have the uninterruptible power supply (UPS) function built in. The unit’s internal power supply shall keep the batteries at a float charge. The batteries shall not be damaged by deep discharges.

f. COMMUNICATION INTERFACE MODULES - A Radio Interface Module (RIM) when utilizing radio communications, or Fiber Network Interface Module (FIM) when utilizing Ethernet, is required in each remote terminal unit.

g. RADIO INTERFACE MODULE - Each remote terminal unit utilizing radio communications shall require one radio interface module (RIM). The RIM shall control the terminal radio during the polling sequence. The radio interface module shall have a service port to provide communications link monitoring. The service port shall also provide the capability to directly monitor and/or control each module in the remote terminal unit. The radio interface module utilized at the remote terminal units shall be interchangeable with the radio interface module at the central site. The system shall be capable of utilizing up to 505 radio interface modules per communications link and up to 15 function modules per radio interface module. All communications shall be in ASCII and utilize an error detecting and correction data transfer protocol. Each radio interface module shall have a radio transceiver mounted to it. The radio shall be an FM transceiver. The radio interface module shall measure and transmit to the central site computer system the received signal strength (RSS). Replacement of the radio interface module shall trigger an automatic configuration of the new module to accommodate the site address and function (plug & play).
h. NETWORK INTERFACE MODULE - Each remote terminal unit utilizing Ethernet communications shall require one fiber network interface module (FIM). The FIM shall interface to the network during the polling sequence. The FIM shall use serial tunneling to pass data between the network and the function modules. The FIM shall have a service port to provide system debugging. The service port shall also provide the capability to directly monitor and/or control each module in the RTU. The FIM utilized at the RTU shall be interchangeable with any other FIM. The FIM shall be for used in the RTU as an interface to the Ethernet network. The system shall be capable of utilizing up to 250 FIMs per communications link and up to 15 function modules per FIM. Communications between the HSS and the RTU shall have a speed of 10 Mbps. The FIM shall have flash memory for field upgrades. The FIM shall feature a 10Mbps Ethernet Media Converter that supports either multi-mode or single mode fiber to protect the unit from transient voltage damage. The type of converter used shall depend on the length of fiber optic cable required. The FIM shall use serial tunneling to communicate over a network with RS232 devices.

i. FUNCTION MODULES - The function modules shall be designed so they do not have configuration switches or straps and may be easily added in the future. The function modules shall be designed with surge suppression on all inputs and outputs. The function module card edge connector fingers shall be gold-over-nickel-over-copper plated to inhibit corrosion. Replacement of a function module shall not require the use of tools or the removal of any interface wires. There shall be no components associated with the function module mounted to the motherboard (passive backplane). All the function modules shall support central site computer access to the revision level of the module.

j. DIGITAL MONITOR MODULE (DMM) - The digital monitor module shall accept 12 on/off or pulsed inputs of 12 to 30 volts AC or DC. Voltages from 100 to 300 volts AC or DC shall be accommodated with the use of an inline voltage converter device. Status reporting of the digital inputs shall have an accuracy of +/- 2 seconds, the accuracy being defined as time of an occurrence to actual time recorded by the central site computer. The digital monitor module shall not require interfacing relays to monitor 24 VDC, 115 VAC, 220 VAC or 480 VAC. The digital monitor module shall have
LEDs to indicate: the status of each input point; receive communications; transmit communications; CPU fault; and power status. The configuration of the monitor points as alarm points, monitor points (pump run time monitors), or pulsed input points shall be operator changeable. The custom configuration of the digital monitor module shall not require any software or firmware changes in the remote terminal unit. Replacement of the digital monitor module shall trigger an automatic configuration of the new module by the central site computer (plug & play).

k. DIGITAL CONTROL MODULE (DCM) - The digital control module shall provide for remote control of 8 independent 60 to 280 volt AC devices. The control relays shall be solid-state devices with zero crossover detection. Each control point shall be capable of driving a 0.5 amp load @ 280 volts AC (140 VA), with inrush current of 5 amps. The control module shall have the configurable capability to automatically shut down all outputs in the case of a power loss on any one of three phases. Operator intervention shall be required to restart a control point after a phase loss shutdown. Any discrete control point shall have the capability of being automatically controlled by any discrete monitor point, at the same RTU or at any other RTU. This shall be accomplished during configuration at the central site computer system and shall be available for an unlimited number of control points. The digital control module shall have LEDs to indicate: the status of each output point; receive communications; transmit communications; CPU fault; and power status. Replacement of the digital control module shall trigger an automatic configuration of the new module by the central site computer (plug & play).

l. DIGITAL CONTROL/MONITOR MODULE (DCM) - The digital control/monitor module shall provide for remote control of four (4) independent 60 to 280 volt AC devices. The control relays shall be solid-state devices with zero crossover detection. Each control point shall be capable of driving a 0.5 amp load @ 280 volts AC (140 VA), with inrush current of 5 amps. Any discrete control point shall have the capability of being automatically controlled by any discrete monitor point, at the same RTU or at any other RTU. This shall be accomplished during configuration at the central site computer system and shall be available for an unlimited number of control points. The digital control/monitor module shall also accept eight (8) ON/OFF
inputs of 12 to 30 volts AC or DC. Voltages from 100 to 300 Volts AC or DC shall be accommodated with the use of an inline voltage converter device. Status reporting of these inputs shall have an accuracy of ± 2 seconds - accuracy being defined as time of an occurrence to actual time recorded by the central site computer. The module shall not require interfacing relays to monitor 24 VDC, 115 VAC, 220 VAC or 480 VAC. The configuration of the monitor points as alarm points or monitor points (pump run time monitors) shall be operator selectable. The configuration shall not require any software or firmware changes in the system. The digital control/monitor module shall have LEDs to indicate: the status of each output point; the status of each input point; receive communications; transmit communications; CPU fault; and power status. Replacement of the digital control/monitor module shall trigger an automatic configuration of the new module by the central site computer (plug & play).

m. ANALOG MONITOR MODULE (AMM) - The analog monitor module shall monitor up to 4 analog inputs. The analog monitor module shall be capable of accepting 4-20 ma or 0-5 VDC on each of the inputs. The analog input shall have 12-bit accuracy. The analog monitor module shall have support-configurable reporting granularity and alarm thresholds. The configuration parameters shall be downloaded over the radio link from the central site computer. All the analog monitor module-configurable parameters shall be operator-controlled. The analog monitor module shall have 4 qualifier inputs to prevent alarms during conditions when alarms are not valid. The analog monitor module shall have LEDs to indicate: the status of each qualifier input point; receive communications; transmit communications; CPU fault; and power status. Software or firmware modifications to support the configuration shall not be accepted. The analog monitor module shall supply a 24 VDC power source for the 4-20 ma loops. Replacement of the analog monitor module shall trigger an automatic configuration of the new module by the central site computer (plug & play).

n. ANALOG CONTROL MODULE (ACM) - The analog control module shall control up to 4 analog outputs. The analog control module shall be capable of producing 4-20 ma on each of the outputs, driving a 0 to 1000 ohm load. The analog output shall have 12-bit accuracy. Each analog control output shall have configurable engineering units. All the analog control module configurable
parameters shall be operator controlled. The analog control module shall have LEDs to indicate: receive communications; transmit communications; CPU fault; and power status. Any analog control point shall have the capability of being automatically controlled by any analog monitor point, at the same RTU or at any other RTU. This shall be accomplished during configuration at the central site computer system and shall be available for an unlimited number of control points. Software or firmware modifications to support the configuration shall not be accepted. The analog control module shall supply a 24 VDC power source for the 4-20 ma loops. Replacement of the analog control module shall trigger an automatic configuration of the new module by the central site computer (plug & play).

o. ENCLOSURES - Each RTU shall be housed in a NEMA 4X-316 stainless steel enclosure, acid-dipped and painted white. The enclosure shall be sized to accommodate the plug-in modules needed to meet the requirements. All mounting hardware utilized shall be stainless steel. The enclosure shall be capable of being locked. The latches utilized to secure the door of each enclosure shall not require the use of a screwdriver to open or close.

p. ANTENNA SUBSYSTEM - A high gain directional antenna shall be used to transmit and receive data at the Remote Terminal Units. The directional antennas shall have all welded aluminum elements, and a single radiator element connected to a type N female connector. Element connections utilizing nuts and bolts are not acceptable. The antennas shall meet or exceed the quality, reliability and performance of the RTA series as provided by Data Flow Systems, Inc. of Melbourne, Florida. When an antenna mast/pole is utilized, it shall be hot dipped galvanized for corrosion protection. All mounting hardware shall be made of stainless steel. The mast shall meet or exceed the quality and reliability of the AG20 manufactured by Rohn. The coax cable shall be the type that utilizes an inert semi-liquid compound to flood the copper braid. The coax cable shall be of the RG-8 construction type and have the RF-loss characteristic of foam flex. The coax cable shall meet or exceed the quality, reliability and performance of RTC 400 as supplied by Data Flow Systems, Inc. of Melbourne, Florida. Type N connectors shall be utilized at both ends of the coax. The Type N connectors shall be sealed with 3-inch sections of Alpha FIT321-1-0 sealant shrink tubing. The coax cable shall be secured to the mast/pole with EVA-coated 316 stainless steel cable ties. The cable ties shall meet or exceed the quality, reliability and performance of AE112 cable ties manufactured by Band-It. The RTU shall be protected from electrical surge or transients entering through the coaxial cable by use of a coaxial cable surge protector. The coaxial cable surge protector shall meet or exceed the quality,
reliability and performance of the IS-B50LN-C2 manufactured by Polyphaser.

q. **WARRANTY** - The system supplier shall warrant all hardware and SCADA software provided under this contract against all defects in material and workmanship for a period of one year. The system supplier shall warrant the SCADA software to be free of defects for as long as it is in operation by the owner. The system supplier shall also provide free SCADA Software updates for the life of the system. The function modules utilized in the remote terminal units shall carry an additional 2-year return-to-factory warranty. The 2-year return-to-factory warranty shall cover damage due to lightning and surge.

r. **SERVICE** - The system supplier shall offer full factory support of the installed system through the use of factory-trained employees. The Owner shall have 24 hour per day access to service personnel through a pager and/or cell phone.

s. **SPARES** - One spare circuit board of each type utilized in master radio communications equipment and remote terminal units shall be supplied.

2.04 **SPARE PARTS**

A. Obtain from the manufacturer(s) and provide the recommended critical spare parts as part of the work. The spare parts are the property of the Owner.

B. All system spare parts and expendables, as required for a period of one year, shall be included and maintained at the job site by the PICS supplier.

PART 3 - EXECUTION

3.01 **INSTALLATION**

A. Install the PICS field instruments and control panels in strict accordance with the respective manufacturer's instructions and recommendations, in locations as shown on the Drawings, and as indicated on the installation details of the Drawings.

B. Install all mechanical piping and fittings as well as in-line instruments supplied with and/or supplied for the PICS, in accordance with Division 15, Mechanical.

END OF SECTION
PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install complete and ready for use, all the equipment, machinery, apparatus, motors, drives, tools, meters, charts and other accessories, and shall perform such operations and tests, all as specified herein, and as indicated on the drawings.

B. The materials of construction of all equipment furnished and permanently installed on the project shall be of best quality. The workmanship of construction, finish and fit shall be equal to the highest industry standards. All equipment and/or components thereof shall be new, and shall not have been in service at any other installation.

C. The desired standard of quality for each item of equipment is established by reference on the drawings and in the specifications to specific manufacturer's products. Materials of construction and/or fabrication shall equal or exceed the standard of the referenced product. The Contractor's attention is called to Article 1.06.

1.02 EQUIPMENT WARRANTY

A. All mechanical and electrical equipment, together with devices of whatever nature and all components, which are furnished and/or installed by the Contractor shall be guaranteed against manufacturing and/or design inadequacies, materials and workmanship not in conformity with the paragraph above, improper assembly, hidden damage, failure of devices and/or components, excessive leakage or other circumstances which would cause the equipment to fail under normal design and/or specific operating conditions for a period of two years or such longer period as may be shown and/or specified from and after the date of acceptance of the equipment by the Owner. Each piece of equipment, device or components thereof which shall fail within the above specified term of the guarantee shall be replaced and installed with reasonable promptness by the Contractor without cost to the Owner.

B. Rotating machinery shall be designed and fabricated to provide satisfactory operation without excessive wear and without excessive maintenance during its operating life. Rotating parts shall be statically and dynamically balanced and shall operate without excessive vibration.

C. On all equipment ample mean of lubrication shall be provided for all bearings and other metal parts in sliding contact.
D. The minimum design criteria for lubrication of moving parts of the equipment shall include one week of continuous operation during which no lubricants shall be added to the system. The system shall also be designed to receive lubricants whether in operation or shut down, and shall not leak or waste lubricants under either condition. The manufacturer's recommendations of grade and quality and a supply of lubricants so recommended in quantities sufficient to conduct startup and testing operations shall be furnished with the equipment. Alemite industrial-type fittings, or equal, shall be used for grease lubrication except as noted.

1.03 SPECIAL TOOLS

A. Special tools, wrenches and thickness or depth gauges required for removing parts and for making adjustment shall be included with each item of equipment having wearing parts and requiring repairs or adjustments. All accessories such as indicating gauges, indicators and lubrication devices necessary for the proper maintenance and operation of the equipment shall be furnished and stored safely at the site of the work and delivered to the Owner after the equipment is accepted.

1.04 SAFETY REQUIREMENTS

A. Screens, guards or cages shall be provided for all exposed, rotating or moving parts in accordance with accepted practices of applicable governmental regulatory agencies.

1.05 NAMEPLATES

A. Each major component of equipment shall have the manufacturer's name, catalog and/or model number, and serial number on a corrosion-resistant plate securely attached to the item of equipment.

1.06 INITIAL OPERATION AND TESTS

A. Upon completion of all the mechanical work, in a manner satisfactory to the Engineer, the Contractor shall designate a day for initial testing of the equipment. Prior to such completion date, the Contractor shall give the Owner seven (7) days notice thereof in writing, and the Owner will then appoint the personnel which will operate the plant equipment, and on the test day designated, the Contractor shall make the initial test to determine the performance using the personnel designated by the Owner and such personnel of his own as is specified or as he deems necessary to complete the tests.

B. The initial tests shall be limited to a period of twenty-four (24) hour’s duration and during this time the mechanical performance of all equipment shall be tested and demonstrated by the Contractor. If the demonstration and tests indicate satisfactory mechanical performance in the operation of the equipment, the Contractor will then
be given a three (3) day notice by the Engineer to make a final guarantee test of the plant equipment under normal operation. During the initial tests and the three (3) day period between the initial tests and the final tests, the Contractor's personnel shall supervise the operation of the plant equipment, assist and train the Owner's operating personnel in their duties. Experts on equipment installation and operation, as specified or necessary as well as complete, written, detailed erection, operation and maintenance instructions, shall be furnished by the Contractor to train the Owner's personnel. A minimum of six complete sets of operation and maintenance instructions shall be provided.

C. The final guarantee tests shall be for a period of twenty-four (24) hours duration, except as otherwise provided, and shall be made at the conclusion of the three (3) day period of operation and training. These tests shall be made under normal operating conditions under the supervision of the Contractor's personnel. This test is for the purpose of demonstrating that all performance and efficiency guarantees of the equipment and other requirements in compliance with these specifications have been met, that the operation of all equipment is coordinated and that all controls operate satisfactorily in coordination with the equipment installed.

D. In the event the initial or final guarantee testing and demonstration of equipment and controls does not meet the guarantee conditions or is not demonstrated to the satisfaction of the Engineer, the Contractor shall, at his own expense, make such changes and adjustments in the equipment which he deems necessary and shall conduct further tests until full satisfaction is indicated by the Engineer and written certification is received thereof.

1.07 SHOP PAINT

A. All ferrous metal on plant equipment, unless otherwise specified or directed by the Engineer, shall receive shop paint compatible with field costs provided by the Contractor, in accordance with the requirements of the section of the specifications entitled, "Painting and Special Coatings in Part A of Technical Specifications.

PART 2 - MATERIALS AND EQUIPMENT

2.01 EQUIPMENT

A. Equipment Requiring Variations from Structures Shown on the Plans

B. It is the intent that the Contractor shall furnish equipment which may be installed and shall operate properly in the structure as shown. Should the Contractor select alternate equipment resulting in an alteration to, addition to, enlargement of, or any other changes from the lines, dimensions and grades shown on the drawings, the Contractor shall make such changes or alterations as are required and no additional payment will be made by the Owner for changes in structures occasioned by the
selection of alternate equipment. All such variations shall be subject to review and acceptance by the Engineer.

C. Equipment requiring supplemental services in addition to those shown or specified in order to fulfill the operating objectives and including additional mechanisms, operating steps and/or controls as compared with specified equipment will not be acceptable.

END OF SECTION
SECTION 15050A
PIPING MATERIALS, DESIGNATION AND TESTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section specifies the pneumatic, hydrostatic, and leakage testing of piping and acceptable piping materials for each application. The piping designations (mark) are also indicated.

B. Testing Records:

1. Provide a record of each piping installation during the testing. These records shall include:

   a. Date of test.
   b. Identification of pipeline tested or retested including designation.
   c. Identification of pipeline material.
   d. Identification of pipe specifications.
   e. Test fluid.
   f. Test pressure.
   g. Remarks: Leaks identified (type and location), types of repairs, or corrections made.
   h. Certification by Contractor that the leakage rate measured conformed to the specifications.
   i. Signature of Engineer's representative witnessing pipe test.

2. Submit the test records to the Engineer's representative upon completion of the testing.
PART 2 - PRODUCTS

2.01 GENERAL

A. Testing fluid shall be water unless a pneumatic test for air or chemical systems is indicated on the Piping Pressure Test Schedule.

2.02 MATERIALS AND EQUIPMENT

A. Provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic and pneumatic testing.

PART 3 - EXECUTION

3.01 TESTING PREPARATION

A. Pipes shall be in place and anchored before commencing pressure testing.

B. Conduct hydrostatic and pneumatic tests on exposed and above ground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.

C. Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. For pneumatic tests, blow air through the pipes.

D. Test new pipelines which are to be connected to existing pipelines by isolating the new line from the existing line by means of pipe caps, special flanges, or blind flanges. After the new line has been successfully tested, remove caps or flanges and connect to the existing piping.

E. Conduct hydrostatic tests on buried pipe after the trench has been completely backfilled. The pipe may be partially backfilled and the joints left exposed for inspection for an initial leakage test. Perform the final test, however, after completely backfilling and compacting the trench.

F. Testing of piping under structures shall be completed prior to beginning construction of the structure. In the case of concrete encased piping, the pressure test shall be conducted after the concrete encasement has been placed and cured, but prior to beginning construction of any structure above the piping.
3.02 INSPECTION AND TESTING

A. Hydrostatic Testing of Aboveground or Exposed Piping: Open vents at high points of the piping system to purge air while the pipe is being filled. Subject to piping system to the test pressure indicated. Maintain the test pressure for a minimum of two hours. Examine joints, fittings, valves, and connections for leaks. The piping system shall show no leakage or weeping. Correct leaks and retest until no leakage is obtained. Test pressure shall be 150 psi for water unless otherwise specified.

B. Hydrostatic Testing of Buried Piping:

1. Where any section of the piping contains concrete thrust blocks or encasement, do not make the pressure test until at least 10 days after the concrete has been poured. When testing mortar lined or PCCP piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.

2. Apply and maintain the test pressure by means of a hydraulic force pump. Maintain the test pressure for a minimum duration of two hours. After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure. This amount of water is the loss due to leakage in the piping system. The allowable leakage rate is defined by the formula.

\[ L = \frac{ND\sqrt{P}}{7,400} \]

in which:

- \( L \) = allowable leakage (gallons/hours) during the test period.
- \( N \) = number of rubber gasketed joints in the pipe tested (zero for flanged or welded pipe)
- \( D \) = diameter of the pipe (inches)
- \( P \) = specified test pressure (psig)

3. Repair and retest any pipes showing leakage rates greater than that allowed in the above formula.

C. Pneumatic Testing:

1. Test Pressure: As shown in the Specifications, or 150 psi.
2. Perform pneumatic testing using dry air. Perform tests only after the piping has been completely installed including supports, hangers, and anchors. Protect test personnel and Owner's operating personnel. Secure piping to be tested to prevent the pipe from moving and to prevent damage to adjacent piping and equipment. Remove or isolate from the pipe any appurtenant instruments or devices that could be damaged by the test, prior to applying the test.

3. Apply an initial pneumatic leakage test of 25 psig to the piping system prior to final leak testing. Examine for leakage, detected by soap bubbles, at joints and connections. After correcting visible leaks, gradually increase the pressure in the system to not more than one-half of the test pressure. Then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure has been reached. Continuously maintain the pneumatic test pressure for a minimum time of four hours and for such additional time as may be necessary to conduct a soap bubble examination for leakage. The piping system shall show no leakage. Correct any visible leakage and retest.

D. Testing of Non-Pressure Piping:

1. Testing of non-pressure gravity flow pipe shall be accomplished by infiltration or exfiltration testing. Non-pressure piping which has a crown elevation below the groundwater table shall be tested by measuring the infiltration. Non-pressure piping which has a crown elevation above the groundwater table shall be tested by measuring the exfiltration.

   a. Infiltration Testing: The Contractor shall identify and prepare each section of piping to be tested. The designated piping shall be monitored for a minimum of four (4) hours. All buried leaks shall be located and repaired immediately and retested. All visible leaks must be repaired regardless of the measured leakage. No visible leakage will be allowed.

   b. Exfiltration Testing: The Contractor shall close all openings in the section of pipe to be tested. The hydrostatic water level of the pipe system shall be raised to a height equal to the maximum design submergence, but in no case less than 3 feet above the highest point in the line. The closed system shall be maintained for a minimum duration of 4 hours. Any loss of volume shall be noted. The line will not be accepted until this measured quantity is less than 25 gallons per inch of diameter of pipe per mile of pipe per 24 hours. All buried leaks shall be located and repaired as soon as possible. All visible leaks must be repaired regardless of the measured leakage.
2. If impractical to conduct the infiltration or exfiltration tests as specified, the line can be pressurized for low pressure air testing. The air test shall be made by attaching an air compressor or testing apparatus to a suitable opening. After closing all other inlets and outlets to the system, force air into the system until there is a uniform gauge pressure of 5 psi. This pressure shall be held constant without introduction of additional air for a period of at least 30 minutes.

3. The allowable limits of infiltration or exfiltration of manholes shall not exceed a rate of 0.165 gallons per manhole per hour.

4. Testing shall proceed for a continuous period of at least four hours, with exfiltration or infiltration amounts measured by approved methods. Upon application of internal hydrostatic pressure for exfiltration testing, care shall be taken to preclude unseating the joint gaskets for a specific type of pipe by exceeding the pressure capability thereof.

5. Should any test fail, necessary repairs shall be accomplished by the Contractor and the test repeated until within the established limits. The Contractor shall furnish the necessary labor, water and all other items required to conduct the required testing and shall perform the necessary system repairs required to comply with the specified test.

3.03 DISINFECTION

A. Following pressure testing, the Contractor shall disinfect all sections of the water or reclaimed water distribution system, and receive approval thereof from the appropriate agencies, prior to placing in service. Advance notice shall be provided to the Engineer before disinfection procedures start. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA Standard C651, "Disinfecting Water Mains", and all appropriate approval agencies. Testing shall be performed by approved, professional laboratory.

B. The disinfecting agent shall be liquid chlorine or sodium hypochlorite solution conforming to Federal Specification O-S-602b Sodium Hypochlorite, Grade D. Dry hypochlorite, similar or equal to "HTH" may also be used as the disinfecting agent.

C. The piping shall be disinfected by introducing the disinfecting agent into the water, which is being pumped into the system, in such manner that the entire system will be filled with water containing a minimum chlorine concentration of 50 ppm at any point. This water shall be allowed to remain in the system for a minimum contact period of eight hours before the system is flushed out.
D. After the disinfecting agents have been permitted to remain for the specified contact periods, the structures, pipelines, pumps and valves shall be thoroughly flushed with water until the residual chlorine tests are less than .2 ppm in each instance. The determination of the amount of residual chlorine in the system shall be made at such points and in accord with standard tests by means of a standard orthotolodine test set.

E. After any units or portions of the system have been disinfected and flushed as specified, samples of water shall be taken from several points as applicable in suitable sterilized containers and the samples forwarded to an independent, approved testing laboratory for bacterial examination. If repeated tests of such samples show the presence of coliform organisms, the disinfection shall be repeated or continued until tests indicate the absence of pollution. Two consecutive daily samples of two samples per day per sampling point shall be satisfactorily tested, sent to the Florida Department of Environmental Regulation for their approval, and approved before the system is placed in service.

F. The Contractor shall furnish all equipment and materials and perform the work necessary for the disinfecting procedures, including additional disinfection as required and testing lab services.

3.04 CONNECTION TO EXISTING SYSTEM

A. All connections to existing mains shall be made after complete disinfection of the proposed system and shall be made under the direction of the owners of the existing system. Valves separating the mains being installed from existing mains shall be operated by or under the direction of said owner's representative. The cost of the work in making the connections shall be paid for by the Contractor.

B. In the event the proposed main is to be connected to a main which has one or more active services between the point of connection and the first existing line valve, a temporary plug or cap shall be installed on the new main until the pressure tests and disinfecting are completed. Upon satisfactory completion, the cap or plug shall be removed from both mains and the connection made with pipe which has been swabbed out with a solution of chlorine and water. The connection shall be made as swiftly as possible and any water in the ditch shall be kept below the level of the pipe. The pipe line shall then be placed in service by the owner's personnel.

C. In the event any existing users will be without water while a connection is being made, the Contractor shall give the Owner 48 hours notice. The Owner will notify residents when the water will be turned off and when service will be resumed. In some instances, these connections may have to be made at night. No user shall be without water service for more than two hours.

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D. Cut overs from existing water service lines at the meter box shall be accomplished by City personnel after the new water mains have been "cleared" for use and the Contractor has installed the required new water line corporation stops, service lines and curb stops as shown on the contract plans.

TABLE 15050
TREATMENT PLANT PIPING PRESSURE TEST SCHEDULE AND MATERIAL LISTING

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>MARK</th>
<th>TEST PRESSURE IN PSIG</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>A</td>
<td>See Note 1</td>
<td>DIP OR SS</td>
</tr>
<tr>
<td>Alum</td>
<td>ALW(SO$_4$)$_3$</td>
<td>See Note 2</td>
<td>SCH. 80 PVC</td>
</tr>
<tr>
<td>Backwash Air</td>
<td>BWA</td>
<td>See Note 1</td>
<td>DIP</td>
</tr>
<tr>
<td>Backwash Water</td>
<td>BWW</td>
<td>100</td>
<td>DIP</td>
</tr>
<tr>
<td>Chlorinated Effluent</td>
<td>CLE</td>
<td>100</td>
<td>DIP</td>
</tr>
<tr>
<td>Chlorine Gas Pressure</td>
<td>CGP</td>
<td>300, See Note 3</td>
<td>BLK. STEEL</td>
</tr>
<tr>
<td>Chlorine Gas Vacuum</td>
<td>CGV</td>
<td>See Note 4</td>
<td>SCH. 80 PVC</td>
</tr>
<tr>
<td>Chlorine Solution</td>
<td>CS</td>
<td>100</td>
<td>SCH. 80 PVC</td>
</tr>
<tr>
<td>Clarifier Effluent</td>
<td>CE</td>
<td>See Note 5</td>
<td>DIP</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>CA</td>
<td>200</td>
<td>GS</td>
</tr>
<tr>
<td>Dechlorinated Effluent</td>
<td>DCLE</td>
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<td>DIP</td>
</tr>
<tr>
<td>Dirty Backwash Water</td>
<td>DBWW</td>
<td>See Note 5</td>
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<td>SEE NOTE 6</td>
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<tr>
<td>Filter Effluent</td>
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<td>DIP</td>
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<tr>
<td>Filter Influent</td>
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<td>See Note 5</td>
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<tr>
<td>Filtrate</td>
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<td>DIP</td>
</tr>
<tr>
<td>Grit</td>
<td>GR</td>
<td>50</td>
<td>DIP</td>
</tr>
<tr>
<td>Internal Recirculation</td>
<td>IR</td>
<td>50</td>
<td>DIP</td>
</tr>
<tr>
<td>Methanol</td>
<td>M</td>
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<td>SCH. 80 PVC</td>
</tr>
<tr>
<td>SERVICE</td>
<td>MARK</td>
<td>TEST PRESSURE IN PSIG</td>
<td>MATERIAL</td>
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<td>-----------------------</td>
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<td>Mixed Liquor</td>
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<td>SEE NOTE 8</td>
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<td>SEE NOTE 7</td>
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<tr>
<td>Plant Recycle</td>
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<td>DIP</td>
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<td>Plant Recycle Drain</td>
<td>PRD</td>
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<td>SEE NOTE 6</td>
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<td>Polymer Liquid</td>
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<td>See Note 2</td>
<td>SCH 80 PVC</td>
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<td>SCH 80 PVC</td>
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<td>Raw Sewage</td>
<td>RS</td>
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<td>DIP</td>
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<tr>
<td>Return Activated Sludge</td>
<td>RAS</td>
<td>50</td>
<td>DIP</td>
</tr>
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<td>Reuse Water (Pressure)</td>
<td>RW</td>
<td>150</td>
<td>DIP, HDPE or PVC</td>
</tr>
<tr>
<td>Reuse Water (Gravity)</td>
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<td>DIP</td>
</tr>
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<td>Sanitary Sewer</td>
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<td>SEE NOTE 6</td>
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<tr>
<td>Scum</td>
<td>SC</td>
<td>50</td>
<td>DIP</td>
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<tr>
<td>Seal Water</td>
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<td>See Note 9</td>
<td>SCH. 80 PVC</td>
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<td>Sodium Hydroxide</td>
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<td>See Note 2</td>
<td>SCH. 80 PVC</td>
</tr>
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<td>NaOC1</td>
<td>See Note 2</td>
<td>SCH. 80 PVC</td>
</tr>
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<td>Sulfur Dioxide Gas Pressure</td>
<td>SDGP</td>
<td>300, See Note 3</td>
<td>BLK. STEEL</td>
</tr>
<tr>
<td>Sulfur Dioxide Gas Vacuum</td>
<td>SDGV</td>
<td>See Note 4</td>
<td>SCH. 80 PVC</td>
</tr>
<tr>
<td>Sulfur Dioxide Solution</td>
<td>SDS</td>
<td>100</td>
<td>SCH. 80 PVC</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>H2SO4</td>
<td>See Note 2</td>
<td>BLK. STEEL</td>
</tr>
<tr>
<td>Sump Pump Discharge</td>
<td>SPD</td>
<td>50</td>
<td>SCH. 80 PVC</td>
</tr>
<tr>
<td>Thickened Waste Activated Sludge</td>
<td>TWAS</td>
<td>100</td>
<td>DIP</td>
</tr>
<tr>
<td>Waste Activated Sludge</td>
<td>WAS</td>
<td>50</td>
<td>DIP</td>
</tr>
</tbody>
</table>
NOTES:

1. Discharge pipes shall be tested at 1.5 times the maximum output pressure of the blowers, but shall not be less than 50 psig. In addition, suction pipes, duct work or other vacuum conduits shall be vacuum tested at 1.5 times the maximum vacuum produced by blower operation.

2. Chemical feed piping shall be tested at 75 psig using compressed air.

3. Pneumatic test. Pressure test the system with nitrogen. Do not test through equipment.

4. Vacuum test. Perform pneumatic test to 100 psig using nitrogen. Do not perform pneumatic test through equipment. Afterward, perform vacuum test at 10 inch Hg VAC between vacuum regulator and chlorinator or sulphonator, and at 25 inch Hg VAC between chlorinator or sulphonator and injectors.

5. See Specification Section 15050, paragraph 3.02D for testing of non-pressure piping. Calculations for restraint of non-pressure piping shall use a value of 15 psig.

6. Drains pipes/sanitary sewers shall be DR 18 PVC meeting AWWA C900 or C905 or Class 52 DIP. All drain pipes under structures shall be DIP and shall be concrete encased in accordance with the contract documents.

7. Piping for sizes less than 4 inches shall be Schedule 80 PVC or HDPE, (as indicated). All other sizes of pipe shall be DIP of Class 250 or (DR 18) PVC. All above ground piping outside of structure 3 inches and less shall be Schedule 80 PVC while piping above 3 inches in diameter shall be DIP.

8. Odor control duct work shall be vacuum tested at 1.5 times the maximum vacuum produced by blower operation, but shall not be tested at less than 10 inches water VAC.

9. Test pressure requirements for seal water piping shall be 1.5 times the maximum working pressure, but test pressure shall not be less than 100 psig.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of furnishing all labor, equipment and materials and in performing all operations necessary for the construction or installation of all process and utility piping, valves, valve boxes and all castings and appurtenances within, complete and ready for operation as shown on the Drawings and specified herein.

1.02 QUALITY ASSURANCE

A. Construction Requirements:

1. All underground lines shall be installed with at least 30 inches of cover or as detailed on the drawings.

2. For underground utilities changes in pipe alignment and use of fittings may be allowed, subject to approval of the Engineer as to layout. Deflection shall not exceed 80 percent of the maximum allowable deflection as stated in the pipe manufacturer's installation instructions.

B. Pipe Inspection:

1. The Contractor shall obtain from the pipe manufacturers a certificate of inspection to the effect that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications. Certification shall be stamped with corporate seal.

2. All pipe and fitting shall be subject to visual inspection at time of delivery by rail or truck and also just before they are lowered into the trench to be laid. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor.

3. The entire product of any plant may be rejected when, in the opinion of the Engineer, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.
1.03 SUBMITTALS

A. Shop Drawings:

1. In general six (6) copies of the following shop drawings shall be submitted to the Engineer for approval prior to construction:

   a. Mill test certificates or certified test reports on pipe and fittings

   b. Details of restrained and flexible joints

   c. Valve vaults

   d. Valve boxes

   e. All gate, plug, ball, solenoid, check valves, and automatic air release valves

   f. Couplings

   g. Service saddles, curb, & corp stops.

   h. Flexible expansion joints

   i. Pressure gauges

   j. Identification tape

   k. Joint lubricant

   l. Detailed piping layout drawings and pipe laying schedule

   m. Temporary plug and anchorage system for hydrostatic pressure test

   n. Tie rods

   o. Reduces pressure backflow preventers.

2. A separate shop drawing submittal will be required for each major item listed above and for each different type of an item within a major item. For example, separate submittals will be required for gate, plug, ball, solenoid, check and automatic air release valves. All submittals shall be in accordance with the General Conditions and the Supplementary Conditions.
B. Acceptance of Material:

1. The Contractor shall furnish an Affidavit of Compliance certified by the pipe manufacturer that the pipe, fittings and specials furnished under this Contract comply with all applicable provisions of current AWWA and ASTM Standards and these Specifications. No pipe or fittings will be accepted for use in the work on this project until the Affidavit has been submitted and approved by the Engineer.

2. The Owner reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.

C. Operation and Maintenance Manuals:

1. Submit copies of operation and maintenance manuals for all the items requiring routine maintenance.

1.04 DELIVERY, STORAGE AND HANDLING

A. During shipping, delivering and installing pipe, fittings, valves, backflow preventers, and accessories, they shall be handled in such manner as to ensure a sound undamaged condition.

B. Particular care shall be taken not to damage the pipe coating.

C. Insides of valves and backflow preventers shall be kept free of dirt and debris.

1.05 JOB CONDITIONS

A. Water in Excavation:

1. Water shall not be allowed in the trenches while underground pipes are being laid and/or tested. The Contractor shall not open more than 100' of trench than the available pumping facilities are able to dewater to the satisfaction of the Engineer. The Contractor shall assume responsibility for disposing of all water so as not to interfere with the normal drainage of the territory in which he is working.

2. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately plugged during construction by the use of approved stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the work any such materials have entered the pipelines, it must be cleaned.
as directed by the Engineer so that the entire system will be left clean and unobstructed.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Ductile Iron Pipe: Ductile iron pipe shall conform to the requirements of ANSI/AWWA C150/A21.50, latest revision. The minimum thickness class for all pipe greater than 12” diameter shall be pressure Class 250, and all pipe 12” or less in diameter shall be pressure Class 350.

Pipe shall have a minimum rated water working pressure of 250 psi and shall be furnished in laying lengths of 20 feet or less, unless specifically shown otherwise on the Drawings. The pipe shall be lined and coated as specified below.

1. Interior Lining for Raw Activated Sludge (RAS), Sludge Lines and Force Mains: Ductile iron fittings and specials shall be coated with 40 mils nominal dry film thickness of Protecto 401 or approved equal in accordance with the manufacturers recommended actions.

2. Interior Lining for Potable and Reclaimed Water Piping: Ductile iron pipe, fittings and specials shall be cement lined in accordance with ANSI/AWWA C104, current revision, "Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water". The cement lining shall have a standard thickness and after curing the lining shall have a seal coat of bituminous material in accordance with ANSI/AWWA C104, current revision.

3. Exterior Coatings: The exterior of ductile iron pipe fittings and specials to be installed underground shall be coated at the factory with standard bitumastic coating.

4. Polyethylene Encasement: Where indicated the Contractor shall utilize polyethylene encasement in accordance with ANSI/AWWA C105-T1. The polyethylene shall conform with ASTM D1248-68 and be color coded to the service application.

5. Ductile iron pipe, fittings and specials to be installed aboveground shall be furnished with a shop applied primer on the exterior. The shop primer shall be as specified in accordance with manufacturers recommendations.

B. Fittings: Fittings for ductile iron pipe shall be either mechanical joint, restrained joint or flanged joint as indicated on the Drawings and shall have a minimum working pressure of 250 psi. Fittings shall be ductile iron and shall conform to ANSI/AWWA C110, ANSI/AWWA C111 and ANSI/AWWA C153, latest revisions for flanged and mechanical joint pipe. Fittings shall be coated and lined as specified
above for ductile iron pipe. The rubber gaskets for flanged, mechanical, and push on joints shall be as described below.

C. Push-On Joints: Pipe using push-on joints shall be in strict accordance with ANSI/AWWA C111, latest revision and shall be as manufactured by American Cast Iron Pipe Company (Fastite Joint), United States Pipe Company (Tyton Joint), or Clow Corporation (Super Bell Tite Joint). Jointing materials shall be provided by the pipe manufacturer and installation shall be in strict accordance with the manufacturer's recommended practice.

D. Mechanical Joints: Jointing materials for mechanical joints shall be provided by the pipe and fitting manufacturer. Materials assembly and bolting shall be in strict accordance with ANSI/AWWA C111 and ANSI/AWWA C153, latest revisions. Tee head bolts and nuts for mechanical joints shall be manufactured of CORTEN, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, Plymouth, Michigan or an equal approved by the Engineer.

E. Flanged Joints: Flanges shall be American Standard for 125 pound steam pressure with any special drilling and tapping as required to insure correct alignment and bolting. Gaskets shall be rubber full face type, minimum thickness of 1/8 inch. Flanged joints shall be made with bolts and nuts, studs with a nut on each end, or studs with nuts where the flange is tapped.

The number of size of bolts shall conform to the same American National Standard as the flanges. Unless noted otherwise, bolts and nuts shall be Grade B conforming to the ASTM Specifications for Steel Machine Bolts and Nuts and Tap Bolts, Designation A 307. Bolts and studs shall be of the same quality as machine bolts. Bolts and nuts shall have hexagonal heads. Where noted on the Drawings or where flanges are underground, stainless steel nuts and bolts shall be used for flanges. Stainless steel shall be Type 316 in accordance with ASTM A320, Class 2.

1. Machined Surfaces: Machined surfaces shall be cleaned and coated with a suitable rust preventative coating at the shop immediately after being machined.

F. Restrained Joints: Restrained joints shall be provided for all buried piping systems at the location required to restrain the system thrust. Pipe joints and fitting shall be restrained as specified below.

1. Manufactured Restrained Joints: Manufactured restrained joints shall be Flex-Ring, Lok-Ring or Lok-Fast manufactured by the American Cast Iron Pipe Company, Lok-Tyte or Tr-Flex Type manufactured by the United States Pipe Company as manufactured by McWane, or an equal approved by the Engineer. Joints shall be manufacturer's standard specifically modified push-on type joints with joint restraint provided by ductile iron retainer rings joined together by corrosion resistant, high strength steel tee head bolts and nuts or with joint restraint provided by a welded on retainer ring and a split flexible ring assembled behind the retainer ring.
Restrained joint pipe and fittings shall be ductile iron only and shall comply with applicable portions of this specification. Manufactured restrained joints shall be capable of deflection during assembly. Deflection shall not exceed 80 percent of the manufacturer's recommendations.

Tee head bolts and nuts for restrained joints shall be manufactured of CORTEN, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, Plymouth, Michigan, or an equal approved by the Engineer.

2. Alternate Restrained Joints:

   a. When prior approval is obtained from the Engineer, ductile iron pipe and fittings with mechanical joints may be restrained using a follower gland which includes a restraining mechanism. When actuated during installation, the restraining device shall impart multiple wedging action against the pipe wall which increases resistance as internal pressure in the pipeline increases. The pipe must be suitable for use with the proposed device.

   The joint shall maintain flexibility after installation. Glands shall be manufactured of ductile iron conforming to ASTM A536 and restraining devices shall be of head treated ductile iron with a minimum hardness of 370 BHN. The gland shall have standard dimension and bolting patterns for mechanical joints conforming to ASNI/AWWA C111 and C153, latest revisions.

   Tee head bolts and nuts shall be manufactured of corrosion resistant, high strength, low alloy CORTEN steel in accordance with ASTM A242.

   The restraining wedges shall have twist off nuts to insure proper torquing. The mechanical joint restraint device shall have a minimum working pressure rating of 250 psi with a minimum safety factor of 2 to 1 and shall be MEGALUGR as manufactured by EBBA Iron, Inc. No other retainer gland type device will be acceptable. After installation prior to backfilling, all parts of the joint restraint system shall be coated with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M.

   b. When prior approval is obtained from the Engineer, ductile iron pipe and fittings with push on joints may be restrained using a restraining gasket similar to the "Field Lok" gasket manufactured by U.S. Pipe & Foundry. The device must be suitable for the pipe and pressure rating intended and is subject to approval by the Engineer. The required length of restrained joint pipe shall be provided on either side of all valves and fittings employing restraining devices. Restrained lengths
shall be calculated per DIPRA standards based on Type II laying conditions and an operating pressure of 150 psi, unless otherwise indicated.

2.02 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS
A. Gravity Drainage Piping: PVC pipe used for gravity drainage piping installed underground shall be SDR 26 pipe. Fittings shall be as specified in Section 02550.

B. Small PVC Pressure Piping: Unless otherwise specified, all PVC pressure pipe smaller than 4 inches nominal diameter shall be Schedule 80 PVC or Endot Endpure HDPE, (as shown). Schedule 80 pipe shall have either solvent welded or threaded joints. PVC pressure pipe shall bear the approved seal of the National Sanitation Foundation (NSF). PVC pipe that is exposed to sunlight shall be manufactured with additives to provide resistance to ultraviolet deterioration. No glued joint pipe shall be installed below ground, unless otherwise specified. All water pipe to be Class 200 (DR 21) gasketed bell and spigot pipe blue in color.

C. Fittings: Socket type, solvent welded fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2467. Threaded type fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2464. All solvent welded or threaded joints shall be watertight.

D. Flanges: Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with either solvent welded or threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively. Gaskets shall be neoprene, full faced type with a minimum thickness of 1/8 inch. Nuts and bolts shall be hexagonal with machine threads, manufactured of Type 316 stainless steel in accordance with ASTM A320, Class 2. Type 316 stainless steel flat washers with lock washers shall be used against PVC flanges.

E. Solvent Cement: PVC solvent cement shall be in compliance with ASTM D2564 and in accordance with the pipe manufacturer's recommendations.

F. Thread Lubricant: Lubricant for Schedule 80 threaded joints shall be Teflon tape only.

G. Polyvinyl Chloride Pipe 4 Inches and Larger in Size for Pressure Service: Polyvinyl chloride pipe for nominal diameters 4 inches to 12 inches in size shall conform to the requirements of AWWA C900 with a dimension ratio of DR 18, pressure class 150, and gasketed integral bell ends. For PVC pipe larger than 12 inches for pressure service, the pipe shall conform to the requirements of AWWA C-905 with a minimum DR of 25, pressure rating of 165 psi, with gasketed integral bell ends. Pipe shall be designed for maximum working pressure of not less than 150 psi and with not less than a 4 to 1 sustained hydrostatic pressure safety factor. Fittings for C-900 PVC pipe shall be ductile iron fittings with restrained joint ends for potable water or reclaimed water lines, and restrained PVC fittings for sanitary force mains.
H. All PVC pipe installed shall be color coded for the service intended. Potable water piping shall be extruded blue, reclaimed water shall be lavender, force main white, and gravity sewer green. Care shall be taken to avoid exposure to sunlight. Pipe should be marked for its use in three places on the pipe barrel.

I. Joints (4 Inches and Larger PVC Pipe):

1. Bell and Spigot:

   Pipe joints shall be made with integral bell and spigot pipe ends. The bell shall consist of an integral thickened wall section designed to be at least as strong as the pipe wall. The bell shall be supplied with factory glued rubber ring gasket with conforms to the manufacturer's standard dimensions and tolerances. The gasket shall meet the requirements of ASTM F477 "Elastomeric Seals (Gaskets) for Joining Plastic Pipe". PVC joints shall be "Ring-Tite" as manufactured by J-M Manufacturing Company, Inc. or an equal approved by the Engineer.

2. Restrained Joints:

   Where indicated on Drawings, to prevent pipe joints and fittings from separating under pressure, pipe joints and fittings shall be restrained as follows:

   a. PVC pipe bell and spigot joints shall be restrained with EBBA Iron MEGALUG\textsuperscript{R} Series 1500 Restrainer or an equal approved by the Engineer. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536, Grade 65-42-10. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy CORTEN steel meeting the requirements of ASTM A242.

   b. Cast iron mechanical joint fittings used with PVC pipe shall be restrained with the EBBA Iron MEGALUG\textsuperscript{R} Series 2000 PV Restrainer or an equal approved by the Engineer. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536, Grade 65-42-10. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy CORTEN steel meeting the requirements of ASTM A242.

   c. Thrust Blocking. Provided concrete reaction or thrust backing on all pressure pipe lines four (4) inches in diameter or larger (except those having flanged joints or restrained joints) at all tees, plugs, caps, and at bends defecting 22\textdegree E or more, or movement shall be prevented by attaching suitable metal rods or straps as directed by the Engineer. Concrete used for this purpose shall be Class "C". Reference reaction blocking table shown on construction plan details.
d. Joint restraint. Push on joints on either side of valves and fittings restrained by mechanical restraining devices shall be restrained with "Uni-Flange" mechanisms. The number of restrained joints shall be determined by DIPRA methods and a laying schedule shall be provided for approval by the Engineer prior to installation of joint restraint.

2.03 PVC FITTINGS (4 INCHES AND LARGER PVC PIPE)

1. Fittings shall be PVC and manufactured of the same design as the PVC pipe. PVC fittings 4 inches through 36 inches shall be PVC injection molded made of materials meeting or exceeding the requirements of cell class 12454-B material as defined in ASTM D1784. Fittings shall be manufactured with pipe that meets or exceeds AWWA C-905 standard. All PVC fittings must comply with or exceed ANSI/AWWA C907, Uni-B-12, Uni-B-14 standards. All PVC fittings must be certified by CSA to the CSA B137.3 standard as third party certification. The fittings must be of the same design as the PVC pipe with an HDB of 4000 psi and minimum SDR 25 wall thickness design. All fittings must have UL-FM approval, and shall comply with or exceed all ASTM Standards for fittings. Fittings must have NSF-61 certification for contact with potable water. PVC fittings shall be pressure rated to 165 psi or greater.

2. All restrained joint systems shall be pressure rated the same as the PVC pipe and fittings. All components of the restraint system shall meet or exceed all requirements of ANSI/AWWA C-111/A21.11 latest revision. Restraints shall provide a full 360 degree contact on the pipe with sufficient gripping action to secure the clamp to the pipe and be designed so that the restraint action is increased as a result of increases in the line pressure. Restraint devices for PVC pipe and fittings shall consist of split restraint ring installed on the spigot, connected to a split ring which seats behind the gasket race of the fitting. The split restraint ring shall incorporate a series of machined serrations (not “as cast”) on the inside diameter to provide positive restraint, exact fit and 360 degree contact and support of the pipe wall. The two halves of the split backup ring shall interlock without the need for additional bolts and shall form a beveled leading edge to assure exact fit behind the fitting gasket race. Restraint devices shall be of ductile iron, ASTM A536, Grade 65-45-12 and connecting bolts shall be of high strength, low alloy material in accordance with ASNI/AWWA C111/A21.11. Restraint devices shall be Uni-Flange 1300 series or other approved restrained joint devices.

2.04 WALL SLEEVES, SEALS, PIPES AND NON-STANDARD CASTINGS

A. Wall Sleeves: Wall sleeves shall be of cast iron, ductile iron or carbon steel. The sleeve shall be hot dipped galvanized after fabrication and shall have a waterstop located in the center of the wall. Sleeves shall be provided with seals and shall be sized as required for the installation of seals. Sleeves shall terminate flush with finished surfaces of walls and ceilings, and shall extend 2 inches above the finished floor unless otherwise shown on the Drawings.
1. Wall sleeves shall be installed for all piping passing through building walls and floors, except where noted on the Drawings. Sleeves shall be of sufficient size to pass the pipe without binding. Escutcheons shall be provided at walls and floor to completely conceal the sleeves smaller than 3 inches. Escutcheons shall be 304 SS split-type.

B. Wall Sleeve Seals: Wall sleeve seals shall be modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cease the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. The synthetic rubber shall be suitable for exposure to sludge and groundwater. Bolts, nuts and hardware shall be 18-8 stainless steel. The seals shall be Link Seal as manufactured by Thunderline Corporation or equal, and the wall sleeve and seal shall be sized as recommended by the seal manufacturer.

C. Wall Pipes: Wall pipes shall be of the size and types indicated on the Drawings. All wall pipes shall be of ductile iron and shall have a central fin not less than 2 inch thick and the same diameter as the bolting flange cast midway of the length to form a waterstop. Each wall pipe shall be of the same grade, thickness and interior coating as the piping to which it is joined. Those portions of the wall pipes that are buried shall have a coal tar epoxy outside coating.

D. Non-Standard Fittings and Castings: Fittings having non-standard dimensions and cast especially for this project shall be of an approved design. Fittings shall be manufactured to meet the requirements of the same specifications and shall have the same diameter and thickness as standard fittings but laying lengths and types of ends shall be determined by positions in the pipelines and by the particular piping to which it is connected. Flange facing and drilling shall conform to the 125 pound American National Standards Institute. Where required, flanges shall be drilled and tapped for studs. Other dimensions shall be substantially equal to corresponding parts of standard bell and spigot fittings.

2.05 PIPE COUPLINGS

A. Couplings:

1. Pipe couplings used to joint two pieces of plain end pipe shall be sized to suit the outside diameter of the pipe ends to be jointed. Transition couplings shall be used to join pipes of different outside diameters. Pipe couplings shall be bolted type with steel middle ring and end followers. The couplings shall be restrained for the test pressure of line using approved retaining system.

2. All carbon steel parts of the coupling shall be coated on the interior and exterior with a fusion bonded thermosetting epoxy coating with a 12 mil
nominal coating thickness. The coating shall be equal to AL-CLAD as manufactured by Dresser Industries, Inc.

3. Gaskets for the coupling shall be wedge type manufactured of Buna-N resilient rubber.

4. Bolts shall be manufactured of high strength Type 304 stainless steel with Type 316 stainless steel hexagonal nuts. Bolts and nuts shall conform dimensionally to ANSI/AWWA C111, latest revision.

5. Couplings shall be Style 38 as manufactured by Dresser Industries, Inc. or an equal approved by the Engineer.

2.06 PVC BALL AND BALL CHECK VALVES

A. PVC Ball Valves: All PVC ball valves 2 inch through 4 inch in size shall be of a one piece capsule type manufactured of Type 1, Grade 1 PVC. Ball valves shall be true union design with two-way blocking capability and shall have solvent welded socket or NPT threaded ends. Ball valves shall have Teflon seats with Viton backing cushions and Viton O-ring seals, and shall be designed for a 150 psi water working pressure at 120°F. Valves shall be supplied with ABS lever operating handles. PVC ball valves shall be manufactured by Asahi/America, or equal approved by the Engineer.

B. PVC Ball Check Valves: All PVC ball check valves 1 inch through 2-1/2 inch in size shall be of a solid thermoplastic construction manufactured of Type 1, Grade 1 PVC. Ball check valves shall be true union design with solvent welded socket or NPT threaded ends. Ball check valves shall be furnished with a solid thermoplastic ball. Ball seat shall be Teflon coated Viton. The same seal shall function as both the ball seat and the union seal. PVC ball check valves shall be designed for a 150 psi water working pressure at 120°F. Valves shall be manufactured by Asahi/America, or an equal approved by the Engineer.

2.07 GATE VALVES

A. Bronze Gate Valves: Gate valves installed aboveground, less than 2 inches in size and smaller, shall be Class 150 all bronze valves conforming to Fed. Spec. WW-V-54d, Type I, Class B designed for a non-shock water pressure of 300 psi. Bronze for valve body and internals shall be in accordance with ASTM B16.18. Valves shall be furnished with screwed ends, handwheel operator, non-rising stem, one-piece solid wedge disc and screwed bonnet. Valves shall be as manufactured by Crane, Powell or an approved equal. The minimum weight of valves shall be as follows:

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<th>Valves Size (inches)</th>
<th>Valve Weight (inches)</th>
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<tr>
<td>2</td>
<td>1.0</td>
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<tr>
<td>3/4</td>
<td>1.5</td>
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<td>1</td>
<td>2.5</td>
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</table>
B. Ductile Iron Gate Valves:

1. Ductile iron gate valves shall open by turning to the left (counter-clockwise), when viewed from the stem. When fully open, gate valves shall have a clear waterway equal to the nominal diameter of the pipe. Operating nut or hand wheel shall have an arrow cast in the metal indicating the direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast in the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydrostatic pressure equal to twice the specified working pressure. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C509, latest revisions.

2. Gate valves with nominal sizes from 2 to 24 inches shall conform to ASNI/AWWA C509, latest revision, and shall be designed for a minimum working pressure of 250 psi. Valves shall be ductile iron body resilient seat type with O-ring stem seals. The valve stem, stem nut, glands and bushings shall be manufactured of zinc free bronze. Valve disc shall be constructed to assure uniform seating pressure between disc seat ring and body seating surface. Resilient seat of valve shall be formed by a special corrosion and chloramine resistant, synthetic elastomer which is permanently bonded to and completely encapsulates a ductile iron valve disc. Interior of valve body shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust and grease before coating. Exterior surfaces shall be coated as specified hereinafter. Resilient seated type gate valves shall be as manufactured by U.S. Pipe or equal.

3. Valve Joints: All gate valves shall have either mechanical joint, restrained joint or flanged ends to fit the pipe run in which they are to be used. Gate valves installed on push on joint pipe shall have mechanical joint ends unless otherwise specified.

4. Valve Operators: Gate valves shall open left (counter-clockwise) when viewed from the stem. Unless otherwise shown on the Drawings or specified herein, gate valves shall have non-rising stems. Buried gate valves shall be furnished with a 2 inch square AWWA standard nut operator with a valve box and cover. Gate valves located aboveground or inside structures shall be furnished with a handwheel operator which shall have an arrow cast in the metal indicating the direction of opening. Gate valves used as isolation valves for reduced pressure backflow preventers shall be of the open screw and yoke (OS&Y) design with a handwheel operator.
5. Exterior Valve Coatings: All exterior surfaces of iron body gate valves shall be clean, dry and free from rust and grease before coating. For buried service, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Prior to backfilling, all uncoated units, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust-inhibitive pigments and synthetic resins. Following installation, aboveground valves shall be finish painted in accordance with manufacturers recommendations.

2.08 PINCH CHECK VALVES

A. Valves are to be of the flow operated check type with flanged joint ends on both check sleeve and metal body. Port areas shall be 100% of the mating pipe port area. The port area shall contour down to a duckbill which shall allow passage of flow in one direction and prevent reverse flow in the other direction. The flexible duckbill sleeve shall be one piece rubber construction with fabric reinforcement. The flange shall be drilled to ASNI B16.1, Class 125/ANSI B16.5 Class 150 standard. Valve body shall be drilled and tapped for flushing connection on top and bottom of the housing. Valve body shall be two piece split body construction. The two halves shall be sealed by diamond shaped cross section rubber gaskets permanently locked by a groove cast in the valve body. Company name and location shall be cast onto the valve body. The valve shall be designed for a maximum back pressure of 100 psi. The valve shall be red valve series 33 or equal.

B. Interior Valve Coating: Prior to shipment from the factory, the interior ferrous surfaces of the valve, except for finished, non-ferrous or bearing surfaces, shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust and grease before coating.

C. Exterior Valve Coating: All exterior surface of swing check valves shall be clean, dry and free from rust and grease before coating. For valves installed in below ground valve vaults, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Following installation, all uncoated nuts, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust-inhibitive pigments and synthetic resins. Following installation aboveground valves shall be finish painted in accordance with manufacturer’s recommendations.

2.09 PLUG VALVES
A. General: Plug valves shall be non-lubricated eccentric type with flanged or mechanical joint ends as specified below. Valves shall open by turning to the left (counter-clockwise), when viewed from the stem. Port area of valves shall be a minimum of 80 percent of full pipe area. Valve pressure ratings, body flanges and wall thicknesses shall be in full conformance with ASNI B16.1, latest revision. Valves shall seal leak-tight against full rated pressure in both directions. Prior to shipment from the factory, each valve shall be hydrostatically tested as follows: Valve seats shall be tested to provide leak tight shut off to 175 psi for valves through 12 inch and 150 psi for valves 14 inches and larger, with pressure in either direction. In addition, a hydrostatic shell test shall be performed with a plug open to a pressure twice that of rating specified above to demonstrate overall pressure integrity of the valve body. Plug valves shall be eccentric plug valves as manufactured by DeZurik, Milliken, or approved equal.

B. Eccentric Plug Valves: Eccentric plug valves shall be Series 100 as manufactured by DeZurick or equal. Valve bodies shall be constructed of high strength cast iron conforming to ASTM A126, Class B and AWWA C504, latest revisions. Valve bodies shall be cast with raised eccentric seats which have a corrosion resistant welded in overlay of not less than 90 percent pure nickel on all surfaces contacting the plug face. Valve seats shall be in accordance with AWWA C504 and AWWA C507, latest revisions. Valves shall be furnished with resilient faced plugs with Neoprene facing, suitable for use with sludge. Valves shall be furnished with replaceable, permanently lubricated, stainless steel, sleeve-type bearings in the upper and lower plug stem journals. Plug stem bearings shall comply with AWWA C504 and C507, latest revisions. Valves shall be bolted bonnet design. Valves shaft seals shall be designed so that they can be repacked without removing the bonnet and the packing shall be adjustable. Packing material shall be Buna-Vee type packing. Valve shaft seals shall be in accordance with AWWA C504 and AWWA C507, latest revisions. All exposed valve nuts, bolts, springs, washers and the like shall be Type 304 stainless steel.

C. Interior Valve Lining: All interior ferrous surfaces of the valve that will have contact with the leachate except the valve seating surfaces shall be coated with a factory applied, fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revisions. Coating shall be holiday free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust, oil and grease before coating.

D. Exterior Valve Coating: All exterior surfaces of plug valves shall be clean, dry and free from rust and grease before coating. For buried service, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Prior to backfilling, all uncoated nuts, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed above ground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust inhibitive pigments and synthetic resins. Following installation aboveground valves shall be finish painted in accordance with manufacturer’s recommendations.
E. Valve Joints: All plug valves installed aboveground, in valve vaults or on flanged piping shall have flanged ends. Flanges shall comply with facing, drilling and thickness of ANSI Standards for Class 125 dimension. Nuts and bolts for flanged connections in valve vaults or corrosive atmospheres shall be Type 316 stainless steel in accordance with ASTM A320, Class 2. Nuts and bolts for aboveground installations or non-corrosive atmospheres shall be carbon steel in accordance with ASTM A307, Grade B. All buried plug valves shall have mechanical joint ends with dimensions, bolting patterns and assembly in strict accordance with ANSI/AWWA C111, latest revision. Tee head bolts and nuts for mechanical joints shall be manufactured of CORTEN-A, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, Plymouth, Michigan or an equal approved by the Engineer.

F. Mechanical Valve Actuators:

1. All plug valves installed in valve vaults or buried underground shall have actuators designed for buried and submerged service. Valves shall have seals on all shafts and gaskets on valve and actuator covers to prevent entry of water and dirt. Actuator mounting brackets for buried and submerged service shall be totally enclosed and shall have gasket seals. All exposed valve nuts, bolts, springs, washers and the like shall be Type 304 stainless steel.

2. All plug valves 6 inch in size and larger shall be furnished with mechanical gear actuators. Gear actuators shall be furnished with AWWA Standard 2 inch square operating nuts for buried valves, or handwheel, chainwheel or 2 inch square nut operators for aboveground or valve vault installation, as shown on the Drawings. Gear actuator shall be sized for the maximum pressure differential across the valve, equal to the pressure rating of the valve. All gearing shall be enclosed in a high strength cast iron housing, suitable for running in a lubricant. Housing shall be provided with seals on all shafts to prevent the entry of dirt and water into the actuator. Actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuator shall clearly indicate valve position for aboveground and valve vault installations and an adjustable stop shall be provided to set closing torque. Actuator shall be capable of withstanding an over-torque without damage up to 450 foot pounds for 2 inch square nut operators and to 300 foot pounds for handwheel or chainwheel operators.

3. Four inch and smaller aboveground valves shall be furnished with manual actuators, one-quarter turn to open. Actuator shall be supplied with an AWWA Standard 2 inch operating nut with a standard valve operating lever.

2.10 BUTTERFLY VALVES

A. General: All butterfly valves shall be of the tight closing, rubber seat type with rubber seats that are securely fastened to the valve body or disc. No metal to metal seating surfaces will be permitted. Valves shall be bubble tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving
throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity and for buried installation. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. Valves shall meet the full requirements of AWWA Standard C 504 for Class 150B, short body, flanged or mechanical joint as required. Wafer design valves are not acceptable, except when indicated on the Drawings. The manufacturer shall have manufactured tight closing, rubber seat butterfly valves for a period of at least five years. All valves shall be Henry Pratt Company, DeZurik, Mueller, or equal.

B. Valve Body: Valve bodies shall be constructed of cast iron ASTM A126 Class B or ASTM A48 Class 40. Ends shall be mechanical joint for buried service and flanged for aboveground use. Flange drilling shall be 125 pound in accordance with ANSI B16.1. Two trunnions for shaft bearings shall be integral with each valve body. When disc has the rubber seat, the valve body shall have a 18-8 Type 304 stainless steel body seat. The port diameter shall be no smaller than one inch less than the nominal valve size.

C. Valve Shaft: The valve shaft may consist of a one piece unit extending completely through the valve unit or may be the "stub shaft" type. Materials to be stainless steel 18-8 Type 304.

D. Valve Discs: Valve discs shall be constructed either of cast iron ASTM A126 Class B, ductile iron ASTM A536 or cast iron ASTM A48 each with Type 316 stainless steel seating edge or the entire disc may be constructed of cast 316 stainless steel. The stainless steel seating edge is not applicable to rubber seat disc type valves.

E. Valve Seats: Valve seats shall be of a synthetic or natural rubber compound and any be mounted on the valve body.

F. Valve Bearings: Valves shall be fitted with sleeve type bearings. Bearings shall be corrosion resistant and self-lubricating.

G. Valve Packings: Packing shall be self-adjusting Chevron type or of the O-ring type.

H. Interior and Exterior Valve Coatings: The valve shall be coated similarly as described in Section 2-05 C and D.

2.11 SWING CHECK VALVES

A. Swing check valves 2-inch through 12-inch in size shall conform to AWWA C-508, latest revision, and shall be designed for a minimum water working pressure of 150 psi. Check valves shall have cast iron body, swing type and ends shall be flanged, Class 125 in accordance with ANSI B16.1 When open, the valve shall have a straight way passage with a minimum flow area equal to the full pipe area. Swing check valves shall be completely bronze fitted with renewable bronze seat ring and a rubber faced disc; valve hinge pin shall be stainless steel. Check valves shall be supplied with an outside lever and weight.
B. Swing check valves shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the downstream pressure. The check valve shall be constructed such that the disc and body seat ring may be easily removed and replaced without removing the valve from the line. Each valve shall be hydrostatically tested at the factory, at a test pressure of 300 psi.

C. Interior Valve Coating: Prior to shipment from the factory, the interior ferrous surfaces of the valve, except for finished, non-ferrous or bearing surfaces, shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C-550, latest revision. Coating shall be holiday-free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust and grease before coating.

D. Exterior Valve Coating: All exterior surface of swing check valves shall be clean, dry and free from rust and grease before coating. For valves installed in below ground valve vaults, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Following installation, all uncoated nuts, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust-inhibitive pigments and synthetic resins. Following installation aboveground valves shall be finish painted in accordance with manufacturer’s recommendations.

2.12 SERVICE SADDLES AND CORPORATION STOPS

A. Service Saddles: Service saddles shall have ductile iron bodies in accordance with ASTM A536, latest revision, with double stainless steel straps. Bodies shall be brass or ductile iron, body shall have a fusion bonded nylon coating with a minimum thickness of 12 mils. Straps shall be Type 304 stainless steel with premium grade Type 304 L stainless steel bolts and Type 304 stainless steel washers and nuts. The nuts shall be Teflon coated. The gasket material shall be an elastomeric compound resistant to degradation by oil, natural gas, acids, alkalies, most aliphatic fluids and leachate. The outlet of the saddle shall have NPT threads. Service saddles shall be Rockwell No. 317, Ford or an equal approved by the Engineer.

B. Corporation Stops: Corporation stops shall be all bronze construction in accordance with AWWA C80, latest revision. Inlet threads shall be NPT iron pipe threads and the outlet connections shall be of the packed joint type suitable for use with Schedule 80 PVC pipe. Corporation stops shall be Ford Ball Corp Type FB 1102, McDonald or an equal approved by the Engineer.

C. Polyethylene Tubing. Service tubing shall be nominal wall polyethylene tubing conforming to the requirements of ASTM D-2737 and AWWA C-901. Tubing shall be manufactured from prime virgin PE-3408 high density polyethylene (HDPE) resin. Each coil of tubing shall be spiral wrapped with four (4) inch wide black .004 polyethylene film with minimum 2% carbon black content to shield the tubing from
ultraviolet and violet light. Reclaimed water service tubing shall be lavender in color.

D. Tubing shall be DR 9.0 CTS OD and supplied in 100 foot rolls. Tubing shall conform to all requirements set forth in AWWA C901. Tubing shall be marked with the following information at not more than 5 foot intervals: nominal size, material code designation, dimension ration and diameter base, AWWA pressure class, AWWA designation and manufacturer's name or trademark and product record code.

E. Fittings for use with polyethylene (PE) tubing shall be brass containing a pressure sealing O-ring and undirectional grip ring and shall be designed for "press-on" or "stab-on" installation, and manufactured by Ford Meter Box Company.

2.13 SOLENOID VALVES

A. Solenoid valves shall be 2 way type for normally closed operation designed for not less than a 150 psi water working pressure. The valves shall have forged stainless steel Series 300 bodies for 3/4 inch and smaller and brass bodies for 1 inch and larger with NPT threaded ends, Buna N seals/disks and NEMA 4X Red hat II solenoid enclosures. The valves shall operate on 120 VAC power, shall have threaded conduit hubs, standby manual operators and shall not require a minimum operating pressure differential for standby operation. The valves shall be provided with a manual override. The valves shall be Series 8210G for 3/4 inch and smaller and Series 8221G for one inch and larger as manufactured by Automatic Switch Company or approved equal.

2.14 FLEXIBLE EXPANSION JOINTS

A. Flexible expansion joints shall be of the molded wide arch design manufactured of chloroprene (neoprene) rubber with polyester reinforcement. Chloroprene (neoprene) body shall be supplied with a hypalon coating. Joints shall be flanged suitable for 150 psi water working pressure and in accordance with ANSI B16.1 dimensions and bolting patterns. Flanged ends shall be furnished and galvanized, split ductile iron retaining rings.

B. Provide limit restraint bolts on all pump suction and discharge lines. Expansion joints 6 inches and larger in size shall have a minimum of four limit restraint bolts. Restraint bolts and nuts shall be Type 304 stainless steel.

C. Minimum performance for flexible expansion joints shall be as follows:

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<tr>
<th>Size (in.)</th>
<th>Axial Compression (inches)</th>
<th>Axial Elongation (inches)</th>
<th>Lateral Angular Deflection (inches)</th>
<th>Lateral Angular Deflection (degrees)</th>
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<tr>
<td>2</td>
<td>1-3/4</td>
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<td>3</td>
<td>d.o.</td>
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D. Flexible expansion joints shall be Style 1015 Maxi-Joint as manufactured by General Rubber Corporation, Style 100 Metrasphere as manufactured by the Metraflex Company or an equal approved by the Engineer. Flexible joints for pump suction and discharge piping shall be designed for leachate service at 250 degrees F.

2.15 PRESSURE GAUGE ASSEMBLIES

A. Pressure gauges shall have the following design features: glycerin filled, 2 inch dial, aluminum dial with black numerals on white background, Type 316 stainless steel bourdon tube and movement, 300 series stainless steel case and ring, safety glass lens, threaded lens retaining ring, adjustable pointer with over-pressure stop and zero pointer stop, blowout protection, 2 inch Type 316 stainless steel stem mounting and 1.0 percent accuracy based on full scale. Provide Type 316 stainless steel pressure snubbers on all gauges not protected by seals. Pressure gauges shall be as manufactured by U.S. Gauge, Ashcroft, Marshalltown, Marsh, or approved equal.

B. Pressure Gauge Service and Ranges: Pressure gauges shall be furnished for the following services with the indicated ranges. Diaphragm seals shall be furnished for gauges as indicated.

2.16 VALVE BOXES

A. Furnish, assemble, and place a valve box over the operating nut for each buried valve. The valve box shall be designed so as to prevent the transmission of surface loads directly to the valve or piping.

B. Valve boxes shall be of the adjustable slide type of suitable length with an interior diameter of not less than 5 inches. The valve boxes shall be manufactured of cast iron and shall be of the two piece design including a bottom section and top section with cover. The cast iron cover shall be shaped and labeled for the appropriate service designation. The top section shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade.

C. The castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM A48, Class 30B for Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections and other harmful defects. The seating surfaces of both the cover and the top section shall be machined so that the cover will not rock after it has been seated.

D. The valve boxes shall be coated inside and outside with an asphaltic coating prior to machining, so that the machined seating surfaces will be free of any coating. Cast
iron valve box assemblies shall be Clow Corp. No F2452, Tyler Corp. Series 6855 or 6865 or an approved equal.

E. Valve extension stems shall be provided for all buried valves when operating nut is deeper than 3 feet below final grade.

2.17 PIPE AND VALVE IDENTIFICATION SYSTEMS
A. Not Included

2.18 GLOBE VALVES AND ANGLE VALVES
A. Globe valves and angle valves shall be suitable for throttling flows of liquid, oil, gas and air lines. Valves shall have end connections as indicated on the Drawings and shall be suitable for a working pressure of not less than 150 psi.
B. Each valve shall have self-lubricating TFE-impregnated asbestos packing to provide a tight stem steel. Valves shall have a removable bonnet in order to facilitate dismantling and reassembly of the valves.
C. Globe valves shall be Crane Model No. 1, Stockham Valves Figures B-16, or equal. Angle valves shall be Crane Model No. 2, Stockham Valves Figure B-216, or equal.

2.19 PRESSURE REGULATING VALVE
A. Pressure regulating valves shall be of bronze body construction, seat shall be of stainless steel, diaphragm shall be Buna N.
B. Regulator shall have a maximum pressure limit of 100 psi and the pressure reduction range shall be to 5 psi for all the services except for belt washwater. The maximum and minimum pressure variation range for the belt washwater shall be per gravity belt supplier's recommendations. The regulator shall be a direct acting, spring loaded, diaphragm type for hydraulic operation, and shall be capable of delivering a constant pressure. An adjusting screw shall be easily accessible for changing the outlet pressure.
C. Valves shall be installed in strict accordance with the manufacturer's recommendations. The manufacturer shall be Watts, or equal.

2.20 TIE RODS
A. When prior approval is obtained from the Engineer, ductile iron pipe, fittings, and valves may be restrained using tie bolt joint restraint. Joint restraint materials for this method of restraint shall be the Super-Star SST Series Joint Restraint Joint System as manufactured by Star National Products, a Division of Star Industries, Inc., Columbus, Ohio, or an equal approved by the Engineer.
B. All bolts, nuts, washers, tie rods and other fasteners for the joint restraint system shall be manufactured of CORTEN high strength, low alloy, corrosion resistant steel in conformance with ASTM A242. Tie bolts shall be manufactured of heat treated CORTEN steel. Tie rods and all fasteners for the system shall be galvanized in conformance with the requirements of ASTM A123. Tie rods shall have a minimum diameter of 3/4 inch. The number of tie rods required per joint shall be as recommended by the manufacturer.

C. Prior to backfilling after installation, all parts of the joint restraint system shall be coated with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M, for a minimum dry film thickness of 20 mils.

2.21 REDUCED PRESSURE BACKFLOW PREVENTERS


B. Product Handling: Exercise care in transporting and handling backflow preventers to avoid damage. Inside of backflow preventers shall be kept free of dirt and debris.

C. Reduced pressure principle backflow preventers shall include an integral sensing system that will automatically open a relief valve whenever the differential pressure between the inlet supply and the reduced pressure zone drops to 2 psi. The relief valve shall remain open until a positive pressure differential of 2 psi is re-established. If pressure upstream of the first check valve drops to atmospheric or below, the relief valve shall remain fully open providing an internal air gap between the first check valve and the water level in the reduced pressure zone. The unit shall also be constructed such that any minor leakage of the second check valve will result in visible flow from the relief valve, event if the first check valve is totally disabled.

D. Reduced pressure principle backflow preventers shall have all bronze bodies for sizes 22 inches and smaller and all ductile iron bodies for sizes 3 inches and larger. Ductile iron bodies shall be coated with a fusion bonded thermosetting epoxy coating in accordance with AWWA C550 with a minimum, holiday free, coating thickness of 12 mils. The reduced pressure backflow preventer shall consist of two independently operated, spring loaded, wye pattern, poppet type check valves designed for installation in a normal horizontal flow attitude. An independent spring loaded relief valve shall be located between the two check valves. Check valve assemblies, springs and seats and all other internal parts shall be constructed of Type 316 stainless steel. Relief valve body and trim shall be constructed of bronze. Check valve and relief valve seats shall be field replaceable without removing the device from the service line. Backflow preventers shall be designed for a working pressure of 200 psi and a temperature range of 32EF to 140EF. The backflow preventer shall be manufactured as a complete unit including test cocks, and upstream and downstream connections.
downstream isolation valves. The test cocks shall be manufactured of bronze and shall be arranged such that the unit can be tested without removing the unit from the line.

E. Isolation Valves: Reduced pressure backflow preventers shall be furnished complete with isolation valves. For sizes 22 inches and smaller, the isolation valves shall be all bronze ball valves with Buna N O-rings and valve seats, and a lever operating handle. Ball valves shall be in accordance with AWWA C80, latest revision. For sizes 3 inches and larger, the isolation valves shall be resilient seated gate valves with flanged ends and OS&Y handwheel operators. Gate valves shall be as specified and described hereinbefore.

F. Exterior Coating: The exterior ferrous surfaces of the reduced pressure backflow preventer and the isolation valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust inhibitive pigments and synthetic resins compatible with the finish coats. Following installation, the backflow preventer unit and aboveground piping shall be finish painted in accordance with manufacturer’s recommendations. All surfaces to be coated shall be clean, dry and free of rust, oil and grease.

G. Acceptable Manufacturers: Reduced pressure principle backflow preventers shall Model 825 as manufactured by Febco, or an equal approved by the Engineer.

2.22 TAPPING SLEEVES AND VALVES

A. Tapping sleeves shall be designed for a water working pressure of 150 psi and shall be mechanical joint end type. Tap shall be done under pressure and without interruptions of service. Taps shall be tested at factory to 175 psi.

B. Tapping valves shall be as specified herein under Gate Valves.

C. The manufacturer shall furnish the services of a supervisor who will direct all operations for the installation of material, attachment of tapping machine and operation of the machine in making the connection. The Contractors shall bear all such rental and supervision costs, and all other related costs.

D. Tapping sleeves and valves shall be the product of one of the following manufacturers, or equal: Mueller, Clow, M&H.

2.23 FLANGED ADAPTERS (WHEN APPLICABLE)

A. For joining plain end or grooved end pipe to flanged pipes and fittings.

B. Adapters shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125 or 150 pound standard unless otherwise required for connections.
C. Exposed Sleeve Type:

1. Constructed from steel.

2. Coating: In accordance with manufacturer’s recommendations.


4. Acceptable Manufacturers:
   a. Dresser Manufacturing Company - Style 128 for cast iron ductile iron and steel pipes with diameters of two (2) inches through 96 inches.
   b. Or equal.

2.24 FIRE HYDRANTS

A. Hydrants shall comply with AWWA Standard C402 "Fire Hydrants for Ordinary Water Works Service", and shall be equipped with a minimum of one (1) pump outlet nozzle 4 2 inches in diameter and two (2) hose nozzles 2 2 inches in diameter. Threads, nozzle caps, operating nuts and color shall conform to City standards. Units shall be traffic types with breakable safety clips, or flange, and stem, with safety coupling located below barrel break line to preclude valve opening. Hydrants shall be dry top. Outlet nozzles shall be on the same place, with minimum distance of 18 inches from center of nozzles to ground line. Valve shall be compressive type with 52 inches minimum opening and hose inlet connection to be 6 inches minimum. Hydrants shall open left by Mueller A-423 or Clow Medallion Hydrant (AWWA C-502). Hydrants must drain.

2.25 INSERT VALVE

A. General
   The Ductile Iron Insert Valve shall be a rated for 250 psig and shall be a Resilient Wedge Gate Valve as specified in this section. The valve shall be able to be installed into an existing pressurized pipeline while maintaining constant pressure and service as usual. After closing the wedge and adequately restraining the valve body the downstream pipe can be completely removed and replaced (allowing for upsizing of the pipe if necessary). The host pipe shall not be a permanent component of the Insert Valve. The Insert Valve shall be UL listed and approved to NSF / ANSI Standard 61- Drinking Water System Components. The insert valve must be installed by a qualified installer per the manufacturer’s requirements.

B. Construction: Sizes 12" and smaller must be capable of working on Cast/Grey Iron or Ductile Iron Class A, B, C and D, IPS PVC, C900 and C909 PVC, Steel, AC pipe diameters without changing either top or bottom portion of split valve body. The 250 psig maximum
working rating markings must be cast into the body of the valve. After the installation of the Insert valve body on to the existing pipe a pressure test of 1.1 times that of the contents shall sustained for 15 minutes. Once the pressure test is affectively achieved the Insert valve body must not be moved in accordance with AWWA Standards. If the Insert valve is moved the pressure test must be completed again. The Insert valve must not be moved or repositioned once the pressure test is achieved.

C. **Resilient Wedge Gate Assembly:** The construction of the Resilient Wedge shall comply with AWWA C509 requirements. The ductile iron wedge shall be fully encapsulated with EPDM rubber by a high pressure and high temperature compression or injection mold process. This will assure the ductile gate is fully coated with molded rubber – no exposed iron. The resilient wedge shall seat on the valve body and not the pipe to obtain the optimum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal. Abrasion results thus shorting the life and quality of the shut down if the wedge contacts the pipe. Pressure equalization on the down or upstream side of the closed wedge shall not be necessary to open the valve. The wedge shall be symmetrical and seal equally well with flow in either direction. The Resilient wedge must ride inside the body channels to maintain wedge alignment throughout its travel to achieve maximum fluid control regardless of high or low flow pressure or velocity. An oversized flow way shall be unobstructed to provide optimum flow. The valve shall be fully epoxy coated on the interior and the exterior a minimum of 10 mils epoxy in compliance with AWWA C550 and certified to ANSI/NSF-61. The fusion-bonded coating shall be applied prior to assembly so that even the bolt holes and body-to-bonnet flange surfaces are fully epoxy coated.

D. The valve shall have triple O-Ring stem seals, two O-Rings above, and one below the thrust collar. The lower two O-Rings provide a permanently sealed lubrication chamber that will make the valve easier to operate over a longer period of time. The upper O-Ring ensures that sand, dirt or grit cannot enter the valve to cause damage to the lower O-Rings. This is especially important for buried and sewage service applications. Side flange seals shall be of the O-Ring type of either round, oval, or rectangular cross-sectional shape.

E. American Made Quality: All primary parts and components to be exclusively and completely assembled, manufactured, machined and coated in the USA. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense. Bolting materials shall develop the physical strength requirements of ASTM A307 with dimensions conforming to ANSI B18.2.1.

F. Split Restraint Devices: Shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure rating of 350 psi for 4-12 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes. Chemical and modularity tests shall be performed as recommended by the Ductile iron Society, on a per ladle basis. Three test bars shall be incrementally poured per production shift as per U.L. specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.
G. Gland body wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts. Set screw pressure point type hardware shall not be used.

The Insert valve shall be as manufactured by Team Industrial Services 13131 Dairy Ashford Rd Sugar land, TX 77478 1-800-662-8326 281-331-6154, Team InsertValve Patent number 6,776,187 and 7,225,827 or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. All pipe, fittings, valves and other material shall be subject to inspection and approval by the Engineer after delivery, and no broken, cracked, imperfectly coated, or otherwise damaged or unsatisfactory material shall be used. When a defect or crack is discovered, the injured portion shall not be installed. Cracked pip shall have the defect cut off at least 12 inches from the break in the sound section of the barrel.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Excavation, backfill, and compaction shall conform to the provisions of Section 02100.

1. Pipe Cradle: Upon satisfactory installation of the pipe bedding material as specified, a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.

B. Cover for underground piping shall not be less than that indicated on the Drawings. The minimum cover for pipe shall be 36 inches. In areas where other piping conflicts preclude the maximum cover desired, the piping shall be laid to provide the maximum cover obtainable.

C. Pipe, fittings, valves and accessories shall be installed as shown or indicated on the Drawings.

D. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation and cooperation with authorities of the Owner.

E. Pipe Joint Deflection: Whenever it is desirable, and approved by the Engineer, to deflect pipe joints to avoid obstructions or to maintain required alignment, the amount of the joint deflection shall not exceed 80 percent of the maximum limits allowed by the pipe manufacturer.
F. In preparation for pipe installation, placement (stringing) of pipe should be as close to the trench as practical on the opposite side of the trench from the excavated material. The bell ends of the pipe should point in the direction of the work progress.

G. Pipe and fittings shall be laid accurately to the lines and grades indicated on Drawings or required. Where grades for the pipeline are not indicated on the Drawings, maintain a uniform depth of cover with respect to finish grade. Care shall be taken to insure a good alignment both horizontally and vertically and to give the pipe a firm bearing along its entire length. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid.

H. All pipe and fittings shall be cleared of sand, dirt, and debris before laying. All precautions shall be taken to prevent sand, dirt or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any sand, dirt, or other foreign material that enters the pipe shall be removed from the pipe immediately. Interior of all pipe and fittings shall be kept clean after installation until acceptable in the complete work.

I. Any time that pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the Engineer. Plugs shall remain in pipe ends until all water is removed from the trench. No pipe shall be installed when trench conditions are unsuitable for such work, including standing water, excess mud, or rain.

J. After pipe has been laid, inspected, and found satisfactory, sufficient backfill shall be placed along the pipe barrel to hold the pipe securely in place while conducting the preliminary hydrostatic test. No backfill shall be placed over the joints until the preliminary test is satisfactorily completed, leaving them exposed to view for the detection of visible leaks.

K. Upon satisfactory completion of the hydrostatic test, backfilling of the trench shall be completed.

L. Aboveground and Exposed Piping: Piping shall be cut accurately to measurements established at the job site and shall be worked into place without springing or forcing, properly clearing all equipment access areas and openings. Changes in sizes shall be made with appropriate reducing fittings. Pipe connections shall be made in accordance with the details shown and manufacturer's recommendations. Open ends of pipe lines shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe supports and hangers shall be provided where indicated or as required to insure adequate support of the piping.

3.03 INSTALLATION OF DUCTILE IRON PIPE
A. Handling and Cutting Pipe:

1. Care shall be taken in handling, cutting, and laying ductile iron pipe and fittings to avoid damaging the pipe and interior coal tar epoxy or cement mortar lining, scratching or marring machined surfaces, and abrasion of the pipe coating. All cracked pipe and fittings shall be removed at once from the work at no additional cost to the Owner.

2. Pipe cutting shall be done in a neat workmanlike manner without creating damage to the pipe and interior coal tar epoxy or cement mortar lining. Ductile iron pipe may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling wheel saw or oxyacetylene torch. Cut ends and rough edges of ductile iron pipe shall be ground smooth. For push-on joint connections, the cut end shall be beveled to prevent gasket damage during joint assembly. Interior lining shall be repaired at cut ends per the manufacturer's instructions prior to joint assembly.

B. Laying Pipe and Fittings:

1. Bedding for Ductile Iron Pipe: Minimum bedding requirements shall be Type 2 as defined in ANSI/AWWA C600, latest revision. Provide proper bedding required, in accordance with thickness class of pipe being laid and depth of cover. Proper pipe laying conditions shall be in accordance with ANSI/AWWA C150 and C151, latest revision, and ANSI/AWWA C600, latest revision.

2. All ductile iron pipe and fittings shall be laid in accordance with American Water Works Association Standard ANSI/AWWA C600, latest revision, entitled "Standard for Installation of Ductile Iron Water Mains and Their Appurtenances", with the following sections specifically applying:

   a. Section 3.3 - Pipe Installation

   b. Section 3.4 - Joint Assembly

C. Ductile Iron Pipe Joints:

1. Type: The joints of all pipelines shall be made absolutely tight. The particular joint used shall be approved by the Engineer prior to installation. Where shown on the Drawings or where, in the opinion of the Engineer, settlement or vibration is likely to occur, all pipe joints shall be bolted mechanical type or restrained type as specified above, or as indicated on the Drawings.

2. Push-on Joints: Push-on joints shall be made in strict accordance with the manufacturer's recommendations. Lubricant, if required, shall be an inert, non-toxic, water soluble compound incapable of harboring, supporting, or
culturing bacterial life. Manufacturer's installation recommendations shall be submitted to the Engineer for review and approval before commencing work. The bell of the pipe shall be cleaned of excess tar or other obstructions and wiped out before the cleaned and prepared spigot of the next pipe is inserted. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

3. Mechanical Joint: All types of mechanical joint pipes shall be laid and jointed in full conformance with manufacturer's recommendations, which shall be submitted to the Engineer for review and approval before work is begun. Only skilled workmen shall be permitted to makeup mechanical joints. Torque wrenches, set as specified ion AWWA Standard C111, shall be used; or spanner type wrenches not longer than specified therein may be used without the permission of the Engineer.

4. Flanged Joints: Flanged joints shall be made up by inserting the gasket between the flanges. The threads of the bolts and the faces of the gaskets shall be coated with suitable lubricant immediately before installation.

5. Restrained Joints: Restrained joints shall be provided where indicated on the Drawings. Joint assembly shall be made in strict accordance with the manufacturer's instructions, which shall be submitted to the Engineer for review and approval before commencing work.

3.04 INSTALLATION OF PVC PIPE

A. Storage and Handling:

1. PVC pipe shall be delivered to the site in unbroken bundles packaged in such manner as to provide protection against damage. When possible, pipe should be stored at the job site in the unit packages until ready for use. Packaged units shall be handled using a forklift or a spreader bar with fabric straps. Packaged units shall not be stacked at the job site higher than two units high.

2. When it is necessary to store PVC pipe for long periods of time, exposure to direct sunlight shall be prevented by covering the pipe with an opaque material. Adequate air circulation above and around the pipe shall be provided as required to prevent excessive heat accumulation. PVC pipe shall not be stored close to heat sources of hot objects such as heaters, fires, boiler, or engine exhaust. Pipe gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. The interior and all sealing surfaces of pipe, fittings, and other appurtenances shall be kept clean and free of dirt and foreign matter.
3. Care shall be taken in handling and laying pipe and fittings to avoid severe impact blows, crushing, abrasion damage, gouging or cutting. Pipe shall be lowered, not dropped, from trucks or into trenches. All cracked, damaged, or defective pipe and fittings, or any length of PVC pipe having a gouge, scratch or other permanent indentation of more than 10 percent of the wall thickness in depth, shall be rejected and removed at once from the work and replaced with new acceptable pipe at no additional cost to the Owner.

B. Field Cutting PVC Pipe: Field cutting of pipe shall be done in a neat workmanlike manner without creating damage to the pipe. The pipe shall be cut square with a fine-toothed hand or power saw or other cutter or knife designed for use with plastic pipe. Prior to cutting, the pipe shall be marked around its entire circumference or a square in vise shall be used to ensure the pipe end is cut square. Remove burrs by smoothing edges with a knife, file, or sandpaper.

1. Field Cutting Bell and Spigot PVC Pipe: Bevel the cut end of the pipe using a pipe beveling tool, wood rasp or portable sander to prevent damage to the gasket during joint assembly. A factory finished beveled end should be used as a guide to ensure proper beveling angle and correct depth of bevel. Round off any sharp edges on the leading edge of the bevel with a knife or file.

C. Laying PVC Pipe:

1. Pipe Bedding: Bedding for PVC pipe shall be as specified using granular pipe bedding material.

2. All PVC pipe shall be laid in accordance with the pipe manufacturer's published installation guide, the AWWA Manual of Practice No. M23 "PVC Pipe-Design and Installation" and the Uni-Bell Plastic Pipe Association installation recommendations.

D. PVC Pipe Joint Assembly for Rubber Gasketed Bell and Spigot Pipe:

1. The PVC bell and spigot joint shall be assembled in accordance with the pipe manufacturer's installation instructions. Clean the interior of the bell, the gasket, and the spigot of the pipe to be jointed with a rag to remove any dirt or foreign material before assembling. Inspect the gasket, pipe spigot bevel, gasket groove and sealing surfaces for damage or deformation.

2. Lubricate the spigot end of the pipe with a lubricant supplied or specified by the pipe manufacturer for use with gasketed PVC pipe in potable water systems. The lubricant should be supplied as specified by the pipe manufacturer. After the spigot end is lubricated, it must be kept clean and free of dirt and sand. If dirt and sand adhere to the lubricated end, the spigot must be wiped clean and relubricated.
3. Insert the spigot into the bell so that it contacts the gasket uniformly. Align the pipe sections and push the spigot end into the bell until the manufacturer's reference mark on the spigot is flush with the end of the bell. The pipe should be pushed into the bell using a bar and wood block. The joint shall not be assembled by "stabbing" or swinging the pipe into the bell, nor shall construction machinery be used to push the pipe into the bell.

4. If undue resistance to insertion of the spigot end is encountered or if the reference mark does not reach the flush position, disassemble the joint and check the position of the gasket. If the gasket is twisted or pushed out of its seat, inspect the components, repair or replace damaged items, clean the components and repeat the assembly steps. Be sure the pipe is in proper alignment during assembly. If the gasket was not out of position, check the distance between the spigot end and the reference mark and relocate the mark if it is out of position.

E. PVC Pipe Joint Assembly for Threaded and Solvent Welded Pipe

1. All threaded and solvent welded joints shall be made watertight. All pipe cutting, threading and jointing procedures for threaded and solvent welded PVC pipe joints shall be in strict accordance with the pipe and fitting manufacturer's printed installation instructions. Thread lubricant for threaded joints shall be Teflon tape only.

2. At threaded joints between PVC and metal pipes, the metal side shall contain the socket end and the PVC side the spigot. A metal spigot shall not, under any circumstances, be screwed into a PVC socket.

F. PVC forcemains underground shall be strapped every 10 feet or spiral wrapped with an insulated green No. 14 gauge copper ground wire for future location. The wire shall be stubbed out at each valve box or manhole.

3.05 FITTING INSTALLATION FOR UNDERGROUND PIPING

A. The weight of ductile iron fittings shall not be carried by the pipe on which they are installed. The fitting shall be supported by a concrete cradle as shown on the standard details. Concrete used for supports shall have a minimum compressive strength of 3000 psi at 28 days. Concrete for support cradle shall be poured against undisturbed soil.

B. All glands, clamps, bolts, nuts, studs and other uncoated parts of fitting joints for underground installation shall be coated with two coats, 10 mils DFT per coat, of coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M.

3.06 CONCRETE PIPE ENCASEMENT
A. Concrete for concrete pipe encasement shall have a minimum strength of 3000 psi at 28 days and encasement shall be constructed in accordance with details shown on the Drawings. Encasement shall be constructed where:

1. Indicated on the Drawings

2. The Engineer shall order the pipeline encased.

B. The points of beginning and ending of concrete pipe encasement shall be not more than 6 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads. Pipe shall be wrapped in visqueen.

C. Pipe encasement shall provide a minimum coverage of 6 inches all around the pipe including pipe bells.

3.07 INSTALLATION OF PIPE SLEEVES, WALL CASTINGS AND COUPLINGS

A. Pipe sleeves and wall castings shall be provided at the locations called for on the Drawings. These units shall be as detailed and of the material as noted on the Drawings. They shall be accurately set in the concrete or masonry to the elevations shown. All wall sleeves and castings required in the walls shall be in place when the walls are poured. Ends of all wall castings and wall sleeves shall be of a type consistent with the piping to be connected to them.

B. Link seals for wall sleeves shall be installed in strict accordance with the manufacturer's printed installation instructions. For watertight applications in tanks or treatment units, the link seal installation shall be tested hydrostatically for leaks at the same time as the tank or treatment unit. Any leaks that occur during the test period shall be repaired by checking the link seals for proper installation and replacement of unit(s) found to be defective at no additional cost to the Owner.

C. Pipe couplings shall be installed in strict accordance with the manufacturer's published instructions and recommendations.

3.08 INSTALLATION OF VALVES

A. Valves of the size and type shown on the Drawings shall be set plumb and installed at the locations indicated on the Drawings. Valves shall be installed in accordance with manufacturer's installation instructions and with the Details shown on the Drawings.

B. Valves shall be installed such that they are supported properly in their respective positions, free from distortion and strain. Valves shall be installed such that their weight is not borne by pumps and equipment that are not designed to support the weight of the valve.
C. Valves shall be carefully inspected during installation; they shall be opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Check and adjust all valves for smooth operation.

D. Install valves with the operating stem in either horizontal or vertical position.

E. Allow sufficient clearance around the valve operator for proper operation.

F. Clean iron flanges by wire brushing before installing flanged valves. Clean carbon steel flange bolts and nuts by wire brushing, lubricate threads with oil or 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.

G. For buried valves, a valve box shall be centered accurately over the operating nut and the entire assembly shall be plumb. The tops of valve boxes shall be adjusted to the proper elevation as specified below and as shown on the Drawings.

1. In paved areas, tops of valve box covers shall be set flush with pavement. Following paving operations, a 16 inch square shall be neatly cut in the pavement around the box and the paving removed. The top of the box shall then be adjusted to the proper elevation and a 30 inch square by 6 inch thick concrete pad poured around the box cover. Concrete pads in traffic areas shall be reinforced with No. 4 reinforcement bars as shown on the Drawings. Concrete for the pad shall be 3000 psi compressive strength.

2. In unpaved areas, tops of valve box covers shall be set 2 inches above finished grade. After the top of the box is set to the proper elevation, a 16 inch square by 6 inch thick concrete pad shall be poured around the box cover. Concrete for the pad shall be 3000 psi compressive strength.

H. Valves shall be tested hydrostatically, concurrently with the pipeline in which they are installed. Protect or isolate any parts of valves, operators, or control and instrumentation system whose pressure rating is less than the pressure test(s). If valve joints leak during pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts and hydrostatically retest the joints.

I. Following installation, all aboveground valves shall be painted in accordance with the painting system specified in accordance with manufacturer’s recommendations. Following installation of buried valves or valves installed in valve vaults, repair any scratches, marks and other types of surface damage, etc., with a coating equal to the original coating supplied by the manufacturer. Prior to backfilling, all nuts, bolts and other parts of the valve joints shall be coated with two coats, 10 mils DFT per coat, of coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M.
3.09 SEPARATION OF NON-POTABLE WATER MAINS AND POTABLE WATER MAINS

A. Reclaimed water mains shall be installed with at least a 3 foot horizontal separation from any potable water main. Force mains and gravity sewers shall have a 6 foot separation from potable mains. At crossings the installation shall provide of a minimum vertical separation distance of 12 inches between the outside of the crossing non-potable and potable water mains. This separation shall be provided where the potable water main is either below or above the non-potable water main. When the 12 inch minimum vertical separation distance cannot be maintained, the potable water main shall be encased in concrete. Concrete encasement shall be as specified above. The potable water main shall be encased for 10 feet each way of the crossing.

3.10 MAIN CLEANING AND FLUSHING

A. Following the hydrostatic and leakage tests, all the mains constructed under this contract shall be cleaned and flushed to remove sand, loose dirt and other debris. Flushing velocity shall be a minimum of 2.5 fps. Flushing shall continue until clean water flows from the main. However, the Contractor shall endeavor to use the minimum amount of flushing water required to complete the work. To increase the efficiency of the cleaning and flushing operation, the Contractor shall use a pipeline pigging device of the proper size and designed to clean the intended pipeline. The pigging device shall be capable of turning through a standard 90 degree MJ bend. The type of pipeline pigging device and the method of operation shall be approved by the Engineer.

B. Upon completion of testing for the gravity drain line system, drain lines shall be flushed to remove dirt, sand, stones and other debris which may have entered the lines during construction and settled out in the lines and manholes. Materials and debris flushed from the drain lines shall be removed from a downstream manhole or basin and disposed of at an approved disposal area.

C. Water for flushing shall be clean water provided by the Contractor from a source approved by the Engineer and the owner prior to beginning connections for flushing operations. Flushing shall only be completed upon approval by the Owner.

D. Temporary blow offs may be required for the purpose of flushing mains. Temporary blow offs shall be installed as close as possible to the ends of the main being flushed. Blow offs installed on the main shall be the same diameter as the main. Temporary blow offs shall be removed and plugged after the main is flushed. All costs for installing and removing temporary blow offs shall be at no additional cost to the Owner.

E. The Owner shall be notified at least 3 working days prior to flushing mains.

F. Blow offs and temporary drainage piping used for flushing shall not be discharged into any gravity sewer or pumping station wetwell. The Contractor shall obtain prior
approvals from the Engineer and the Owner as to the methods and locations of
flushing water discharge.

3.11 INSTALLATION OF TIE RODS

A. Tie rods shall be installed in strict accordance with the manufacturer's written
installation requirements. Unless otherwise indicated on the Drawings, the size and
number of tie rods for a joint or installation shall be as recommended by the
manufacturer's design chart for a working pressure of 150 psi.

B. Following installation and prior to backfilling, all parts of the tie rod joint restraint
system, including tie rods, tie bolts, nuts, washers, and other fasteners, shall be coated
with two coats, 10 mils DFT per coat, of coal tar epoxy equal to Kop-Coat Bitumastic
No. 300-M.

3.12 INSTALLATION OF REDUCED PRESSURE BACKFLOW PREVENTERS

A. Backflow preventers shall be installed at the locations shown on the Drawings.
Backflow preventers shall be installed in accordance with the manufacturer's written
installation instructions and as shown on the Drawings.

B. Reduced pressure principle backflow preventers shall be installed horizontally with
an 18 inch minimum clearance between the finished grade and the lowest point on
the bottom of the unit. Reduced pressure backflow preventers shall be installed with
provisions for a suitable drain arrangement to drain off discharges from the relief
valve, so that discharges are not objectionable. Backflow preventers shall be
installed such that they are easily accessible for testing, maintenance and repair.

C. Piping and fittings for units 3 inches and larger in size shall have flanged joints.
Piping, fittings and valves shall be properly supported with pipe support stands as
shown on the Drawings.

D. Following installation of the reduced pressure backflow preventer, piping, fittings
and valves, the entire aboveground assembly shall be finished painted in accordance
with manufacturer’s recommendations.

END OF SECTION