CONTRACT DOCUMENTS
AND
SPECIFICATIONS

FOR THE

CITY OF LAFAYETTE

WASTEWATER TREATMENT
PLANT UPGRADES

CWSRF PROJECT NO. CS010403-05, CONTRACT NO. 2
CONTRACT NO. LF24 144

CONTRACT DOCUMENTS
AND SPECIFICATIONS

FOR

CITY OF LAFAYETTE

WASTEWATER TREATMENT
PLANT UPGRADES

CWSRF PROJECT NO. CS010403-05, CONTRACT NO. 2
CONTRACT NO. LF24-144

Certified by:

Dave B. Bechtel, P.E.
Reg. Engineer No. 16187
State of Alabama

Utility Engineering Consultants, LLC
WATER DESIGN • WASTEWATER DESIGN • OPERATOR TRAINING • GIS

NON-COLLUSION AFFIDAVIT

STATE OF ALABAMA

PROJECT NAME: City of Lafayette
Wastewater Treatment Plant Upgrades
CWSRF Project No. CS010403-05 Contract No. 2

CHAMBERS COUNTY

BID OPENING: _____.

I certify that _____ has not, either
(Name of Contracting Firm)
directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this contract.

Signed: _____
(Name of Contracting Firm)

By: _____

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

_____
Notary Public

My Commission expires_____

FAILURE TO EXECUTE THIS AFFIDAVIT SHALL BE CAUSE FOR REJECTION OF THIS BID.

NOTICE TO CONTRACTORS
INVITATION FOR BIDS

Sealed Bids will be received by the City of Lafayette, 50 Alabama Avenue West, Lafayette, Alabama 36862 until March 27, 2025 at 10:00 A. M.. local time, for furnishing all labor, materials, and equipment and doing the work of constructing, according to Plans, Specifications and Contract Documents on file in the office of the Owner, the improvements hereinafter described. No bids will be received after the time set forth herein above; and the Bids will be publicly opened and read.

The work of constructing City of Lafayette Wastewater Treatment Plant Upgrades CWSRF Project No. CS010403-05, Contract No. 2 Contract LF24-144 be let under one Contract, the principal items of work are detailed herein below.

1. Replace grit removal system
2. Repair final clarifiers
3. Replace SCADA
4. Replace WAS Pumps
5. Replace Scum Pump
6. Replace RAS Pump
7. Replace wiring to final Clarifiers

Plans, Specifications and Contract Documents are open to public inspection at the office of Owner, the City of Lafayette, 50 Alabama Avenue West, Lafayette Alabama 36862 or may be obtained from the office of the Engineers, Utility Engineering Consultants, LLC, 135 Gemini Circle, Suite 211, Homewood, Alabama 35209 for the amount of $ 50.00 per set, the actual cost of printing, reproducing, handling and distribution for each set of documents. No refunds will be made except to Prime Contractor Bidders, which shall be refunded for one bid set.

The Contractor is hereby advised that TIME IS OF THE ESSENCE on this project and that the contract time of 365 consecutive calendar days and noted restrictions shall be strictly observed. LIQUIDATED DAMAGES WILL BE ASSESSED IF THE CONTRACT TIME IS EXCEEDED. The Contractor may apply for an extension of time in accordance with the provisions of the contract; however, such an extension must be approved prior to the contract completion date to avoid the imposition of liquidated damages.

Utility Engineering Consultants, LLC
135 Gemini Circle, Suite 211
Homewood, Alabama 35209
Phone: (205) 951-3838 ✶ Fax: (205) 951-3839
Website: uecllc.com

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THE CITY OF LAFAYETTE WASTEWATER TREATMENT PLANT UPGRADES

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INSTRUCTIONS TO BIDDERS

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INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office* — The office of the Engineer from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from the Issuing Office.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

A. The deposit shall be refunded in full to each prime contractor bidder upon return of the documents in reusable condition within ten days after bid opening. Additional sets for prime contractor bidders, subcontractors, vendors, or dealers may be obtained upon payment of the same deposit.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, within five days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below. Each Bidder must submit evidence of Bidder's qualification to do business in the State of Alabama.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.02 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.03 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.04 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;

B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;

D. obtain and carefully study (or accept consequences of not doing so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

E. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the Price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

F. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

G. correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.05 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 A mandatory pre-Bid conference will be held at City of Lafayette Council Chambers, 50 Alabama Avenue West, Lafayette, Alabama 36862 on _____ at _____., local time in accordance with the Notice to Contractors. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are required to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price or $50,000.00, whichever is less, and in the form of a certified check or bank money order or a Bid bond (on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIME

9.01 The number of days within which, or the dates by which the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or those substitute or "or-equal" materials and equipment approved by Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type,. function and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Engineer as a substitute or "or-equal" unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of

the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner.

12.02 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents. Additional copies my be obtained from the Engineer.

13.02 All blanks on the Bid Form shall be completed by printing in ink or by typewriter and the Bid signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid item listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown below the signature.

13.06 A Bid by an individual shall show the Bidder's name and official address.
13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.10 The address and telephone number for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01 Unit Price

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on the account of cash allowances, if any, named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.

ARTICLE 15 - SUBMITTAL OF BID

15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The complete copy of the Bidding Documents is to be completed and submitted with the Bid security complete.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the The City of Jacksonville Water Works, Sewer and Gas Board, 320 Church Avenue, SE, Jacksonville, Alabama 36265.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If within 24 hours after Bids are opened, any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, individuals, or entities must be submitted as provided in the Supplementary Conditions.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.06 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Base Bid plus any alternates that are in the best interests of the Project. Project will be awarded upon the base bid, if applicable, the Owner may choose to use the alternate bid if it is in the best interest of the Project.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22 - RETAINAGE

22.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in the Agreement.

SECTION 00410

BID FORM

TABLE OF ARTICLES

BID FORM

ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to:

City of Lafayette
50 Alabama Avenue West, Lafayette Alabama 36862

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

E. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

F. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

G. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

J. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

ARTICLE 4 - FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

A. this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 5 - BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

PROPOSAL FORM
CITY OF LAFAYETTE
WASTEWATER TREATMENT PLANT UPGRADES
CWSRF PROJECT NO. CS010403-05 CONTRACT NO. 2
CONTRACT NO. LF24 144

CONTRACTOR_____ **LICENSE #**_____

Item No.	Description	Est. Quan.	Bid Unit Price	Bid Price
1	Replace Grit System, Scum Pump and WAS Pump including all mechanical, structural, electrical and miscellaneous items Furnish and Install Complete Per LS	1 LS		
2	Replace Data Collection System, miscellaneous items Furnish and Install Complete Per LS	1 LS		
3	Replace all wiring to existing final clarifiers, including wire, conduit, connection and terminations Furnish and Install Complete Per LS	1 LS		
4	Replace RAS pumps including all mechanical, structural, electrical and miscellaneous items Furnish and Install Complete Per LS	1 LS		
5	Mechanical Modifications and Additions to Existing Plant per engineer's and owner's approval Per LS	1 LS	$ 50,000.00	
6	Electrical Modifications and Additions to Existing Plant per engineer's and owner's approval Per LS	1 LS	$ 50,000.00	
7	Mobilization and Demobilization (4% of bid maximum) Furnish and Install Complete Per LS	1 LS		
			TOTAL AMOUNT OF BASE BID	

Total Amount of Bid in Written Form: _____

_____

Amount are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.

LUMP SUM BID

SUBSTITUTE EQUIPMENT

Allowance of substitute equipment does not constitute a waiver of the Specifications. If the Bidder desires to offer equipment as a substitute to the Lump Sum Base Bid, he shall indicate in appropriate schedule below the substitution requested. The Owner reserves the right to decide whether or not the proposed substitution will be accepted. The Engineers and the Owner will review requested substitution for equipment and will generally deem the equipment equal, provided that:

1. The substitute equipment is of equal quality, function and performance to the listed equipment item, and it will perform satisfactorily and continuously. In this case, it will be assumed that the cost to the Contractor of the equipment proposed to be substituted is less than the equipment named in the Contract, and, if the substitution is approved, the Contract price shall be reduced to a corresponding amount by a Change Order which will be executed simultaneously with the signing of the Contract. The cost to be deducted from the Lump Sum Base Bid price for acceptable substitute equipment shall be determined by the Engineers and the Owner upon documentation supplied by the Bidder.

2. The equipment or material proposed for substitution is superior in construction and efficiency to that named in the Contract.

No substitute equipment will be considered unless, in the opinion of the Owner and the Engineer, it conforms to the Contract Drawings and Specifications in all respects, except for make and manufacturer and minor details.

In order that the Owner and the Engineer may determine if the proposed substitution item is equal to those specified, one set of Drawings, Specifications and full descriptive material and a list of the equipment and products proposed shall be submitted in accordance with the Instructions to Bidders, Item 9. A full explanation of variances from these Specifications shall be included with each substitution.

In the event that the substitute equipment or products is not allowed, then the equipment or products as specified for the base bid shall be furnished for the amount included in the Total Amount of Base Bid.

Substitution or modifications to the attached TABULATION OF MAJOR EQUIPMENT AND PRODUCTS ITEMS shall not be considered after the receipt of the Bidder's Proposal.

Design of this project is based upon the manufacturer's equipment or product listed in the schedule of major equipment hereinbelow. Should the Bidder propose to substitute equipment and products not listed, the Bidder shall notify the Engineers in writing of all dimensional, mechanical, hydraulic, electrical and structural changes and/or requirements for the units used and shall reimburse the Owner for any associated redesign and/or construction drawings. He shall include in his bid, the additional construction cost of mechanical, architectural, structural, electrical and engineering cost of that unit. Redesign and Drawing revisions will be prepared by the Engineers. The Contractor shall pay the Owner for such redesign cost. The bid shall also include any paid up licenses necessary for the use of the equipment if required by the manufacturer.

The Contract will be awarded to the qualified, responsible bidder that has completed the TABULATION OF MAJOR EQUIPMENT AND PRODUCTS ITEMS including the price for materials and articles specified by the Engineers even when the Bidder chooses not to offer substitute materials and articles. The Bidder shall furnish complete the materials and articles shown as (a.) under the heading Materials and Articles in the TABULATION OF MAJOR EQUIPMENT AND PRODUCTS ITEMS when no substitute materials and articles are shown in (b.).

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

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

ARTICLE 6 - TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07.B of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

ARTICLE 7 - ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

2. Required Bid security in the form of Bid Bond or check

3. List of Proposed Subcontractors

4. List of Proposed Suppliers

5. List of Project References

6. Affidavit of Non-Collusion

7. Bid Bond

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by: Schmidt Environmental Construction, Inc.

If Bidder is: a corporation

An Individual

Name (typed or printed): N/A

By: N/A (SEAL)
(*Individual's signature)*

Doing business as: N/A

A Partnership

Partnership Name: N/A (SEAL)

By: N/A
(Signature of general partner — attach evidence of authority to sign)

Name (typed or printed): N/A

A Corporation

Corporation Name: Schmidt Environmental Construction, Inc. (SEAL)

State of Incorporation: Alabama

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

By: _____
(Signature — attach evidence of authority to sign)

Name (typed or printed): Aaron B. Schmidt

Title: President

(CORPORATE SEAL)

Attest _____

Date of Authorization to do business in *Alabama* is 9 / 23 / 2011.

A Joint Venture

Name of Joint Venture: N/A

First Joint Venturer Name: N/A (SEAL)

By: N/A
(Signature of first joint venturer partner — attach evidence of authority to sign)

Name (typed or printed): N/A

Title N/A

Second Joint Venturer Name: N/A (SEAL)

By: N/A
(Signature of second joint venturer partner — attach evidence of authority to sign)

Name (typed or printed): N/A

Title: N/A

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

All Bidder's
Business Address PO Box 369, Auburn, AL 36831

Phone No. 334-887-0334 Fax No. 334-887-0335

SUBMITTED on March 27 , 2025

State Contractor License No. 47519

BID BOND

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

BID

Bid Due Date: _____

Project (Brief Description Including Location): _____

BOND

Bond Number: _____

Date (Not later than Bid due date): _____

Penal sum _____ _____

(Words) (Figures

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER	SURETY
(Seal)	(Seal)
_____	_____
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: Above addresses are to be used for giving required notice.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Surety's liability.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:
   3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
   3.2 All Bids are rejected by Owner, or
   3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

SECTION 00520

AGREEMENT

BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT

THIS AGREEMENT is by and between **City of Lafayette** (Owner) and _____ (Contractor).

Owner and Contractor, in consideration of the mutual covenants set forth herein, agree as follows:

ARTICLE 1 - WORK

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

Water Treatment Plant Upgrades, CWSRF Project No. CS010403-05, Contract No. 2
Contract No. LF24 144

ARTICLE 2 - THE PROJECT

2.01 The Project for which the work under the Contract Documents may be the whole or only a part is generally described as follows:

Replace Grit Removal, WAS Pumps, RAS Pumps SCUM Pump and add SCADA

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by

Utility Engineering Consultants, LLC
135 Gemini Circle, Suite 211
Homewood, Alabama 35205
Phone: (205) 951-3838 ✶ Fax: (205) 951-3839
Website: uecllc.com

(Engineer), who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

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

4.02 Days to Achieve Substantial Completion and Final Payment

A. The Water Line shall be coated and ready to disinfect within 365 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions. This shall be deemed substantial completion. All work shall be ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 385 days after the date when the Contract Times commence to run.

4.03 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner $ 100.00 for each day that expires after the time specified in Paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner $200.00 for each day that expires after the time specified in Paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraph 5.01.A below:

A. For all Work, for the sum of $
B. For the sum of $, at the prices stated in Contractor's Bid Form, attached hereto as an exhibit.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

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

6.02 Progress Payments; Retainage

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 15.01 of the General Conditions:

    a. 100 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, Owner, on recommendation of Engineer, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no additional retainage; and

b. 100 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 15.03 of the General Conditions and less 100 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 Final Payment

A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 15 of the General Conditions shall not bear interest. The Owner shall make payment promptly when proper invoice is issued by the Contractor.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 5.03 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Conditions, if any, at the Site which has been identified in the Supplementary Conditions as provided in Paragraph 5.06 of the General Conditions.

E. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.

F. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data as necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

I. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 6, inclusive).
2. Performance bond (pages 1 to 3 inclusive).
3. Payment bond (pages 1 to 3 , inclusive).
4. Other bonds (pages _____ to _____, inclusive).
   a. _____ (pages _____ to _____, inclusive).
   b. _____ (pages _____ to _____, inclusive).
   c. _____ (pages _____ to _____, inclusive).
5. General Conditions (pages 1 to 50, inclusive).
6. Supplementary Conditions (pages 1 to 8, inclusive).
7. Specifications as listed in the table of contents of the Project Manual.
8. Drawings consisting of 0 sheets with each sheet bearing the following general title: _____.
9. Addenda (numbers ___ to ___, inclusive).

10. Exhibits to this Contract (enumerated as follows):

    a. Contractor's Bid (pages ___ to ___, inclusive).

    b. Documentation submitted by Contractor prior to Notice of Award (pages _____ to _____, inclusive).

    c. _____.

11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

    a. Notice to Proceed (pages____ to_____, inclusive).

    b. Work Change Directives.

    c. Change Order(s)

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 11.01 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 Terms

A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 Assignment of Contract

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

10.03 Successors and Assigns

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

10.04 Severability

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in quadruplicate. One counterpart each has been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Agreement will be effective on, _____, **2025** (which is the Effective Date of the Agreement).

OWNER:	CONTRACTOR:
City of Lafayette	_____
By: _____ Kenneth Miles	By: _____
Title: **Mayor**	Title: **President**
	[CORPORATE SEAL]
Attest: _____	Attest: _____
Title: _____	Title: _____
Address for giving notices:	Address for giving notices:
50 Alabama Avenue	**Post Office Box 369**
Lafayette, Alabama 36862	**Auburn, Alabama 36831**
	License No.: _____ (Where applicable)

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Owner-Contractor Agreement.)

Agent for service or process: _____

_____

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR
(Name and Address):

SURETY
(Name and Address of Principal Place of Business):

OWNER (Name and Address):
City of Lafayette
50 Alabama Avenue West, Lafayette, Al 36862

CONTRACT
Date:
Amount: **($**
Description (Name and Location): **Wastewater Treatment Plant Upgrades CWSRF Project No. CS010403-05, Contract No. 2 LF24 144**

BOND
Bond Number:
Date (Not earlier than Contract Date:
Amount: **($**
Modifications to this Bond Form:

Surety and a Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:
Signature: (Seal)
Name and Title:

SURETY
(Seal)
Surety's Name and Corporate Seal

By:
Signature and Title
(Attach Power of Attorney)

Attest:
Signature and Title

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL
Company:
Signature: (Seal)
Name and Title:

SURETY

Surety's Name and Corporate Seal

By:
Signature and Title
(Attach Power of Attorney)

Attest:
Signature and Title:

1 Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

2 If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.

3 If there is no Owner Default, Surety's obligation under this Bond shall arise after:

3.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contractor. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contractor, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

3.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and

3.3 Owner has agreed to pay the Balance of the Contract Price to:

3.3.1 Surety in accordance with the terms of the Contract;

3.3.2 Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.

4 When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:

4.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contractor; or

4.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or

4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

4.4.1 After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner, or

4.4.2 Deny liability in whole or in part and notify Owner citing reasons therefor.

5 If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4., and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

6 After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

6.1 The responsibilities of Contractor for correction of defective. Work and completion of the Contract.

6.2 Additional legal, design, professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and

6.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

7 Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No rights of action shall accrue on the Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

8 Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

9 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10 Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

11 When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12 Definitions

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

12.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

12.3 Contractor Default: Failure of Contractor, which has neither been remedied not waived, to perform or otherwise to comply with the terms of the Contract.

12.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY — Name, Address and Telephone
Surety Agency or Broker:
Owner's Representative:
Utility Engineering Consultants, LLC
135 Gemini Circle, Suit 211 , Alabama 35209, Phone (205) 951-3838

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR
(Name and Address):

SURETY
(Name and Address of Principal Place of Business):

OWNER (Name and Address):
City of Lafayette
50 Alabama Avenue West, Lafayette, Al 36862

CONTRACT
Date:
Amount: **($**
Description (Name and Location): **Wastewater Treatment Plant Upgrades - CWSRF Project No. CS010403-05, Contract No. 2 LF24 144**

BOND
Bond Number:
Date (Not earlier than Contract Date:
Amount: **($**
Modifications to this Bond Form:

Surety and a Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:
Signature: (Seal)
Name and Title:

SURETY
(Seal)
Surety's Name and Corporate Seal

By:
Signature and Title
(Attach Power of Attorney)

Attest:
Signature and Title

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL
Company:
Signature: (Seal)
Name and Title:

SURETY

Surety's Name and Corporate Seal

By:
Signature and Title
(Attach Power of Attorney)

Attest:
Signature and Title:

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to Owner, this obligation shall be null and void if Contractor:

2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contractor, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.

4. Surety shall have no obligation to Claimants under this Bond until:

4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the addresses described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2 Claimants who do not have a direct contract with Contractor:

1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.

5. If a notice by a Claimants required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.

6. When a Claimants has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:

6.1 Send an answer to that Claimants, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2 Pay or arrange for payment of any undisputed amounts.

7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.

8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they

agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimants under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contractor or to related Subcontractors, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimants under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimants gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

15.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY — Name, Address and Telephone
Surety Agency or Broker:
Owner's Representative:
Utility Engineering Consultants, LLC
135 Gemini Circle, Suite 211 Homewood, AL 35209 (205) 951-3838

SECTION 00700

GENERAL CONDITIONS

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GENERAL CONDITIONS

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.

7. Bidding Documents — The Bidding Requirements and the proposed Contract Documents (including all Addenda).

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 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's 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.

16. Cost of the Work — See Paragraph 11.01.A for definition.

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. The General Requirements pertain to all sections 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 in connection with the Work.

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 Conditions 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 pound s 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. Related Entity — An officer, director, partner, employee, agent, consultant, or subcontractor.

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

38. 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.

39. 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.

40. 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.

41. 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.

42. 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.

43. 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.

44. 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.

45. 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.

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

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

48. Supplier — A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. 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.

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

51. 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 City of Cleveland.

52. 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 following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following 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 requirements of and information in the Contract Documents and conformance with the design concept of the completed 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 work "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, 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.

5. Unless stated otherwise in the Contract Documents, words or phrases which 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 th 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

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.

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 therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to 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 may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended 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 Article9.

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, or Engineer, or any of, their Related Entities, 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 may discover 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 any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, 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 knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be other wise 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, code, or instruction (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 or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, 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 Engineer's consultants, including electronic media editions; or

2. reuse any of 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 adaption by Engineer.

B. The prohibition 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. Copies of data furnished by Owner or Engineer to Contractor or 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 test 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 therefor 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 of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the general 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 Related Entities 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 at or contiguous to the Site 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 6.16A), 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 therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities 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.

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; 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 al l 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 the 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 therefor 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: Reference is made to the Supplementary Conditions for the identification of those

reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the general 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 Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspect 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 our 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.

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 to Contractor written notice: (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 therefor 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 part may make a Claim therefor 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, 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 extend permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractor 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 Paragraph 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 current 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 must be accompanied by a certified copy of the agent's authority to act.

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 Paragraph 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 coverages 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 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 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.

5.04 Contractor's Liability Insurance

A. Contractor shall purchase and maintain such liability and other 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 therefrom; 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 Paragraph 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (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, 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 coverages 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 completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraph 6.11 and 6.20;

5. contains 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);

6. 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

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

a. 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, 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 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 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 Lump Sum, water damage, (other than 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 additional insured to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such boiler and machinery 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, 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 an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with 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 additional insured 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 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 in writing advise Contractor 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 to be listed as insureds or additional insureds (and the officers, directors, 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 additional insureds thereunder. Owner and Contractor waive al rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses 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 to be listed as insured or additional insured (and the officers, directors, 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, 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 Supplementary Conditions 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, 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 insureds, 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 s 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 and 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. The

superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

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-Equal"

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,

3) it has a proven record of performance and availability of responsive service; and

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 that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. 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 in 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 or not 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 or not 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;

4) and 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 Paragraph 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 either a Change Order for a substitute or 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 Paragraph 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall also reimburse Owner for the 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 Subcontractors, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractors, Supplier, or other individual or entity, nor

2. shall anything in the Contract Documents 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 finishing 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 Subcontractors or Supplier which specifically binds the Subcontractors 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 Subcontractors or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractors or Supplier will contain provisions whereby the Subcontractors or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, 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 Subcontractors 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, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, 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 primary 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 therefor 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, 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 Engineer, 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. 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. 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).

D. 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 acceptable 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: Contractor shall also submit s\Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

    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 Drawings or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have 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.

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 Drawing's 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. 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 Drawings 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 Related Entities 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 Drawings 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, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, and 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 respective consultants, agents officers, directors, partners, or employees 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 performs 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, 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 via other direct contracts therefor, 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 therefor 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, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall 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 their work and will

only cut or alter their 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.

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. Paragraph 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 actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's 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 Paragraph 14.02.C and 14.07.C.

8.05 Lands and Easements; Reports and Tests

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraph 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 in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 Insurance

A. Owner's responsibilities, if any, in 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 in 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 i Paragraph 4.06.

8.11 Evidence of Financial Arrangements

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

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 and will not be changed without written consent of Owner and Engineer.

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 o or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor 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 thereunder. 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 believe 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, and 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 Subcontractors, 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.

ARTICLE 10 -CHANGES IN THE WORK; CLAIMS

10.01 Authorized Changes in the Work

A. Without invalidating the Contractor 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 Work Change

Directive, a Claim may be made therefor 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.B.

10.03 Execution of Change Order

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 notice 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) is required by the provisions of any bond to be given to a surety, 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 Time 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 Paragraph 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. Cost 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 include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

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 at the Site. 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 subcontractor 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 Engineer, 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, 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, expresses, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is 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 (or 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. Cost due to the negligence of Contractor, any Subcontractors, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

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

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 Paragraph 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 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 Contractor 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 manually 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 Paragraph 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent.

b. for cost 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 Paragraph 12.01.C.2.a 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 Paragraph 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 Paragraph 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 Paragraph 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 Contractor 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 therefor 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 the Related Entities of each of them 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. All 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, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site 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 Paragraph 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 said 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, it must, if requested by Engineer, be uncovered 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 therefor 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 therefor 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 Subcontractors, 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 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 damages to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency

where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. 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 therefrom) 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 cost to be approved by Engineer as to reasonableness) and 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 therefor 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 provisions 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 therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not 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 Application 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 on the Site 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, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to 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. that 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 Paragraph 14.02.B.5.a through 14.02B.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 corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined 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.

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 therefor.

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 therefor. 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 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 will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion 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 completions. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 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 procedures 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.7;

   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 al 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 or Owner's property might in any way be responsible 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 I've 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' 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 Contractor, 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 therefor 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 disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

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 Paragraph 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 Paragraph 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 the 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 Paragraph 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 their 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.

SUPPLEMENTARY CONDITIONS

TABLE OF CONTENTS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. C-700, 2001 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.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

See the Attached ADEM Supplementary Conditions

SC-4.02 SUBSURFACE AND PHYSICAL CONDITIONS

Delete Paragraphs 4.02.A and 4.02 B in the General Conditions in their entirety and insert the following:

A. Subsurface and Physical Conditions

B. No reports of explorations or tests of subsurface conditions at or contiguous to the Site are known to the Owner or Engineer.

SC-5.03 CERTIFICATES OF INSURANCE

Add the following new paragraphs immediately after Paragraph 5.03.B in the General Conditions:

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

D. Workmen's Compensation and Employer's Liability Insurance shall be in strict accordance with the requirements of the current and applicable Workmen's Compensation Laws of the State of Alabama. The insurance shall cover all of the Contractors employees employed or associated with the project; and where any part of the work is subcontracted, the Contractor shall require Subcontractor to provide similar Workmen's Compensation and Employer's Liability Insurance for all employees of the Subcontractor unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work under this Contractor is not protected under the Workmen's Compensation Statute the Contractor shall provide, and shall cause such Subcontractor to provide, adequate coverage for the protection of all employees on the project not otherwise protected under applicable provisions of the Statues relating to Workmen's Compensation and Employer's Liability Insurance. The minimum limits of coverage shall be as follows:

(1) State of Alabama	Statutory
(2) Applicable Federal	Statutory
(3) Employer's Liability	$500,000
(4) Benefits required by union labor contracts	As applicable
(5) Voluntary Compensation	$500,000
(6) Broad Form All States Endorsement	

E. Comprehensive General Liability Insurance shall protect the Contractor and any Subcontractors performing work under this Contract from any claims for bodily injury, for sickness or disease, for death, for personal injury, and for property damages which may rise either directly or indirectly out of, or in connection with, the performance of work under this Contract. The Comprehensive General Liability Insurance Coverage shall include: Premises - Operations; Independent Contractor's Protective; Broad Form Property Damage and Fellow Employee Coverage. The minimum limits of coverage shall be as follows:

(1)	Bodily Injury	$1,000,000 Each Occurrence $1,000,000 Annual Aggregate
(2)	Property Damage	$1,000,000 Each Occurrence $1,000,000 Annual Aggregate
(3)	Property Damage Liability shall provide Explosion, Collapse or Underground coverage as applicable.	

F. Contractual Liability
Minimum limits of coverage shall be as follows:

(1)	Bodily Injury	$1,000,000 Each Occurrence
(2)	Property Damage	$1,000,000 Each Occurrence
		$1,000,000 Annual Aggregate

G. Personal Injury (with Employment Exclusion deleted).
The minimum limits of coverage shall be as follows:

Annual Aggregate	$1,000,000

H. Comprehensive Automobile Liability Insurance (Owner, Non-Owned, Hired) shall protect Contractor and any Subcontractor performing work under this Contract from any claims for bodily injury, for death, and for property damages which may arise either directly or indirectly out of, or in connection with, the performance of work under this Contract. The minimum limits of coverage shall be as follows:

Combined Single Limits for Bodily Injury and Property Damage.

(1) Bodily Injury	$1,000,000 Each Occurrence
(2) Property Damage	$1,000,000 Each Occurrence

I. Aircraft Liability (Owned and Non-Owned), when applicable. The minimum limits of coverage shall be as follows:

Combined Single Limits for Bodily Injury and Property Damage.

(1) Admitted Liability	$100,000 Per Seat
(2) Bodily Injury	$1,000,000 Each Occurrence
(3) Property Damage	$1,000,000 Each Occurrence

J. Umbrella Excess Liability over Primary Insurance The minimum limits of coverage shall be as follows:

Each Occurrence	$10,000,000
Aggregate	$10,000,000

SC-5.06 PROPERTY INSURANCE

Delete Paragraph 5.06.A in the 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.

1) This insurance shall:

a. include the interests of Owner, Contractor, Subcontractors, Engineer and any other individuals or entities identified herein, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

b. in addition to the individuals and entities specified, include as additional insureds, the following:

c. 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 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;

d. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

e. 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;

f. allow for partial utilization of the Work by Owner;

g. include testing and startup; and

h. 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 additional insured to whom a certificate of insurance has been issued.

2) Contractor shall be responsible for any deductible or self-insured retention.

3) The policies of insurance required to be purchased and maintained by Contractor in accordance with this Paragraph SC-5.06.A shall comply with the requirements of paragraph 5.06.C of the General Conditions.

Delete paragraph 5.06.B in the General Conditions in its entirety.

Delete paragraph 5.06.E in the General Conditions in its entirety.

SC-5.08 RECEIPT AND APPLICATION OF INSURANCE PROCEEDS

Receipt and Application of Proceeds shall be modified by replacing Owner with Contractor in Paragraphs A & B in the General Conditions.

SC-6.09 LAWS AND REGULATIONS

Add the following new paragraphs immediately after Paragraph 6.09.C in the Supplementary Conditions:

D. The attention of bidders is called to provisions of State Law Governing General Contractors, as set forth in Sections 34-8-1 to 34-8-24, inclusive, Code of Alabama 1975, as amended; and bidders shall be governed by said law insofar as it is applicable. The above mentioned provisions of the Code make it illegal for the Owner to consider a Bid from anyone who is not properly licensed under such code provisions. The Owner, therefore, will not consider any bid unless the bidder produces evidence that he is so licensed. Neither will the Owner enter into a Contract with a foreign corporation which is not qualified under State Law to do business in the State of Alabama.

E. The attention of bidders not resident in the State of Alabama is called to the provisions of Alabama Law, Act No. 84-227, requiring every nonresident contractor, as defined in Section 39-2-14, Code of Alabama 1975, as amended, to register with the Department of Revenue prior to engaging in the performance of a Contract in the State of Alabama, and to deposit with the Department of Revenue an amount, or approved corporate surety bond in lieu thereof, equal to five percentum (5%) of the amount such contractor is to receive for performance of the contract, such amount or bond to be held pending completion of the contract and the payment of taxes due the State and the governmental bodies.

F. The attention of nonresident bidders is called to the provisions of Alabama Law, Section 39-3-5, Code of Alabama 1975, as amended, relating to preference to be given to resident contractors in Alabama over nonresident contractors in the award of contracts in the same manner and to the same extent as provided by the laws of the state of domicile of the nonresident contractor, and to the requirement that the bid documents tendered by any nonresident contractor must be accompanied by "a written opinion of an attorney-at-law licensed to practice law in such nonresident contractor's state of domicile as to the preference, if any or none, granted by the law of that state to its own business entities whose principal places of business are in the state in the letting of any or all public contracts" (sic).

SC-6.17 SHOP DRAWINGS AND SAMPLES

Add the following new paragraphs immediately after Paragraph 6.17.E in the General Conditions:

F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring approval and Contractor shall reimburse Owner for Engineer' charges for such time.

G. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time unless the need for such substitution is beyond the control of Contractor.

SC-11.01 COST OF THE WORK

Delete Paragraph 11.01.A.5.c in the General Conditions in its entirety and insert the following in its place:

c. Construction Equipment and Machinery

1. Rentals of all construction equipment and machinery, and the parts thereof 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.

2. Costs for equipment and machinery owned by Contractor will be paid at a rate shown for such equipment in the [Use rate book appropriate for the Project]. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. Costs will include the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, shall cease to accrue when the use thereof is no longer necessary for the changed Work. Equipment or machinery with a value of less than $1,000 will be considered small tools.

SC-16.01 DISPUTE RESOLUTION

Delete Paragraph 16.01 in the General Conditions in its entirety and insert the following in its place:
16.01 MEET TO CONFER AND NEGOTIATE

A. Engineer's action under Paragraph10.05.C or a denial pursuant to Paragraphs10.05.C.3 or 10.05.D shall become final and binding 30 days after receipt of written notice of Engineer's action or decision unless, within that time period, Owner or Contractor gives to the other party written notice of intent to submit the Claim to a process of bilateral negotiations as set forth below.

B. Within 30 days of the delivery of such notice, Owner and Contractor shall meet and confer regarding

the Claim. A good-faith effort to negotiate resolution shall be made by both parties.

C. If the negotiations contemplated by Paragraph SC-16.01.B are unsuccessful, management representatives of Owner and Contractor at least one tier above the individuals who met under SC-16.01.B shall meet, confer, and negotiate within 30 days of the closure of the unsuccessful negotiations.

D. If the Claim is not resolved by negotiation, 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 negotiations unless, within that time period, Owner or Contractor:

1) gives to the other party written notice of intent to submit the Claim to a court of competent jurisdiction, or

2) agrees with the other party to submit the Claim to another dispute resolution process.

E. Notwithstanding any applicable statute of limitations, a party giving notice under Paragraph SC-16.01.D.1 shall commence an action on the Claim within one year of giving such notice. Failure to do so shall result in the Claim being time-barred and Engineer's action or denial shall become final and binding.

V. ADDITIONAL COMMENTS

A. Equal Employment Opportunity

1) The Contractor will be required to comply with the Equal Employment Opportunity provisions of Executive Order 11246, as amended, and regulations of 41 CFR Part 60-4 on all Federally Assisted Contracts in excess of $10,000.00. The statement required by this provision shall be included in the bid proposal and shall be returned with your executed contract.

B. Erosion and Sediment Control

1) The Contractor shall meet all applicable codes, rules, and regulations for erosion and sediment control. The erosion, sediment and pollution control measures in these Specifications shall be taken as minimum requirements.

2) Contractor shall provide and maintain silt barriers and siltation ponds. Due to this project's location near several creeks and rivers the Contractor shall not allow any mud, silt or construction debris from the construction site to enter said creeks and rivers.

a. The Contractor shall furnish all silt fences, hay bales, etc., around the construction site.

b. The Contractor shall apply for an NPDES Storm Water Permit. No construction shall take place prior to providing the Engineer with an executed copy of the NPDES Permit.

C. Traffic Control And Access

1) All traffic control shall be in accordance with the National Manual on Uniform Traffic Control Devices. Contractor shall be responsible for all traffic control and required signage.

2) Business access shall be allowed at all times but may be restricted to pedestrians, if required. Affected businesses shall be notified by the Contractor in writing at least three (3) weeks prior to traffic interruption.

3) Homeowner access to driveways shall be provided in the morning and evening. No exceptions.

D. Utilities

1) Utilities may be interrupted during daylight hours only with one week minimum notice to

homeowners. All utilities shall be in service at the end of each workday. No exceptions.

E. Endangered Species

1) The United States Department of the Interior, Fish and Wildlife Service, Daphne, Alabama, has identified the flattened musk turtle as a listed endangered species that may be present on the jobsite. The Black Warrior Waterdog, a species proposed as endangered may also be present.

2) Water quality is vital to the survival of these species and the Contractor shall prevent siltation of area streams.

a. The Contractor will endeavor to cooperate with Fish and Wildlife to ensure species protection and minimize risk for endangered species.

b. The Contractor shall comply with the Endangered Species Act.

F. Minority Business Enterprise (MBE) Women's Business Enterprise (WBE)

1) The DWSRF program requires all projects to comply with:
   a. Civil Rights Act of 1964 & 1990
   b. Executive Order 11246 (Equal Employment Opportunity)
   c. Executive Order 11625 and 12138 (MBE/WBE)

2) In compliance with the Federal regulations governing the DWSRF program, the State has negotiated a MBE/WBE "fair share" objective of: 3.1% MBE participation + 2.4% WBE participation.

3) These "fair share" objectives are required to be stated in the loan agreement and in the project specifications (DWARF Supplemental Special Conditions; "pink" specifications package.

4) The State will require the loan recipient to take affirmative steps to assure MBE/WBE's are utilized when possible as sources of supplies, construction and services.

5) The affirmative steps required for procurement of MBE/WBE's are as follows:
   a. Include qualified MBE/WBE's on solicitation lists.
   b. Assure that MBE/WBE's are solicited whenever they are potential sources.
   c. Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of MBE/WBE's.
   d. Using the services and assistance of:
      (1) the Office of Small and Minority Business Assistance in the Alabama Development Office
      (2) the Minority Business Development Centers
      (3) the Alabama Department of Transportation (DOT) for MBE/WBE's
   e. Establishing delivery schedules, where the requirements of the work permit, which will encourage participation of MBE/WBE's
   f. Requiring each contractor to take the affirmative steps of items 1-5 above in procuring subcontractors
   g. The State will review the loan recipient's progress in complying with the ME/WBE participation goals as an integral part of:
      (1) Plans and Specifications review process (inclusion of DWARF Supplemental Special Conditions in construction specifications)
      (2) the Project Review and Cost Summary/Approval-to-Award process relative to construction contracts, and
      (3) the MBE/WBE utilization reporting process during construction

G. Implementation of 6 Affirmative Steps to Attain "Fair Share" Goals

1) Include qualified MBE/WBE's on solicitation lists.

a. Maintain and update a listing of qualified MBE/WBE's that can be solicited for supplies, construction and/or services.

b. Provide this listing to all interested parties who requested to be placed on the bidder's mailing list or requested copies of bid or proposal documents.

c. Contact sources within geographic area of project to identify qualified MBE/WBE's for placement on MBE/WBE list.

d. Check for other MBE/WBE listings such as those utilized by the State Minority Business Office, the Small Business Administration, Minority Business Development Office, EPA Region IV Office of Small and Disadvantaged Business Utilization (OSBDU), or the Alabama Department of Transportation.

2) Assure that MBE/WBE's are solicited whenever they are potential sources.

a. Conduct meetings, conferences and follow-ups with MBE/WBE's, small, minority and/or women's business associations, minority media etc., to inform these groups of opportunities to provide supplies, services and construction.

b. Conduct pre-bid, pre-solicitation and post-award conferences to ensure that consultants, suppliers and builders solicit MBE/WBE's.

c. Provide bidders with listings of qualified MBE/WBE's and establish that a fair share of subagreements be awarded.

d. Advertise in general circulation, trade publications, State agency publications of identified MBE/WBE's, minority or women's business focused media, etc., concerning contracting opportunities on your projects. Maintain a list of minority or women's business focused publications that may be used to solicit MBE/WBE's.

e. Provide interested MBE/WBE's with adequate information about plans, specifications and other requirements of the proposed projects.

f. Provide interested MBE/WBE trade organizations with summaries of bid solicitations.

g. Consider notifying MBE/WBE's of future procurement opportunities so that they may establish bidding solicitations and procurement plans.

3) Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of MBE/WBE's.

a. Perform an analysis to identify portions of work that can be divided and performed by qualified MBE/WBE's.

b. Scrutinize the elements of the total project to develop economically feasible units of work that are within the bonding range of MBE/WBEs.

c. Analyze bid packages to afford MBE/WBEs maximum participation.

4) Use the appropriate services and assistance of:

a. the Office of Small and Minority Business Assistance in the Alabama Development Office
b. the Minority Business Development Centers
c. the Alabama Department of Transportation (for WBEs)
d. the Small Business Association

5) Establish delivery schedules, within the requirements of the work permit, which will encourage participation of MBE/WBEs.

a. Consider lead times and scheduling requirements often needed by MBE/WBE firms.

b. Develop realistic delivery schedules, which may provide for greater MBE/WBE participation.

c. Require each contractor to take the affirmative steps of items 1-5 above in procuring subcontractors.

6) Use the services of outreach programs sponsored by the Minority Business Development Agency and/or the Small Business Association to recruit bona fide firms for placement on MBE/WBE bidder's lists

and to assist these firms in the development of bid packaging.

7) Seek out Minority Business Development Centers (MBDCs) to assist you in identifying MBE/WBEs for potential work opportunities on your projects.

8) MBE/WBE Contacts

City of Birmingham
Office of Economic Development
Attn: Andrew Mayo
Economic Specialist
710 20th Street North
Birmingham, Alabama 35203
(205) 254-2799
(205) 254-7741 FAX
ajmayo@ci.birmingham.al.us

U. S. Small Business Administration
http://www.pronet.sba.gov

National Association of Minority Contractors (NAMC)
http://www.namc-atl.org

Alabama Department of Transportation
ATTN: John Huffman
1409 Coliseum Boulevard
Montgomery, Alabama 36130
334-244-6261
http://www.dot.state.al.us

U.S. Department of Commerce
Minority Business Development Agency
401 West Peachtree Street NW - Suite 1715
Atlanta, Georgia 30308
(404) 730-3300
(404) 730-3313 FAX
http://www.mbda.gov/

Governor's Office of Minority and Women's Business Enterprises
401 Adams Avenue
Suite 360
Montgomery, Alabama 36130
1-800-447-4191
(334) 242-2220
(334) 242-4203 FAX

Birmingham Construction Industrial Authority
Attn: Rhonsha Walker or Kimberly Bivins
3600 4th Avenue South
Birmingham, Alabama 35222
(205) 324-6202
(205) 324-6210 FAX
http://www.BCIA1.org

"General Decision Number: AL20250069 01/03/2025

Superseded General Decision Number: AL20240069

State: Alabama

Construction Type: Heavy
Including Water and Sewer Line Construction

Counties: Chambers, Cherokee, Clay, Cleburne, Coosa, Jackson, Randolph, Talladega and Tallapoosa Counties in Alabama.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be

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

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025

ENGI0312-009 09/01/2023

	Rates	Fringes
Operating Engineers:		
Crane and Cherry Picker	$ 31.52	13.98
Oiler	$ 28.45	13.98

Cranes with 100 ft. or more boom receive $0.25 extra per hour,
Cranes with 200 ft. or more boom receive $0.50 extra per hour,
Cranes with 350 ft. or more boom recieve $1.10 extra per hour,
Cranes with 500 ft. or more boom receive $1.45 extra per hour,
Tower Cranes, Derricks, Climbing Cranes, Ringer Cranes shall receive $0.35 in addition to A-rate and boom pay per hour

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SUAL2007-154 11/28/2007

	Rates		Fringes
ELECTRICIAN	$ 15.96	**	3.57
LABORER: Common or General	$ 8.54	**	0.00
LABORER: Pipelayer	$ 10.13	**	0.00
OPERATOR: Backhoe	$ 13.46	**	0.00
OPERATOR: Bulldozer	$ 16.60	**	2.64
OPERATOR: Drill	$ 9.50	**	2.36
OPERATOR: Grader/Blade	$ 12.59	**	1.33
OPERATOR: Loader (Front End)	$ 11.67	**	0.00

OPERATOR: Roller	$ 9.45 **		0.00
OPERATOR: Scraper	$ 9.78 **		0.18
OPERATOR: Trackhoe	$ 12.00 **		0.00
TRUCK DRIVER	$ 15.70 **		5.86

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.75) or 13658 ($13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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

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

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by

computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

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

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

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

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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

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

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

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

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END OF GENERAL DECISION"

State of Alabama
Alabama Department of Environmental Management
State Revolving Fund (SRF) Loan Program

SRF Section
Permits and Services Division
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

(334) 271-7793
(334) 271-7950 FAX

Supplemental General Conditions

for SRF Assisted

Public Drinking Water and Wastewater
Facilities Construction Contracts

Clean Water
State Revolving Fund

Protect Our Health from Source to Tap
Drinking Water State Revolving Fund

SRF Project Number: CS010403-05

Table of Contents:

I – ADEM Special Conditions

1. Construction within State rights-of-way shall be in accordance with the Alabama Department of Transportation policies and procedures.

2. Construction is to be carried out in compliance with applicable NPDES permits and in a manner that prevents bypassing of raw wastewater flows during construction. If bypassing is anticipated, the ADEM NPDES Enforcement Branch (334-271-7975) shall be advised in advance and the contractor shall take all necessary steps to minimize the impacts of bypassing.

3. Siltation and soil erosion shall be minimized during construction. The contractor shall obtain an NPDES storm water permit for construction if required.

4. The owner shall provide and maintain competent and adequate supervision and inspection.

5. ADEM and EPA shall have access to the site and the project work at all times.

6. These Special Conditions shall supersede any conflicting provisions of this contract.

7. **A project sign is required.** See **Parts XVII and XVIII, pages SGC-36 – SGC-37**, for more information.

II – Bonds and Insurance

Bonding requirements shall comply with Alabama Act No. 97-225. Provisions of the Act are summarized below:

1. Bid Bond – Not less than 5% of either the owner's estimated cost or of the proposed prime contractor's bid up to a maximum of $10,000. The bid guarantee shall consist of a cashier's check drawn on an Alabama bank or a bid bond executed by a surety company duly authorized and qualified to make bonds in the State of Alabama.

2. Performance Bond – In an amount not less than 100% of the contract price.

3. Payment Bond – Payable to the awarding authority, shall be executed in an amount not less than 50% of the contract price.

In addition to the insurance requirements elsewhere in the specifications, the owner or the contractor, as appropriate, must acquire any flood insurance made available by the Federal Emergency Management Agency as required by 40 CFR 30.600 (b), if construction will take place in a flood hazard area identified by the Federal Emergency Management Agency.

III – Utilization of Disadvantaged Businesses Enterprises (DBEs)

It is the policy of the State Revolving Loan Fund (SRF) to promote a "fair share" of sub-agreement awards to **small, minority, and/or women-owned businesses** for equipment, supplies, construction, and services. Compliance with these contract provisions is required in order for project costs to be eligible for SRF funding. *The "fair share" objective is a goal, not a quota.* DBE (Disadvantaged Business Enterprise) is an all-inclusive business classification, which includes MBE (minority business enterprises and/or WBE (women business enterprises) and is used synonymously when these entities are referenced individually or collectively.

Failure on the part of the apparent successful bidder to submit required information to the Loan Recipient (Owner) may be considered (by the Loan Recipient (Owner)) in evaluating whether the bidder is responsive to the bid requirements. The project objectives for utilization of Minority Business Enterprises (MBEs) and Women's Business Enterprises (WBEs) are as follows:

Commodities (Supplies)	MBE 4%	WBE 11%
Contractual (Services)	MBE 8%	WBE 30%
Equipment	MBE 5%	WBE 20%
Construction	MBE 2.5%	WBE 3%

For purposes of clarification:

- This objective applies to any Federally assisted procurement agreement in excess of $10,000.
- This objective necessitates three responsibilities; separate solicitations must be made of small and minority and women's business enterprises.
- A minority business is a business, at least 51 percent of which is owned and controlled by minority group members (Black; Hispanic; Asian American; American Indian; and, any other designations approved by the Office of Management and Budget).
- A women's business is a business, at least 51 percent of which is owned and controlled by one or more women.
- The control determination will revolve around the minority or woman owner's involvement in the day-to-day management of the business enterprise.
- Solicitation should allow adequate time for price analysis. ADEM recommends that contact be made no later than 15 days before bid opening.
- Efforts taken to comply with this objective must be documented in detail; maintain records of firms contacted, including any negotiation efforts to reach competitive price levels, and awards to the designated firms.
- ADEM recommends that the Loan Recipient (Owner) or proposed Prime Contractor utilizes the services of the Minority Business Development Service Centers. These Centers are funded by the U.S. Department of Commerce to provide technical, financial and contracting assistance to minority and women's business enterprises. These Centers are located in a number of Regional cities.
- Use of the services provided by these Centers does not absolve the Loan Recipient (Owner) or proposed Prime Contractor from pursuing additional efforts to meet this objective.

IV – Six Affirmative Steps for Good Faith DBE (MBE-WBE) Solicitation

The Loan Recipient (Owner) shall follow the six affirmative steps found in the SRF application when using loan funds to procure sources of supplies, construction and services.

If the successful bidder plans to subcontract a portion of the project, the bidder must submit to the owner within 10 days after bid opening, evidence of the affirmative steps taken to utilize small, minority and women's businesses. These six affirmative steps or ‘good faith efforts’ are required methods to ensure that DBEs have the opportunity to compete for procurements funded by EPA financial assistance dollars. Such affirmative steps are described as follows:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. This will include placing DBEs on solicitation lists and soliciting them whenever there are potential sources.

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

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

5. Use the resources, services, and assistance of the AL Department of Transportation (ALDOT), Small Business Administration (SBA), and the Minority Business Development Agency of the Department of Commerce (MBDA).

6. If the Contractor awards subcontracts, it must take the steps described in items (1) through (5) listed above.

V – Documentation Required from Loan Recipient (Owner) and Contractor

The low, responsive, responsible bidder must forward the following items, in duplicate, to the loan recipient (owner) no later than 10 days after bid opening. The Loan Recipient (Owner) shall transmit one (1) copy of its DBE documentation of the prime contractor solicitation and one (1) copy of the prime contractor's/bidder's DBE documentation of all subcontractor solicitation to the SRF Section within 14 days after bid opening.

1. SRF project number and project name/loan name*. (*not contract name)

2. List of **all** subcontractors (DBE **and** non-DBE) with name, address, telephone number, estimated contract dollar amount and duration. If there are to be no subcontractors, please indicate such in a letter on company letterhead.

3. List of any subcontract work yet to be committed with estimate of dollar amount and duration of contract.

4. MBE-WBE (DBE) Documents - See **Part V, page SGC-6**.

5. Debarred Firms Certification – See **Part XIV, page SGC-25**.

6. Certification Regarding Equal Employment Opportunity – See **Part XIII, page SGC-24.**

The Loan Recipient (Owner) shall submit annual MBE/WBE Utilization Reports (EPA Form 5700-52A, **pages SGC-16 - SGC-17**) within 30 days of the end of the annual reporting period **(October 30th, i.e. by November 30th)**. Submit reports directly to:

Laketa Ross, Accountant
Administrative Section
Fiscal Branch
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

The proposed Prime Contractor must submit the following items to the Loan Recipient (Owner):

1) DBE Compliance Form. The Loan Recipient (Owner) must submit this information to the SRF Section to demonstratecompliance with the DBE requirements. ADEM's approval is required prior to award of the construction contract and commencement of any SRF-funded construction. **(Page SGC-8)**

2) Certification Regarding Equal Employment Opportunity. This form is required of the proposed prime contractor(re: all subcontracts executed) and should be submitted with the prime proposed contractor's MBE-WBE solicitation submittal to the Loan Recipient (Owner). (**Page SGC-24**)

3) Debarred Firms Certification. This form is required of the proposed prime contractor (re: all subcontracts executed) and should be submitted with the prime proposed contractor's MBE-WBE solicitation submittal to the Loan Recipient (Owner). (**Page SGC-25**)

4) EPA Form 6100-2 DBE Subcontractor Participation Form. This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the proposed prime contractor, how much the DBE subcontractor was paid, and any other concerns the DBE subcontractor might have. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-10)**

5) EPA Form 6100-3 DBE Subcontractor Performance Form. This form captures an intended DBE subcontractor's description of work to be performed for the proposed prime contractor and the price of the work. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-12)**

6) EPA Form 6100-4 DBE Subcontractor Utilization Form. This form captures the proposed prime contractor's intended use of all identified DBE subcontractors and the estimated dollar amount of the work. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-14)**

7) EPA Form 5700-52 A MBE/WBE Utilization Reports (DBE Annual Report), if applicable. The Loan Recipient (Owner) must submit this information to the SRF Section within 30 days of the end of the annual reporting period (October 30th), i.e., **by November 30th)**. **(Pages SGC-16 - SGC-17)**

8) Changes to Approved DBE Compliance Form, if applicable. If any changes, substitutions, or additions are proposed to the subcontractors included in previous Department approvals, the Owner must submit this information to the Department for prior approval in order for the affected subcontract work to be eligible for SRF funding. **(Page SGC-23)**

9) Certified Payrolls. These should be submitted to the Loan Recipient (Owner), at least, monthly for the prime contractor and all subcontractors. The Loan Recipient (Owner) must maintain payroll records and make these available for inspection

Please note that DBEs, MBEs, and WBEs must be certified **in writing** by EPA, SBA, or DOT (or by state, local, Tribal, or private entities whose certification criteria match EPA's). Depending upon the certifying agency, a DBE may be classified as a Disadvantaged Business Enterprise (DBE), a Minority Business Enterprise (MBE), or a Women's Business Enterprise (WBE). Written certification as a DBE (MBE or WBE) is required in order to be counted toward the Loan Recipient/Owner's MBE-WBE accomplishments.

The documentation of these good faith solicitation efforts must be detailed in order to allow for satisfactory review. Such documentation might include fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The proposed prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with, at least, 1 logged phone call.

The proposed prime contractor must employ the six affirmative steps to subcontract with DBEs, even if the proposed prime contractor has achieved its fair share objectives.

The prime contractor must employ the six affirmative steps to subcontract with DBEs, even if the proposed prime contractor has achieved its fair share objectives. If a DBE subcontractor fails to complete work under the subcontract for any reason, the proposed prime contractor must notify the Loan Recipient (Owner) in writing prior to any termination and must employ the six 'good faith efforts' described above if using a replacement subcontractor. Any proposed changes from an approved DBE subcontractor must be reported to the Loan Recipient (Owner) and to the SRF Section on the Changes to Approved Subcontractors Form prior to initiation of the action. EPA Forms Nos. 6100-3 and 6100-4 must also be submitted to the SRF Section for new DBE subcontracts.

VI – Resources for Identifying MBE-WBE (DBE) Contractors/Subcontractors

The following organizations may provide assistance in soliciting DBE participation:

City of Birmingham
Office of Economic Development
ATTN: **Monique Shorts**, Economic Specialist
710 20th Street North
Birmingham, Alabama 35203
Ph: (205) 254-2799
Fax: (205) 254-7741
Monique.shorts@birmingham.gov

U.S. Small Business Administration
http://www.pro-net.sba.gov

National Association of Minority Contractors (NAMC)
https://namcatlanta.org/

Alabama Department of Transportation
ATTN: **John Huffman**
1409 Coliseum Boulevard
Montgomery, Alabama 36130
Ph: (334) 244-6261
http://www.dot.state.al.us

U.S. Department of Commerce
Minority Business Development Agency
ATTN: **Donna Ennis**
75 5th Street NW,
Suite 300
Atlanta, Georgia 30308
Ph: (404) 894-2096
http://www.mbda.gov/

Governor's Office of Minority and Women's Business Enterprises
Hilda Lockhart, STEP Project Director
401 Adams Avenue
Suite 360
Montgomery, Alabama 36130
Ph: (334) 242-2220

Birmingham Construction Industrial Authority ATTN: **Ashley Orl** or **Kimberly Bivins**
601 37th Street South
Birmingham, Alabama 35222
Ph: (205) 324-6202
aorl@bcia1.org
kbaylorbivins@bcia1.org

NOTE:

(1) The Loan Recipient (Owner) and the proposed Prime Contractor shall use the necessary resources to identify and directly solicit no less than three (3) certified DBE/MBE/WBE companies to bid in each expected contract/subcontract area. If a diligent and documented search of ALDOT, SBA, and MBDA directories does not identify three (3) potential certified DBE/MBE/WBE firms, then the proposed Prime Contractor shall post an advertisement in, at least, one (1) of the other online or print resources. Whenever possible, post solicitation for bids or proposals should be posted/advertised for a minimum of 30 calendar days before the bid or proposal closing date.

(2) Expenditures to a DBE that acts merely as a broker or passive conduit of funds, without performing, managing, or supervising the work of its subcontract in a manner consistent with normal business practices may not be counted.

(3) The proposed Prime Contractor should attempt to identify and first solicit DBEs in the geographic proximity of the project before soliciting those located farther away.

(4) In addition, our SRF DBE Compliance Staff is readily available for assistance, as follows: Laketa Ross at (334) 271-7727 or laketa.ross@adem.alabama.gov OR Diane Lockwood (DBE Coordinator) at (334) 271-7815 or dpl@adem.alabama.gov.

VII – DBE Compliance Form

NOTE: FOR DBE COMPLIANCE, ONE (1) COPY OF THIS FORM (WITH ALL INFORMATION OUTLINED) IS REQUIRED (WITH THE LOAN RECIPIENT (OWNER)'S DBE SUBMITTAL) FOR EACH PR&CS REVIEW. THE LOAN RECIPIENT (OWNER) AND PROPOSED PRIME CONTRACTOR SHOULD ENSURE THAT THIS INFORMATION IS COMPLETE *PRIOR TO THE PR&CS SUBMITTAL TO THE SRF SECTION*.

Loan Recipient: _____ SRF Loan (Project) Number: _____

CERTIFICATIONS:

I certify that the information submitted on and with this form is true and accurate and that this company has met and will continue to meet the conditions of this construction contract regarding DBE solicitation and utilization. I further certify that criteria used in selecting subcontractors and suppliers were applied equally to all potential participants and that EPA Forms 6100-2 and 6100-3 were distributed to all DBE subcontractors.

_____ Date 3/28/2025

(Proposed Prime Contractor Signature)

Aaron B. Schmidt, President

(Printed Name and Title)

I certify that I have reviewed the information submitted on and with this form and that it meets the requirements of the Loan Recipient's/Owner's State Revolving Fund loan contract.

(Only ONE (1) signature required below.)**

_____ Date_____

(Signature of Loan Recipient (Owner))

OR**

_____ Date_____

(Loan Recipient's (Owner's) Representative's Signature, (**P.E.**))

_____

(Printed Name and Title)

GENERAL INFORMATION:

Loan Recipient (Owner) Contact: _____

Loan Recipient (Owner) Phone Number/Email: _____

Consulting Engineer Contact: Dave Bechtel

Consulting Engineer Phone Number/Email: (205) 951-3838 / dbechtel@uecllc.com

Proposed Prime Contractor: Schmidt Environmental Construction, Inc.

Proposed Prime Contractor Contact: Jackie Smith

Proposed Prime Contractor Phone Number/Email: 334-887-0334 jackie@schmidteci.com

Proposed Prime Contract Amount: $ 1,972,900.00

Proposed Total DBE/MBE Participation: $ 0 Percentage: 0 % Goal: 2.5%

Proposed Total WBE Participation: $ 0 Percentage: 0 % Goal: 3.0%

_____

Please ensure the following is submitted in the *full* DBE submittal (with the DBE COMPLIANCE FORM (page SGC-8)):

(1) **List of all committed and uncommitted subcontractors** by trade, including company name, address, telephone number, contact person, dollar amount of subcontract, and DBE/MBE/WBE status. Indicate in writing if no solicitations were made because the contractor intends to use only its own forces to accomplish the work.

(2) **Proof of certification (certificate or letter)** by EPA, SBA, DOT (or by state, local, Tribal, or private entities whose certification criteria match EPA's) for each subcontractor listed as a DBE, MBE, or WBE.

(3) **Documentation of solicitation effort for prospective DBE firms**, such as fax confirmation sheets, copies of solicitation letters/emails, printout of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with at least 1 logged phone call. Whenever possible, post solicitation for bids or proposals should be for a minimum of 30 calendar days before the bid or proposal closing date.

(4) **Justification for not selecting a certified DBE subcontractor** that submitted a low bid for any subcontract area.

(5) **Certification By Proposed Prime Contractor or Subcontractor Regarding Equal Opportunity Employment. (Page SGC-24**)

(6) **Debarred Firms Certification**. (**Page SGC-25**)

(7) **EPA Form 6100-2 DBE Subcontractor Participation Form** for **each** proposed **certified** DBE subcontractor.* (**Page SGC-10**) (*This form is completed by the proposed prime contractor. It is signed by **each** proposed subcontractor **only**.)

(8) **EPA Form 6100-3 DBE Subcontractor Performance Form** for each DBE subcontractor.** (**Page SGC-12**) (**This form is completed by the proposed prime contractor and signed by each proposed certified subcontractor and the proposed prime contractor per subcontract.)

(9) **EPA Form 6100-4 DBE Subcontractor Utilization Form** to summarize all DBE subcontracts/subcontractors.*** (**Page SGC-14**) (***This form is completed and signed by the proposed prime contractor **only**.)

NOTE:

ALL DBE contractors selected must have a current DBE certificate or letter of certification by an approved certifying agency.

Loan Recipient (Owner) DBE Submittal

At minimum, the Loan Recipient (Owner)'s DBE submittal should **always** consist of **a cover letter** (*preferred, but optional*) **and a VII - DBE Compliance Form (page SGC-8) and DBE solicitation documentation** (i.e., DBE solicitation list(s) with source(s) of list(s) clearly identified, contractor contact information and results/outcomes of each solicitation (or of the overall solicitation effort, if all results/outcomes were the same), documentation of solicitation method (i.e., copies of emails, phone logs, faxes, etc.).

Prime Contractor DBE Submittal

At minimum, the Prime Contractor's DBE submittal should **always** consist of **a cover letter** (*preferred, but optional*) **and DBE solicitation documentation** (i.e., DBE solicitation list(s) with source(s) of list(s) clearly identified, subcontractor contact information and results/outcomes of each solicitation (or of the overall solicitation effort, if all results/outcomes were the same), documentation of solicitation method (i.e., copies of emails, phone logs, faxes, etc.) **OR** a "No Subcontractors" Letter (*if none will be utilized*) **and** a List of ***ALL*** *(DBE/non-DBE) subcontractors* contracted/yet to be contracted **and** ***ALL EPA 6100 Forms*** *described above* (*DBE subcontractors selected **or not***) **and** Certification Regarding Equal Employment Opportunity **and** Debarred Firms Certification.

United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE[1] subcontractor[2] the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Prime Contractor Name		Issuing/Funding Entity: DWSRF

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services , Equipment or Supplies	Amount Received by Prime Contractor

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

This form is intended to capture the DBE[1] subcontractor's[2] description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Prime Contractor Name		Issuing/Funding Entity: DWSRF

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: O DOT O SBA O Other: _____	Meets/ exceeds EPA certification standards? O YES O NO O Unknown	

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

Subcontractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE[1] subcontractors[2] and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name
Schmidt Environmental Construction, Inc.		Lafayette Wastewater Treatment Plant Upgrades
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact Jackie Smith
Address PO Box 369, Auburn, AL 36831		
Telephone No. 334-887-0334		Email Address jackie@schmidteci.com
Issuing/Funding Entity: DWSRF		

I have identified potential DBE certified subcontractors	○ YES	◉ NO
If yes, please complete the table below. If no, please explain: We were unable to obtain quotes from any of the DBE contractors solisited.		

Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified?

Continue on back if needed

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

U.S. ENVIRONMENTAL PROTECTION AGENCY
MBE/WBE UTILIZATION UNDER FEDERAL GRANTS AND COOPERATIVE AGREEMENTS

PART I OF II
(PAGES SGC-16 & SGC-17)

FOR COOPERATIVE AGREEMENTS OR OTHER FEDERAL FINANCIAL ASSISTANCE WHERE THE COMBINED TOTAL OF FUNDS BUDGETED FOR PROCURING SUPPLIES, EQUIPMENT, CONSTRUCTION OR SERVICES EXCEED $150,000.

PART 1: PLEASE REVIEW INSTRUCTIONS BEFORE COMPLETING

1A. FEDERAL FISCAL YEAR (Oct 1- Sep 30)	1B. REPORT TYPE
20_____	☐ Annual ☐ Last Report (Project completed)

1C: REVISION OF A PRIOR YEAR REPORT? ◯ No ◯ Yes, Year_____

IF YES, BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:

2A. EPA FINANCIAL ASSISTANCE OFFICE ADDRESS (ATTN: DBE COORDINATOR)	3A. RECIPIENT NAME AND ADDRESS
2B. EPA DBE COORDINATOR Name: Email: Phone: Fax:	3B. RECIPIENT REPORTING CONTACT Name: Address: Phone: Email:
4A. FINANCIAL ASSISTANCE AGREEMENT ID NUMBER (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C)	4B. FEDERAL FINANCIAL ASSISTANCE PROGRAM TITLE OR CFDA NUMBER:
5A. TOTAL ASSISTANCE AGREEMENT AMOUNT EPA Share: $ _____ Recipient Share: $ _____ ☐ **N/A (SRF Recipient)/Loan Amount: $_____**	5B. If NO procurements and NO accomplishments were made this reporting period (by the recipients, sub-recipients, loan recipients, and prime contractors), **CHECK and SKIP to Block No. 7**. (Procurements are all expenditures through contract, order, purchase, lease or barter of supplies, equipment, construction, or services needed to complete Federal assistance programs. Accomplishments, in this context, are procurements made with MBEs and/or WBEs.) ☐

5C. Total Procurements This Reporting Period (Only include amount not reported in any prior reporting period)

Total Procurement Amount $_____

(Include total dollar values awarded by recipient, sub-recipients and SRF loan recipients, including MBE/WBE expenditures.)

5D. Were sub-awards issued under this assistance agreement? Yes ◯ No ◯

Were contracts issued under this assistance agreement? Yes ◯ No ◯

5E. MBE/WBE Accomplishments This Reporting Period

Actual MBE/WBE Procurement Accomplished (Include total dollar values awarded by recipient, sub-recipients, SRF loan recipients and Prime Contractors.)

	Construction	Equipment	Services	Supplies	Total
$MBE:	_____	_____	_____	_____	0.00
$WBE:	_____	_____	_____	_____	0.00

6. COMMENTS: (If no MBE/WBE procurements, please summarize how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.)

7. NAME OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	TITLE
8. SIGNATURE OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	DATE

EPA FORM 5700-52A available electronically at https://www.epa.gov/sites/production/files/2014-09/documents/epa_form_5700_52a.pdf

If reporting DBE procurement, please enter the Loan Project Number and the information in the grid below, as applicable.
If no additional DBE procurement to report, please enter the Loan Project Number and enter 'N/A' in the black box below.

PART II OF II
(PAGES SGC-16 & SGC-17)

PART II.

MBE/WBE PROCUREMENTS MADE DURING REPORTING PERIOD

SRF Financial Assistance Agreement Number: _____

1. Procurement Made By			2. Business Enterprise		3. $ Value of Procurement	4. Date of Procurement MM/DD/YY	5. Type of Product or Service (Enter Code)	6. Name/Address/Phone Number of MBE/WBE Contractor or Vendor
Recipient	Sub-Recipient and/or SRF Loan Recipient	Prime	Minority	Women				

Type of Product or Service Codes: 1 = Construction 2 = Supplies 3 = Services 4 = Equipment

Note: Recipients are required to submit MBE/WBE reports to EPA beginning with the Federal fiscal year the recipients receive the award, continuing until the project is completed.

Instructions:

A. General Instructions:

MBE/WBE utilization is based on 40 CFR Part 33. The reporting requirement reflects the class deviation issued on November 8, 2013, clarified on January 9, 2014 and modified on December 2, 2014. EPA Form 5700-52A must be completed annually by recipients of financial assistance agreements where the combined total of funds budgeted for procuring supplies, equipment, construction or services exceeds $150,000.This reporting requirement applies to all new and existing awards and voids all previous reporting requirements.

In determining whether the $150,000 threshold is exceeded for a particular assistance agreement, the analysis must focus on funds budgeted for procurement under the supplies, equipment, construction, services or "other" categories, and include funds budgeted for procurement under sub-awards or loans

Reporting will also be required in cases where the details of the budgets of sub-awards/loans are not clear at the time of the grant awards and the combined total of the procurement and sub-awards and/or loans exceeds the $150,000 threshold.

When reporting is required, all procurement actions are reportable, not just the portion which exceeds $150,000.

If at the time of award the budgeted funds exceed $150,000 but actual expenditures fall below, a report is still required.

If at the time of award, the combined total of funds budgeted for procurements in any category is less than or equal to $150,000 and is maintained below the threshold, no DBE report is required to be submitted.

Recipients are required to report 30 days after the end of each federal year, per the terms and conditions of the financial assistance agreement.

Last reports are due October 30th or 90 days after the end of the project period, whichever comes first.

MBE/WBE program requirements, including reporting, are material terms and conditions of the financial assistance agreement.

B. Definitions:

Procurement is the acquisition through contract, order, purchase, lease or barter of supplies, equipment, construction or services needed to accomplish Federal assistance programs.

A ***contract*** is a written agreement between an EPA recipient and another party (also considered "prime contracts") and any lower tier agreement (also considered "subcontracts") for equipment, services, supplies, or construction necessary to complete the project. This definition excludes written agreements with another public agency. This definition includes personal and professional services, agreements with consultants, and purchase orders.

A ***minority business enterprise*** **(MBE)** is a business concern that is (1) at least 51 percent owned by one or more minority individuals, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority

individuals; and (2) whose daily business operations are managed and directed by one or more of the minority owners. In order to qualify and participate as an MBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

U.S. citizenship is required. Recipients shall presume that minority individuals include Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, or other groups whose members are found to be disadvantaged by the Small Business Act or by the Secretary of Commerce under section 5 of Executive order 11625. The reporting contact at EPA can provide additional information.

A ***woman business enterprise*** **(WBE)** is a business concern that is, (1) at least 51 percent owned by one or more women, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women and (2) whose daily business operations are managed and directed by one or more of the women owners. In order to qualify and participate as a WBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

Business firms which are 51 percent owned by minorities or women, but are in fact not managed and operated by minorities or females do not qualify for meeting MBE/WBE procurement goals. U.S. Citizenship is required.

Good Faith Efforts

A recipient is required to make the following good faith efforts whenever procuring construction, equipment, services, and supplies under an EPA financial assistance agreement. These good faith efforts for utilizing MBEs and WBEs must be documented. Such documentation is subject to EPA review upon request:

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

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

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

5. Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

6. If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

C. Instructions for Part I:

1A. Specify Federal fiscal year this report covers. The Federal fiscal year runs from October 1st through September 30th (**e.g. November 29, 2014 falls within Federal fiscal year 2015**)

1B. Specify report type. Check the annual reporting box. Also indicate if the project is completed.

1C. Indicate if this is a revision to a previous year and provide a brief description of the revision you are making.

2A-B. Please refer to your financial assistance agreement for the mailing address of the EPA financial assistance office for your agreement.

The "EPA DBE Reporting Contact" is the DBE Coordinator for the EPA Region from which your financial assistance agreement was originated. For a list of DBE Coordinators please refer to the EPA OSBP website at http://epa.gov/osbp/dbe_cord.

3A-B. Identify the agency, state authority, university or other organization which is the recipient of the Federal financial assistance and the person to contact concerning this report.

4A. Provide the Assistance Agreement number assigned by EPA. A separate report must be submitted for each Assistance Agreement.

***For SRF recipients**: In box 4a list numbers for ALL OPEN Assistance Agreements being reported on this form.

4B. Refer back to Assistance Agreement document for this information.

5A. Provide the total amount of the Assistance Agreement which includes Federal funds plus recipient matching funds and funds from other sources.

***For SRF recipients only**: SRF recipients will not enter an amount in 5a. SRF recipients should check the "N/A" box.

5B. Self-explanatory.

5C. Provide the total dollar amount of **ALL** procurements awarded this reporting period by the recipient, sub-recipients, and SRF loan recipients, **including** MBE/WBE expenditures, not just the portion which exceeds $150,000. For example: Actual dollars for procurement from the procuring office; actual contracts let from the contracts office; actual goods, services, supplies, etc., from other sources including the central purchasing/ procurement centers).

***NOTE**: To prevent double counting on line 5C, if any amount on 5E is for a subcontract and the prime contract has already been included on Line 5C in a prior reporting period, then report the amount going to MBE or WBE subcontractor on line 5E, but exclude the amount from Line 5C. To include the amount on 5C again would result in double counting because the prime contract, which includes the subcontract, would have already been reported.

***For SRF recipients only**: In 5c please enter the total annual procurement amount under all of your SRF Assistance Agreements. The figure reported in this section is **not** directly tied to an individual Assistance Agreement identification number. **(SRF state recipients report state procurements in this section)**

5D. State whether or not sub-awards and/or subcontracts have been issued under the financial assistance agreements by indicating “yes” or “no”.

5E. Where requested, also provide the total dollar amount of all MBE/WBE procurement awarded during this reporting period by the recipient, sub-recipients, SRF loan recipients, and prime contractors in the categories of construction, equipment, services and supplies. These amounts include Federal funds plus recipient matching funds and funds from other sources.

6. If there were no MBE/WBE accomplishments this reporting period, please briefly how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.

7. Name and title of official administrator or designated reporting official.

8. Signature, month, day, and year report submitted.

D. Instructions for Part II:

For each MBE/WBE procurement made under this financial assistance agreements during the reporting period, provide the following information:

1. Check whether this procurement was made by the recipient, sub-recipient/SRF loan recipient, or the prime contractor.

2. Check either the MBE or WBE column. If a firm is both an MBE and WBE, the recipient may choose to count the entire procurement towards EITHER its MBE or WBE accomplishments. The recipient may also divide the total amount of the procurement (using any ratio it so chooses) and count those divided amounts toward its MBE and WBE accomplishments. If the recipient chooses to divide the procurement amount and count portions toward its MBE and WBE accomplishments, please state the appropriate amounts under the MBE and WBE columns on the form. **The combined MBE and WBE amounts for that MBE/WBE contractor must not exceed the “Value of the Procurement” reported in column #3**

3. Dollar value of procurement.

4. Date of procurement, shown as month, day, year. Date of procurement is defined as the date the contract or procurement was awarded, **not** the date the contractor received payment under the awarded contract or procurement, unless payment occurred on the date of award. **(Where direct purchasing is the procurement method, the date of procurement is the date the purchase was made)**

5. Using codes at the bottom of the form, identify type of product or service acquired through this procurement (e.g., enter 1 if construction, 2 if supplies, etc.).

6. Name, address, and telephone number of MBE/WBE firm.

**This data is requested to comply with provisions mandated by: statute or regulations (40 CFR Parts 30, 31, and 33 and/or 2 CFR Parts 200 and 1500); OMB Circulars; or added by EPA to ensure sound and effective assistance management. Accurate, complete data are required to obtain funding, while no pledge of confidentiality is provided.

The public reporting and recording burden for this collection of information is estimated to average l hour per response annually. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclosure or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE Regulatory Information Division, U.S. Environmental Protection Agency (2136), 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB Control number in any correspondence. Do not send the completed form to this address.

XII – Changes to Approved DBE Compliance Form

NOTE: THIS FORM IS REQUIRED OF THE LOAN RECIPIENT (OWNER) (WITH THE PRIME CONTRACTOR'S INPUT) FOR DBE COMPLIANCE ONLY IF A SUBCONTRACTOR/SUPPLIER/VENDOR IS SOUGHT AND/OR PROCURED AFTER THE CONTRACT ATA (APPROVAL-TO-AWARD) HAS BEEN ISSUED. IT IS SIMILAR TO THE DBE COMPLIANCE FORM (PAGE SGC-8) IN THAT IT IS THE COVER/SUMMARY FORM USED TO DOCUMENT THE ADDITIONAL DBE SOLICITATION AND/OR REVISE THE ORIGINAL DBE APPROVAL STATUS.

Loan Recipient: _____ Loan (Project) Number: _____

CERTIFICATIONS:

I certify that the information submitted on and with this form is true and accurate and that this company has met and will continue to meet the conditions of this construction contract regarding DBE solicitation and utilization. I further certify that criteria used in selecting subcontractors and suppliers were applied equally to all potential participants and that EPA Forms 6100-2 and 6100-3 were distributed to all DBE subcontractors.

_____ Date_____
(Prime Contractor Signature)

_____
(Printed Name and Title)

I certify that I have reviewed the information submitted on and with this form and that it meets the requirements of the Loan Recipient's/Owner's State Revolving Fund loan contract. **(*Only ONE (1) signature required below.)**

_____ Date_____
(Signature of Loan Recipient (Owner))

OR*

_____ Date_____
(Loan Recipient's (Owner's) Representative's Signature, (**P.E.**))

Dave Bechtel, P.E.
(Printed Name and Title)

GENERAL INFORMATION: **(Please attach additional pages to address 1 through 5, as needed.)**

(1) If an approved subcontractor is terminated or replaced, please identify this company and briefly state the reason.

(2) For new or additional subcontractors, list name, trade, address, telephone number, contact person, dollar amount of subcontract and DBE status.

(3) Attach proof of certification by EPA, SBA, DOT (or by state, local, Tribal or private entities whose certification criteria match EPA's) for each subcontractor listed as a DBE, MBE or WBE.

(4) Attach documentation of solicitation effort for prospective DBE firms, such as fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each solicitation with, at least, one (1) logged phone call. Whenever possible, post solicitation for bids or proposals should be for a minimum of 30 calendar days before the bid or proposal closing date.

(5) Provide justification for not selecting a certified DBE subcontractor that submitted a low bid for any subcontract area.

XIII – Certification Regarding Equal Employment Opportunity

The prime contractor is required to comply with Executive Order 112-46 of September 24, 1965 entitled "Equal Employment Opportunity" as amended by Executive Order 11375 of October 13, 1967.

The contract for the work under this proposal will obligate the prime contractor and its subcontractors not to discriminate in employment practices.

The prime contractor shall not maintain or provide for his/her employees the facilities, which are segregated on a basis of race, creed, color or national origin, whether such facilities are segregated by directive or on a de facto basis.

The prime contractor must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain his/her eligibility to receive the award of the contract.

The prime contractor must be prepared to comply in all respects with any contract provisions regarding non-discrimination stipulated in conjunction with labor standards.

PRIME CONTRACTOR'S CERTIFICATION:

Prime Contractor's Name: _____

Address: _____

_____

_____

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. Yes____ No____
2. Compliance Reports were required to be filed in connection with such contract or subcontract. Yes____ No____
3. Bidder has filed all compliance reports due under applicable contract requirements. Yes____ No____

If answer to item 3 is "No", please explain in detail on reverse side of this certification.

Certification - The information above is true and complete to the best of my knowledge and belief.

Signature of Prime Contractor: _____

Title: _____

Date: _____

XIV – Debarred Firms Certification

All prime construction contractors shall certify that Subcontracts have not and will not be awarded to any firm that is currently on the General Service Administration's Master List of Debarred, Suspended and Voluntarily Excluded Persons, in accordance with the provisions of ADEM Administrative Code 335-6-14-.35. Debarment action is taken against a firm for noncompliance with Federal Law.

All bidders shall complete this certification in duplicate and submit both copies to the Loan Recipient (Owner) with the bid proposal. The Loan Recipient (Owner) shall transmit one copy to the SRF Section within 14 days after the bid opening.

Project Name/Loan Name*:
(*not **Contract** Name)

SRF Project No.: _____

The undersigned hereby certifies that the firm of _____

_____ has not and will not award a subcontract, in connection with any contract awarded to it as the result of this bid, to any firm that is currently on the General Service Administration's Master List of Debarred, Suspended, and Voluntarily Excluded Persons.

Signature of Prime Contractor: _____

Title: _____

Date: _____

XV – Davis-Bacon and Related Acts

Labor Standards Provisions for Federally Assisted Contracts

Wage Rate Requirements Under FY 2013 Continuing Appropriation

I. Requirements under the Consolidated and Further Continuing Appropriations Act. 2013 (P.L. 113-6) For Subrecipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2013 Continuing Resolution with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Cynthia Y. Edwards at Edwards.Cynthiay@epa.gov or at 404-562-9340 of EPA, Region 4 Grants and SRF Management Section, for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at http://www.dol.gov/whd/

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract Subcontract Provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2010 appropriation , the following clauses:

(1) Minimum wages.

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

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

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

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

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

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

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

(2) Withholding.

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

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at https://www.dol.gov/agencies/whd/forms/wh347 or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

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

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

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

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

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

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

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

(4) Apprentices and trainees.

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program.

If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

(5) Compliance with Copeland Act requirements.

The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment.

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

(8) Compliance with Davis-Bacon and Related Act requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards.

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

(10) Certification of eligibility.

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

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

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

4. Contract Provision for Contracts in Excess of $100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements.

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

(2) Violation; liability for unpaid wages; liquidated damages.

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

(3) Withholding for unpaid wages and liquidated damages.

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

(4) Subcontracts.

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

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing hat the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information
indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract . Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at https://www.dol.gov/agencies/whd/contact/local-offices.

(Insert applicable wage rate determination here.)

Wage Rates are county specific for *Heavy Construction* and can be found at:
https://sam.gov/content/wage-determinations

XVI – American Iron and Steel Requirement

Section 4.13 Compliance with 2014 Appropriations Act. (a) The Loan Recipient agrees to comply with all federal requirements applicable to the Authority Loan (including those imposed by P.L. 113-76, Consolidated Appropriations Act (the "2014 Appropriations Act") and related SRF Policy Guidelines) which the Loan Recipient understands includes, among other things, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel") unless (i) the Loan Recipient has requested and obtained a waiver from the U.S. Environmental Protection Agency pertaining to the Project or (ii) the Authority has otherwise advised the Loan Recipient in writing that the Buy American Requirement is not applicable to the Project. .

(b) The Loan Recipient also agrees to comply with all recordkeeping and reporting requirements under the Clean Water Act (codified generally under 33 U.S.C. §1251 et seq.) (the "Clean Water Act"), including any reports required by a federal agency or the Authority such as performance indicators of program deliverables, information on costs and Project progress. The Loan Recipient understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities, and (ii) failure to comply with the Clean Water Act and this Agreement may be an Event of Default hereunder that results in a repayment of the Authority Loan in advance of the maturity of the Evidence of Indebtedness and/or other remedial actions.

The Loan Recipient agrees to cause all contractors and subcontractors to comply with (through the inclusion of appropriate terms and conditions in all contracts, subcontracts and lower tiered transactions, such terms and conditions to be in substantially the form set forth in connection with the development and construction of the project

The Contractor acknowledges to and for the benefit of the _____, Alabama ("Purchaser"), and the Alabama Water Pollution Control Authority or the Drinking Water Finance Authority (the "State Authority") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State Authority that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State Authority or any damages owed to the State Authority by the Purchaser). While the Contractor has no direct contractual privity with the State Authority, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State Authority.

CW ARPA SIGN DETAIL (Reference: ADEM CW ARPA Agreement)

O. The recipient must construct a project sign that meets the following requirements:

(a) Sign is to be constructed of ½" MDO plywood or similar material, 4' x 8'.

(b) Paint with two (2) coats of enamel paint (or equivalent) prior to lettering.

(c) Background color white, lettering black.

(d) Lettering may be painted or vinyl. All lettering sizes to be proportionate to sign layout.

(e) Sign shall be attached to 4" x 4" x 8' treated posts.

(f) Sign shall be placed in prominent location near the project area, easily readable from existing street or roadway.

(g) Sign shall be maintained in good condition until completion of project.

(h) Sign shall follow the format below and include the following information only:

ADEM
Alabama Department of Environmental Management

STATE OF ALABAMA
Honorable Kay Ivey, Governor

ALABAMA AMERICAN RESCUE PLAN ACT (ARPA)
WASTEWATER INFRASTRUCTURE PROJECT

$ Funds
$(Project/Contract Amount) STATE REVOLVING FUNDS (If Applicable)

• CONTRACTOR
Utility Engineering Consultants, LLC • CONSULTING ENGINEER
ALABAMA DEPARTMENT OF ENVIRONMENTAL
MANAGEMENT U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA

DW ARPA SIGN DETAIL (Reference: ADEM DW ARPA Agreement)

O. The recipient must construct a project sign that meets the following requirements:

(a) Sign is to be constructed of ½" MDO plywood or similar material, 4' x 8'.

(b) Paint with two (2) coats of enamel paint (or equivalent) prior to lettering.

(c) Background color white, lettering black.

(d) Lettering may be painted or vinyl. All lettering sizes to be proportionate to sign layout.

(e) Sign shall be attached to 4" x 4" x 8' treated posts.

(f) Sign shall be placed in prominent location near the project area, easily readable from existing street or roadway.

(g) Sign shall be maintained in good condition until completion of project.

(h) Sign shall follow the format below and include the following information only:

ADEM
Alabama Department of Environmental Management

STATE OF ALABAMA
Honorable Kay Ivey, Governor

ALABAMA AMERICAN RESCUE PLAN ACT (ARPA)
DRINKING WATER INFRASTRUCTURE PROJECT

(NAME OF OWNER)

(PROJECT OR CONTRACT NAME)

$(Project/Contract Amount) ARPA Funds
$(Project/Contract Amount) STATE REVOLVING FUNDS (If Applicable)

(CONTRACTOR NAME)• CONTRACTOR
(NAME OF ENGINEER) • CONSULTING ENGINEER

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA

XIX – Construction Contract Requirements

This checklist is to be completed by the Loan Recipient (Owner)/Engineer when submitting plans and specifications to the SRF Section for review. It affirms to the SRF reviewer that the Loan Recipient (Owner)/Engineer has addressed these items (in boilerplate form) within the specifications manual.

Contract Page No.	Satisfied Yes/No	
_____	_____	Bid Advertisement (including date, time, and location of bid opening).
_____	_____	Bid Bond.
_____	_____	Performance Bond (100%).
_____	_____	Payment Bond (Not less than 50%).
_____	_____	Contract Length.
_____	_____	Liquidated Damages.
_____	_____	Liability Insurance (including workman's comp, public liability, and builder's risk, if applicable).
_____	_____	Method of Award (i.e. lowest, responsive, responsible bidder).
_____	_____	Air testing of gravity sewers (if applicable).

Within 14 days after the bid opening, the Loan Recipient (Owner)/Engineer is to prepare the Project Review and Cost Summary (per the **PR&CS Checklist, page SGC-39**) and submit it to the SRF Section of ADEM. Upon completion of review, a ***written*** ATA (Approval-to-Award) will be issued.

NOTE:

The Loan Recipient (Owner) assumes all financial risk, if the construction contract is awarded prior to the issuance of an ATA letter by the SRF Section.

XX – Project Review and Cost Summary

ADEM Alabama Department of Environmental Management	SRF Project Review and Cost Summary	Form Revised **07-2021**

This form is to be completed and submitted (with supporting documentation) to the SRF Section within 14 days after bid opening. Following satisfactory review, an ATA (Approval-to-Award) letter will be issued. After the ATA is issued/ award of the contract, a pre-construction conference should be scheduled (**with the SRF Project Manager in attendance**). *A complete, bound set of the executed contract documents manual should be forwarded to the SRF Section for review and written approval following the pre-construction conference.*

Loan Recipient: _____ Project Number: _____

Project Name: _____

Contract Number: _____ Contract Name: _____

1. Date of plans and specifications concurrence letter from ADEM-SRF Section: _____

   Date of construction permit issuance from ADEM-DW Branch: _____

2. Attach copies of the following documents:

___ a. Bid advertisement with certification by publisher and date(s) of publication.

___ b. Certified bid tabulation.

___ c. Proposal of the selected bidder.

___ d. Bid bond.

___ e. Engineer's letter to the loan recipient recommending award of the contract. If the award is made to other than the low bidder, provide justification.

___ f. Site certificates for the project, if not previously submitted with the SRF loan application.

___ g. DBE Documentation from **the loan recipient (owner) and the prime contractor**. Utilization, solicitation and documentation requirements (with a list of required documents) are discussed in detail in Parts III - V (pages SGC-3 - SGC-23) of the ADEM *SRF Supplemental General Conditions* for SRF Assisted Public Drinking Water and Wastewater Facilities Construction Contracts.

___ h. Copy of the wage determination used in bidding.

___ i. Any addenda that have been issued after ADEM review of the plans and specifications.

Comments:

_____

_____

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Contract Description: City of LaFayette Wastewater Treatment Plant Upgrades
CWSRF Project No. CS010403-05, Contract No. 2

B. Work by Owner.

C. Contractor use of site and premises.

D. Future work.

E. Work Sequence.

F. Owner occupancy.

G. Scope of work.

H. Location

I. Work to be performed.

1.2 WORK BY OWNER

The Owner will award separate contracts for influent pump station and the wastewater treatment plant that tie directly to the Plant. These projects must be properly coordinated with the required work in this project. This is Contract #2.

1.3 CONTRACTOR USE OF SITE AND PREMISES

A. Limit use of site and premises to allow:
1. Owner occupancy.
2. Work by Others and Work by Owner.

B. Construction Operations: Limited to areas noted on Drawings.

C. Utility Outages and Shutdown: At the Owner's convenience.

1.4 FUTURE WORK

Project is designed for future expansions.

1.5 WORK SEQUENCE

Construct work in phases during the construction period, coordinate construction schedule with Owner and Engineer.

1.6 OWNER OCCUPANCY

A. The Owner will occupy portions of the site during the entire period of construction to conduct normal operations of the existing plant.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate this requirement.

1.7 SCOPE OF WORK

A. Wastewater Treatment Plant Improvements
   1. Piping
   2. Mechanical
   3. Any miscellaneous appurtenances associated with Items 1-3.

B. Yard Piping and Site work, Section 15050 and Section 15100 - Furnish and Install Complete.
   1. Piping - Ductile iron pipe, stainless steel pipe.
   2. Fittings - Cast iron, ductile iron, vitrified clay, galvanized steel, copper.
   3. Concrete - Valve Boxes, manhole connections.
   4. Valves - Butterfly valves, mud valves, gate valves, valve boxes, stem extensions, extension stems with operator.
   5. Site Work - Backfill materials, trench, excavations and miscellaneous structures.
   6. Any miscellaneous appurtenances associated with Items 1-7.

1.8 LOCATION

The location of the work as shown on the project location map is in Lafayette, Alabama.

1.9 WORK TO BE PERFORMED

The work to be performed under this contract consists of furnishing all plant, labor, tools, materials and equipment; and constructing complete, ready for use for the satisfactory prosecution and completion of the contract. All work performed shall be in accordance with the Invitation for Bids, Instructions to Bidders, Supplementary Conditions, General Conditions, Contract and Surety Forms, and Plans and Specifications.

Work will include Wastewater Treatment Plant Improvements, New Screens, Piping, New Roof and Ceiling in Raw Water Pump Station, New Interior Light and Air Burst System for Screens.

1.10 LICENSES AND PERMITS

A. The Contractor's attention has been called to the necessity for compliance with all federal, state and local laws and ordinances regarding licenses and permits as referred to in the Contract Documents as follows: Instructions to Bidders, Page IB-9; General Conditions, Article 6.14 and Article 6.15, Page GC-10.

B. The Contractor is reminded that it is mandatory that all licensing requirements be met. Prior to the beginning of any work.

C. All work performed for the City of Lafayette Alabama for Lafayette Wastewater Treatment Plant Improvements owned or funded projects shall require the use of licensed personnel for the respective trades i.e., plumbers, electricians, gas fitters, etc.

1.11 PROTECTION OF THE OWNER, AGENTS OF THE OWNER, WORKMEN AND THE PUBLIC

The Contractor and the superintendent are requested to carefully read the Articles of the General Conditions relating to protection of the Owner, agents of the Owner, workmen, and the public, such as Insurance; Indemnity; Licenses and Permits: Compliance with Laws, Ordinances and Regulations; Safety; Warning Signs and Barricades; Public Convenience; Sanitary Provisions; etc. This request is made to stress the importance of safe prosecution of the work, and does not imply that the Contractor and his Superintendent should not be completely familiar with all Articles of the General Conditions and all other provisions of the Contract Documents. Under the terms and conditions of this Contract, the Engineer shall not be required to act as Safety Engineer or Safety Supervisor since such responsibility remains solely with the Contractor, who, in the prosecution of his work, is bound by the requirements of "Safety and Health Regulations for Construction Occupational Safety and Health Administration, U.S. Government Department of Labor", and of other authorities having jurisdiction. It is recommended that the Contractor seek the advice of the Safety Inspector for his Insurance Carrier in regard to job safety, and that he observe all precautions and safety provisions as outlined in the "Manual of Accident Prevention in Construction", as published by the Associated General Contractors of America, to the extent that such provisions are not inconsistent with applicable laws or regulations.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SECTION 01041

PROJECT COORDINATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Coordination by the Project Coordinator.

B. Construction mobilization.

C. Schedules.

D. Submittals.

E. Coordination drawings.

F. Closeout procedures.

1.2 RELATED SECTIONS

Section 01700 - Contract Closeout: Contract Closeout Procedures.

1.3 PROJECT COORDINATOR

Project Coordinator: Engineer and/or Owner Representative.

1.4 CONSTRUCTION MOBILIZATION

A. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

B. During construction, coordinate use of site and facilities through the Project Coordinator.

C. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

D. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

E. Coordinate field engineering and layout work under instructions of the Coordinator.

1.5 SCHEDULES

A. Submit preliminary progress schedule in accordance with Section 01300.

B. After review, revise and resubmit schedule to comply with revised Project schedule.

C. During progress of work revise and resubmit with Applications for Payment.

1.6 SUBMITTALS

A. Submit preliminary shop drawings, product data and samples in accordance with Section 01300 for review and compliance with Contract Documents, for field dimensions and clearances, for relation to available space, and for relation to work of separate contracts. Revise and resubmit as required.

B. Submit requests for interpretation of Contract Documents, and obtain instructions through the Engineer.

C. Deliver closeout submittals for review and preliminary inspection reports, for transmittal to Engineer.

1.7 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Engineer.

1.8 CLOSEOUT PROCEDURES

A. Notify Project Coordinator when Work is considered ready for Substantial Completion. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.

B. Comply with Project Coordinator's instructions to correct items of work listed in executed Certificates of Substantial Completion and for access to Owner occupied areas.

C. Notify Project Coordinator when Work is considered finally complete. Accompany Project Coordinator on preliminary final inspection.

D. Comply with Project Coordinator's instructions for completion of items of Work determined by Engineer's final inspection.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

Quality assurance.

1.2 RELATED SECTIONS

General Conditions: Reference standards.

1.3 QUALITY ASSURANCE

A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids.

C. Obtain copies of standards when required by the Contract Documents.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect/Engineer before proceeding.

F. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Architect/Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed products list.

D. Shop drawings.

E. Product data.

F. Samples.

G. Manufacturers' instructions.

H. Manufacturers' certificates.

I. Construction photographs.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturers' field services and reports.

B. Section 01700 - Contract Closeout: Contract warranty and manufacturer's certificates closeout submittals.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer accepted form.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number, and specification Section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and Contract Documents.

E. Schedule submittals to expedite the Project, and deliver to Engineer at business address. Coordinate submission of related items.

F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed work.

G. Provide space for Contractor and Engineer review stamps.

H. Revise and resubmit submittals as required, identify all changes made since previous submittal.

I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

J. Submit the number of opaque reproductions which Contractor requires, **plus 6 copies** which will be retained by Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate **within 20 days** after date of Owner-Contractor Agreement established in Notice to Proceed for Engineer review.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Submit a horizontal bar chart with separate line for each section of work, identifying first work day of each week.

E. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

F. Indicate estimated percentage of completion for each item of work at each submission.

G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

1.5 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Owner-Contractor Agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 SHOP DRAWINGS

A. Submit the number of opaque reproductions which Contractor requires, plus 6 copies which will be retained by Engineer.

B. After review distribute in accordance with Article on Procedures above and for Record Documents described in Section 01700 - Contract Closeout.

1.7 PRODUCT DATA

A. Submit the number of copies which the Contractor requires, plus 4 copies which will be retained by the Engineer.
B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.8 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Owner's selection.

C. Include identification on each sample, with full Project information.

D. Submit the number or samples specified in individual specification Sections; two of which will be retained by Engineer.

E. Reviewed samples which may be used in the work are indicated in individual specification Sections.

1.9 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.10 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification sections, submit manufacturers' certificate to Engineer for review, in quantities specified for product data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

1.11 CONTRACTOR PERMITS AND LICENSES

Copies of all permits and/or licenses required for this work must be retained by the Engineer.

SECTION 01310

PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Format.

B. Content.

C. Revisions to schedules.

D. Submittals.

1.2 RELATED SECTIONS

A. Section 01010 - Summary of Work: Work sequence.

B. Section 01300 - Submittals: Shop drawings, product data, and samples and schedule of values.

1.3 FORMAT

A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first work day of each week.

B. Scale and Spacing: To provide space for notations and revisions.

C. Sheet Size: Minimum 36 x 24 inches.

1.4 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each stage of Work identified in Section 01010.

E. Provide sub-schedules to define critical portions of the entire schedule.

F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the 25th day of each month.

G. Provide separate schedule of submittal dates for shop drawings, product data, samples, and dates reviewed submittals will be required from Engineer. Indicate decision dates for selection of finishes.

1.5 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

1.6 SUBMITTALS

A. Submit initial schedules **within 20 days** after date established in Notice to Proceed. After review, resubmit required revised data within ten days.

B. Submit revised Progress Schedules with each Application for Payment.

C. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Engineer.

1.7 DISTRIBUTION

A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Field samples.

D. Mock-up.

E. Inspection and testing laboratory services.

F. Manufacturers' field services and reports.

1.2 RELATED SECTIONS

A. Section 01090 - Reference Standards.

B. Section 01300 - Submittals: Submission of Manufacturers' Instructions and Certificates.

C. Section 01600 - Material and Equipment: Requirements for material and product quality.

1.3 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.4 REFERENCES

A. Conform to reference standard by date of issue current on date for receiving bids.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification for Engineer before proceeding.

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Sections for review.

B. Acceptable samples represent a quality level for the work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Engineer.

1.6 MOCK-UP

A. Tests will be performed under provisions identified in this section.

B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Engineer.

1.7 INSPECTION AND TESTING LABORATORY SERVICES

A. Owner will appoint, employ, and pay for services of an independent firm to perform inspection and testing.

B. The independent firm will perform inspections, tests, and other services specified in individual specification Sections and as required by the Engineer.

C. Reports will be submitted by the independent firm to the Engineer and the Owner, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

D. Contractor shall cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
   1. Notify Engineer and independent firm a minimum of 24-hours prior to expected time for operations requiring services.
   2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

E. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price.

1.8 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer subject to approval of Engineer and Owner.

B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment and as applicable, and to initiate instructions when necessary.

C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report in duplicate within 30 days of observation to Engineer for review.

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.

1.2 RELATED SECTIONS

A. Section 01550 - Access Roads and Parking Areas.

B. Section 01570 - Traffic Regulation.

C. Section 01590 - Field Offices and Sheds.

D. Section 01700 - Contract Closeout: Final cleaning.

1.3 TEMPORARY ELECTRICITY

A. Cost: By Contractor; provide and pay for power service required from utility.

B. Provide temporary electric feeder from electrical service at location as directed. Do not disrupt Owner's need for continuous service.

C. Complement existing power service capacity and characteristics as required.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

E. Provide main service disconnect and overcurrent protection at convenient location.

F. Permanent convenience receptacles may not be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
   1. Provide 20 ampere duplex outlets, single phase circuits for power tools as required for progress of work.
   2. Provide 20 ampere, single phase branch circuits for lighting.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations.
B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may not be utilized during construction.

1.5 TEMPORARY HEAT

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Maintain minimum ambient temperature of 50 degrees F in areas where interior construction is in progress, unless indicated otherwise in specifications.

1.6 TEMPORARY VENTILATION

Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.7 TELEPHONE AND FACSIMILE SERVICE

Provide, maintain and pay for telephone and facsimile service to field office at time of project mobilization.

1.8 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service required for construction operations.

B. Provide separate metering and reimburse Owner for cost of water used.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.9 TEMPORARY SANITARY FACILITIES

Provide and maintain required facilities and enclosures. **Existing facility use is not permitted.**

1.10 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.

C. Provide protection for plant life designated to remain. Replace damaged plant life.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.11 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water.

1.12 EXTERIOR ENCLOSURES

Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.13 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic on landscaped areas.

1.14 SECURITY

A. Provide security and facilities to protect Work, and existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.15 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Extend and relocate access roads as Work progress requires. Provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

F. All mud and dirt shall be removed from the roads each work day to allow the Owner’s personnel to access their work areas.

1.16 PARKING

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. When site space is not adequate, provide additional off-site parking.

C. Do not allow vehicle parking on existing pavement.

D. Designate two parking spaces for the Engineer.

1.17 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

E. Open free-fall chutes not permitted. Terminate closed chutes into appropriate containers with lids.

F. All concrete waste and rebar scrap must be removed and properly disposed.

1.18 FIELD OFFICES AND SHEDS

A. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table.

B. Provide space for project meetings, with table and chairs to accommodate 15 persons.

C. Locate offices and sheds a minimum distance of thirty (30) feet from any structures.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.20 LICENSES AND PERMITS

A. The Contractor shall be responsible for securing from the local municipalities all permits, licenses and for paying all taxes required to perform the Contract work.

B. The Contractor shall be responsible for compliance with all Federal, State and local laws and ordinances regarding licenses and permits.

1.21 PRE-BLAST SURVEY AND BLASTING TECHNIQUES

A. The Contractor is reminded that he has sole and complete responsibility for the conditions on, in or near the job site, including safety of all persons and property during performance of the work.

B. The required duty of the Engineer to conduct construction review of the Contractor's performance does not, and is not intended to, include review of the adequacy of the Contractor's safety measures in, on, or near the construction site.

C. The observation of safety provisions of applicable laws and local building and construction codes shall be the responsibility of the Contractor.

1.22 REGULATORY REQUIREMENTS

A. Secure from the office of the Inspection Services, Division of the Public Works Departments of the local Municipalities, Information for Regulatory Licenses, and Permits required.

B. Obtain permits and licenses from each Municipality.

C. Requirements contained in each individual authority's permit shall become the provisions and requirement for completion of the work.

1.23 STORM WATER RUNOFF

A. The Contractor shall be responsible for securing National Pollutant Discharge Permit System General Permit from ADEM for stormwater runoff during construction of the City of Lafayette Wastewater Treatment Plant Upgrades and construction of any work associated with this project.

B. The Contractor shall furnish, construct and maintain all silt fences, silt barriers and siltation ponds to prevent any silt or pollutants from reaching local streams.

C. The silt fences, silt barriers and siltation ponds are shown on the Drawings as a minimum requirement for the Contractor. The Contractor shall meet all requirements of the NPDES permit.

D. The Best Management Practices shall be in use during the entire job for storm water runoff.

E. Silt barriers, silt fences and siltation ponds shall be operational and in proper position before the Contractor leaves for the day, holiday or weekend.

F. No construction shall be allowed until the Contractor has shown the NPDES permit to the Owner including storm water runoff plan. A copy of the permit and runoff plan must be submitted to the Owner and Engineer.

G. Contractor shall obtain from the proper authorities the following documents:
   1. EPA
   2. ADEM - NPDES Permit
   3. Best Management Practices

H. The Contractor shall be responsible for meeting the standards and requirements contained in the documents for the prevention of siltation of local streams.

1.24 LOCATION OF UNDERGROUND OBSTRUCTIONS

A. When crossing or running adjacent to existing utilities, plant piping and storm drains, exact location shall be made by hand excavation prior to installation of any new sanitary sewers or water mains.

B. The Contractor shall be responsible for carefully protecting utilities and storm drains during excavation and pipe line installation.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SECTION 01550

ACCESS ROADS AND PARKING AREAS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Permanent pavements and parking facilities.

E. Maintenance.

F. Removal, repair.

1.2 RELATED SECTIONS

A. Section 01010 - Summary of Work.

B. Section 01500 - Construction Facilities and Temporary Controls: Temporary construction.

C. Section 02211 - Rough Grading.

D. Individual Sections: Specifications for earthwork and paving bases.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Construction: Contractors option.

B. Earthwork, Paving Base, Topping and Concrete Which Will Become Permanent Construction: As specified.

PART 3 - EXECUTION

3.1 PREPARATION

Clear areas, provide surface and storm drainage of premises and adjacent areas.

3.2 ACCESS ROADS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Location approved by Engineer.

E. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

F. Provide and maintain access to fire hydrants and control valves free of obstructions.

3.3 PARKING

A. Provide temporary parking areas to accommodate use of construction personnel, personal vehicles in existing plant site to be kept to a minimum.

B. When site space is not adequate, provide additional off-site parking.

C. Locate as approved by Engineer.

3.4 EXISTING PAVEMENTS AND PARKING AREAS

A. Existing on-site streets and driveways may be used for construction traffic. Tracked vehicles not allowed.

B. Existing parking facilities shall not be used by construction personnel.

C. Do not allow heavy vehicles or construction equipment in parking areas.

3.5 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. Prior to Substantial Completion base for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.6 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.7 REMOVAL, REPAIR

A. Remove temporary materials and construction at Substantial Completion.

B. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.

C. Repair existing facilities damaged by use, to specified condition.

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.2 RELATED SECTIONS

A. Document - Instructions to Bidders: Product options and substitution procedures.

B. Section 01400 - Quality Control: Product quality monitoring.

1.3 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

1.4 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request twenty-one (21) days before bids are received for substitution for any manufacturer not named.

D. Products specified by Name in Proposal Form as an "a" item: The "a" item shall be used as base bid price in Proposal Form." Where more than one “a” item is named, the Contractor shall circle only the one they intend to furnish.

1.7 SUBSTITUTIONS

A. Instructions to Bidders specify time restrictions for submitting requests for Substitutions for major equipment during the bidding period to requirements specified in this Section.

B. Substitutions shall not be allowed for items listed as no substitutions allowed in the individual specification section.

C. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

E. A request constitutes a representation that the Bidder:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the Substitution as for the specified product.
   3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.
   5. Will reimburse Owner for review and redesign services associated with re-approval by authorities.

F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

G. Substitution Submittal Procedure:
   1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
   3. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

1.2 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls: Progress cleaning.

B. Section 01730 - Operation and Maintenance Data.

C. Section 01740 - Warranties and Bonds.

1.3 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's inspection

B. Provide submittals to Engineer and Owner that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Owner will occupy all of the site as specified in Section 01010.

1.4 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

H. Cut grass at Plant site a minimum of one time after project completion.

1.5 ADJUSTING

Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the work:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other Modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and Modifications.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface locations.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract Drawings.
   6. Measured grade and alignment of any buried pipe installed.

F. Submit documents to Engineer with claim for final Application for Payment.

1.7 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Format and content of manuals.

B. Instruction of Owner's personnel.

C. Schedule of submittals.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Submittals procedures Shop drawings, product data, and samples.

B. Section 01400 - Quality Control: Manufacturer's instructions.

C. Section 01700 - Contract Closeout: Contract Closeout Procedures.

D. Section 01740 - Warranties and Bonds.

E. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.3 QUALITY ASSURANCE

Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.4 FORMAT

A. Prepare data in the form of an instructional manual.

B. Binders: Commercial quality, 8-1/2 x 11 three-ring binders with hardback, cleanable, plastic covers; three inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project and separate building; identify subject matter of contents.

D. Arrange content by process flow under section numbers and sequence of Table of Contents of this Project Manual.

E. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.5 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Engineer, subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

E. Type Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01400.

F. Warranties and Bonds: As specified in Section 01740.

1.6 MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual product specification Sections.

E. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.

C. Include color coded wiring diagrams as installed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: As specified in individual product specification Sections.

O. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.8 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.9 SUBMITTALS

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of work. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes in final form 15 days prior to final inspection. Copy will be returned after final inspection, with Engineer comments. Revise content of documents as required prior to final submittal.

D. Submit six copies of revised volumes of data in final form within ten days after final inspection.

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparation and submittal.

B. Time and schedule of submittals.

1.2 RELATED SECTIONS

A. Document - Invitation to Bid: - Instructions to Bidders: Bid Bonds.

B. Document - General Conditions: Performance Bond and Labor and Material Payment Bonds, Warranty, and Correction of work.

C. Section 01700 - Contract Closeout: Contract closeout procedures.

D. Section 01730 - Operation and Maintenance Data.

E. Individual Specifications Sections: Warranties required for specific products or work.

1.3 FORM OF SUBMITTALS

A. Bind in commercial quality, 8-1/2 x 11 inch three-ring side binders with hardback, cleanable, plastic covers.

B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible principal.

C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified, and the name of the product or work item.

D. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.4 PREPARATION OF SUBMITTALS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item or work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.

B. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.

C. For items of work when acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

SECTION 02060

BUILDING DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition of designated structure and removal of materials from site.

B. Demolition and removal of foundation and slab-on-grade.

C. Disconnecting and removal of identified utilities.

D. Refer to items as indicated.

1.2 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls: Barriers, fences and landscape protection. Dust control.

B. Section 01600 - Material and Equipment.

C. Section 01700 - Contract Closeout: Project record documents.

D. Section 02110 - Site Clearing: Clearing outside periphery of structures.

E. Section 02223 - Backfilling: Backfill materials.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of barricades, fences and temporary work.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual locations of capped utilities, subsurface obstructions, and piping.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control and disposal.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct roadways, sidewalks or hydrants without permits.

E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

1.6 SEQUENCING

Sequence work under the provisions of Section 01010.

1.7 SCHEDULING

A. Schedule work under the provisions of Section 01300.

B. Schedule work to coincide with site excavation work and/or trenching of pipe installation.

C. Describe demolition removal procedures of abandoned storage shed next to Sedimentation Basin #2 and schedule work with Engineer and Owner.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

Fill Material: Type D fill, specified in Section 02223.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide, erect, and maintain temporary barriers and security devices at locations indicated.

B. Protect existing landscaping materials, appurtenances, structures and piping which are not to be demolished.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

D. Mark location of utilities.

3.2 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with installation of 18" Raw Water Main.

B. Cease operations immediately if adjacent structures (i.e. ex. 12" raw water line) appear to be in danger. Notify Engineer. Do not resume operations until directed.

C. Conduct operations with minimum interference to public or private accesses. Maintain egress and access at all times.

D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.

E. Sprinkle work with water to minimize dust. Provide hoses and water connections for this purpose.

3.3 DEMOLITION

A. Disconnect and cap designated utilities within demolition areas.

B. Remove foundation walls and footings to a minimum of two feet below finished grade beyond area of new construction.

C. Remove concrete slabs on grade.

D. Empty buried tanks located within demolition area. Remove buried tanks, components, and piping from site.

E. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01600.

F. Backfill areas excavated caused as a result of demolition in accordance with Section 02223.

G. Rough grade and compact areas affected by demolition to maintain site grades and contours.

H. Remove demolished materials from site.

I. Do not burn or bury materials on site. Leave site in clean condition.

SECTION 02202

ROCK REMOVAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of discovered rock during excavation.

B. Explosives to assist rock removal.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Inspection of bearing surfaces.

B. Section 02211 - Rough Grading.

C. Section 02222 - Excavation: Building excavation.

D. Section 02223 - Backfilling: Backfill materials.

E. Section 02225 - Trenching: Trenching and backfilling for utilities.

1.3 REFERENCES

NFPA 495 - Code for Explosive Materials.

1.4 DEFINITIONS

Rock: Solid mineral material with a volume in excess of ⅓ cu yd or solid material that cannot be removed with a backhoe without drilling or blasting.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate the proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method.

1.6 QUALIFICATIONS

A. Seismic Survey Firm: Company specializing in seismic surveys with five years documented experience.

B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for explosive disintegration of rock and to NFPA 495 for handling explosive materials.

B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

1.8 SCHEDULING

A. Schedule work under the provisions of Section 01300.

B. Schedule work to avoid disruption to occupied buildings nearby.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.

B. Delay Device: Type recommended by explosive firm.

C. Blast Mat Materials: Type recommended by explosives firm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01400.

B. Verify site conditions and note subsurface irregularities affecting work of this Section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Conduct survey and document conditions of buildings near locations of rock removal and prior to blasting, photograph and video existing conditions identifying existing irregularities.

3.3 ROCK REMOVAL - EXPLOSIVE METHOD

A. If rock is uncovered requiring the explosives method for rock disintegration, execute as follows.

B. Advise owners of adjacent buildings or structures in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations.

C. Obtain a seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.

D. Provide seismographic monitoring during progress of blasting operations.

E. Disintegrate rock and remove from excavation.

F. Remove rock at excavation bottom to form level bearing.

G. Remove shaled layers to provide a sound and unshattered base for footings and foundations.

H. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter as a minimum.

I. Remove excavated material from site.

J. Correct unauthorized rock removal or overbreak in accordance with directions of Engineer.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

3.5 PRE-BLAST SURVEY AND BLASTING TECHNIQUES

A. The Contractor is reminded that he has sole and complete responsibility for the conditions on, in, or near the job site, including safety of all persons and property during performance of the Work.

B. The required duty of the Engineer to conduct construction review of the Contractor's performance does not, and is not intended to, include review of the adequacy of the Contractor's safety measures in, on, or near the construction site.

C. The observation of safety provisions of applicable laws and local building and construction codes shall be the responsibility of the Contractor.

D. During the performance of the Work it will be necessary for the Contractor to remove rock from the pipe trench by the use of blasting techniques.

E. Persons responsible for blasting shall be present and supervise all blasting design, loading and shot firing at all times.

F. The contractor shall be required to perform preblast surveys on structures/buildings within one thousand (1,000) feet of blasting operations.

G. The limit for each charge will be set to limit the effects to; air concussion or air blast of .03 psi maximum (140 dB); Particle velocities shall be a maximum of 1.0 in/sec. measured from locations directed by the Engineer.

3.6 PAYMENT FOR ROCK REMOVAL AND DISPOSAL

Rock is an unclassified material and payment for rock blasting, removal, and disposal is included in the lump sum price bid to construct complete the proposed facilities.

SECTION 02207

AGGREGATE MATERIALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

Aggregate materials.

1.2 RELATED SECTIONS

A. Section 01025 - Measurement and Payment: Requirements applicable to unit prices for the work of this Section.

B. Section 01400 - Quality Control: Testing aggregate fill materials.

C. Section 02211 - Rough Grading.

D. Section 02222 - Excavation.

E. Section 02223 - Backfilling.

F. Section 02225 - Trenching.

G. Section 02231 - Aggregate Base Course.

H. Section 02275 - Riprap.

I. Section 02667 - Site Water Lines.

J. Section 02687 - Site Gas Lines.

K. Section 02722 - Site Storm Sewerage Systems.

L. Section 02732 - Site Sanitary Sewerage Systems.

M. Section 02923 - Landscape Grading.

1.3 REFERENCES

A. AASHTO - M147 - Materials for Aggregate and Soil-Aggregate.

B. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

C. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

E. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

F. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

G. ASTM D2487 - Classification of Soils for Engineering Purposes.

H. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

I. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

J. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

K. State of Alabama Highway Department - Standard Specifications for Highway Construction.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Materials Source: Submit name of imported materials suppliers. Provide materials from same source throughout the work. Change of source requires Engineer approval.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Coarse Aggregate Type A1 (ALDOT #57): Pit run washed stone; free of shale, clay, friable material and debris; graded in accordance with ANSI/ASTM C136, within the following limits:

Sieve Size	Percent Passing
2 inches	100
1 inch	95 to 100
½ inch	25 to 60
No. 4	0 to 10
No. 8	0 to 5

B. Coarse Aggregate Type A2 (ALDOT #67): Pit run washed stone; free of clay, shale, friable material and debris; graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Percent Passing
1 inch	100
¾ inch	90 to 100
⅜ inch	20 to 55
No. 4	0 to 10
No. 8	0 to 5

C. Coarse Aggregate Type 3 (ALDOT #8910): Pit run washed stone; free of shale, clay, friable material and debris; graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Percent Passing
½ inch	100
⅜ inch	90 to 100
No. 4	60 to 85
No. 8	40 to 70

No. 50	10 to 25
No. 200	1 to 5

D. Fine Aggregate Type A4 (Sand ALDOT #100): Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ANSI/ASTM C136; within the following limits:

Sieve Size	**Percent Passing**
⅜ inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 90
No. 50	5 to 30
No. 100	0 to 10

2.2 SOURCE QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Tests and analysis of aggregate material will be performed in accordance with ANSI/ASTM D698.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations indicated designated by Architect/Engineer.

B. Stockpile in sufficient quantities to meet project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

B. If a borrow area is indicated, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

SECTION 02211

ROUGH GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of topsoil and subsoil.

B. Cutting, grading , filling and rough contouring the site.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control : Testing fill compaction.

B. Section 02060 - Building Demolition.

C. Section 02110 - Site Clearing.

D. Section 02202 - Rock Removal.

E. Section 02222 - Excavation: Building excavation.

F. Section 02223 - Backfilling: General building area backfilling.

G. Section 02225 - Trenching: Trenching and backfilling for utilities.

H. Section 02921 - Landscape Grading: Finish grading with topsoil to contours.

1.3 REFERENCES

A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

B. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

1.4 SUBMITTALS

Submit under provisions of Section 01300.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Excavated material, graded, free of roots, rocks larger than 1 inch, subsoil, debris, and large weeds.

B. Subsoil: Excavated material, graded, free of lumps larger than 6 inches, rocks larger than 3 inches, and debris.

C. Granular Fill: Type A3 specified in Section 02207.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

B. Verify that survey benchmark and intended elevations for the Work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

C. Notify utility company to remove and relocate utilities.

D. Protect above and below grade utilities which are to remain.

E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

F. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re- landscaped, or re-graded.

B. Stockpile in area designated on site. Remove excess topsoil not being reused, from site.

C. Do not excavate wet topsoil.

D. Stockpile topsoil to depth not exceeding 8 feet. Cover to protect from erosion.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re- landscaped, or re-graded.

B. Stockpile in area designated on site.
C. Remove from site.

D. Do not excavate wet subsoil.

E. Stockpile subsoil to depth not exceeding 8 feet. Cover to protect from erosion.

F. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.

3.5 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth, compacted to 98 percent.

C. Subsoil and Topsoil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth, compacted to 95 percent of the Proctor value.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.

F. Make grade changes gradual. Blend slope into level areas.

G. Remove surplus fill materials from site.

3.6 TOLERANCES

Top Surface of Subgrade: Plus or minus 1/10 foot.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D1557 and with Section 01400.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1556 ANSI/ASTM D1557 and with Section 01400.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Frequency of Tests: As required by the Engineer.

SECTION 02222

EXCAVATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavation for building foundations.

B. Excavation for slabs-on-grade, paving, landscaping.

C. Excavation for site structures.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Inspection of bearing surfaces.

B. Section 01500 - Construction Facilities and Temporary Controls: Dewatering excavations and water control.

C. Section 02202 - Rock removal: Removal of Rock during excavation.

D. Section 02211 - Rough Grading: Topsoil and subsoil removal from site surface.

E. Section 02223 - Backfilling.

F. Section 02225 - Trenching: Excavation for utility trenches.

1.3 FIELD MEASUREMENTS

Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

C. Notify utility company to remove and relocate utilities.

D. Protect above and below grade utilities which are to remain.

E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

F. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.2 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, site structures, and construction operations.

C. Machine slope banks.

D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to ⅓ cu yd measured by volume. Larger material will be removed under Section 02202.

H. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Correct areas over-excavated by error in accordance with Section 02222.

K. Stockpile excavated material in area designated on site and remove excess material not being reused, from site Remove excavated material from site.

3.3 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400.

B. Provide for visual inspection of bearing surfaces.

3.4 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

SECTION 02223

BACKFILLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building perimeter and site structure backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill under slabs-on-grade and paving.

D. Consolidation and compaction.

E. Fill for over-excavation.

F. Sheet vapor retardant and cover over crawl space and fill.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Testing Fill compaction.

B. Section 02222 - Excavation.

C. Section 02225 - Trenching: Backfilling of utility trenches.

D. Section 03300 - Cast-in-Place Concrete: Concrete materials.

1.3 REFERENCES

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

1.4 SUBMITTALS

Submit under provisions of Section 01300.

1.5 DEFINITIONS

A. Excavation
   1. Removal of earth and rock to form cavities for the construction of foundations and structures and to form trenches for the installation of piping.
   2. Cavity formed by the removal of earth and rock.

B. Earth

1. Unconsolidated material in the crust of the earth derived by weathering and erosion includes:
    a. materials of both inorganic and organic origin;
    b. boulders less than ⅓ cubic yard in volume, gravel, sand, silt, and clay;
    c. materials which can be excavated with backhoe, trenching machine, drag line, clam shell, bulldozer, highlift, or similar excavating equipment without the use of explosives, rock rippers, rock hammers, or jack hammers.

C. Rock
1. A natural aggregate of mineral particles connected by strong and permanent cohesive forces. Rock includes:
    a. limestone, sandstone, dolomite, granite, marble, and lava;
    b. boulders ⅓ cubic yard or more in volume;
    c. materials which cannot be excavated by equipment which is used to remove earth overburden without the use of explosives, rock rippers, rock hammers, or jack hammers;
    d. materials which cannot be excavated with a backhoe, trenching machines, drag line, clam shell, bulldozer, highlift, or similar excavating equipment without the use of explosives, rock rippers, rock hammers, or jack hammers.

D. Undercutting
Excavation of rock and unsuitable earth below the bottom of a foundation, structure, or pipe to be constructed or installed.

E. Subgrade
Undisturbed bottom of an excavation.

F. Pipe Foundation Backfill.
Crushed limestone or crushed dolomite placed as directed by the Engineer to stabilize an unsuitable subgrade below the pipe bedding. The gradation shall be determined by the Engineer and could include rock removed from the pipe trench.

G. Pipe Bedding
1. Crushed limestone or crushed dolomite meeting minimum standards for gradation as set forth by the State of Alabama Department of Transportation (ALDOT) for number 57 stone.
2. Crushed limestone or crushed dolomite placed from level six inches minimum below the bell of pipe to the bell of pipe, as shown in the pipe installation detail in the Drawings.

H. Pipe Haunching
1. Crushed limestone or crushed dolomite meeting minimum standards for gradation as set forth by the State of Alabama Department of Transportation (ALDOT) for number 57 stone.
2. Crushed limestone or crushed dolomite from the bottom of bell of pipe to the centerline of the pipe.

I. Pipe Initial Backfill
1. Crushed limestone or crushed dolomite meeting minimum standards for gradation as set forth by the State of Alabama Department of Transportation (ALDOT) for number 57 stone.
2. Crushed limestone or dolomite placed from top of pipe haunching to one foot (1') above the top of the pipe.

J. Pipe Final Backfill
1. Pipe Trenches Cut in Natural Soil
    a. Earth placed in a pipe trench from the top of pipe zone (or top of initial backfill) to finished grade.
2. Pipe Trenches Cut in Pavement

a. Pipe initial backfill material placed in trench from top of pipe zone (top of initial backfill) to sub-base of pavement.

3. Pipe Trenches Cut Under Structures
   a. Pipe initial backfill material placed in trench from top of pipe zone (top of initial backfill to sub-base of structure.

K. Topsoil
Earth containing sufficient organic materials to support the growth of grass.

L. Structure Foundation Bedding
Crushed limestone or crushed dolomite meeting minimum standards for gradation as set forth by the State of Alabama Department of Transportation (ALDOT) for number 57 stone.

M. Structure Foundation backfill
1. Crushed limestone or crushed dolomite placed as directed by the Engineer to stabilize an unsuitable subgrade below structure foundations. The gradation shall be determined by the Engineer.
2. Six (6) inches of foundation backfill required on all structures.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Type A : Pit run, washed natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 meeting the requirement of coarse aggregate type A1 (ALDOT #57), Section 02207.2.1.

B. Type B: Pit run; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, meeting the requirements of coarse aggregate type A3 (ALDOT #8910) , Section 02207.2.1:

C. Type C - Sand: Natural river or bank sand; washed: free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136, meeting the requirements of fine aggregate type A4 (ALDOT #100), Section 02207.2.1:

D. Type D - Select Fill: Material excavated from site and approved by Engineer.

E. Subsoil: Reused, free of gravel larger than 3 inch size, and debris.

F. Concrete: Structural concrete conforming to Section 03300 with a compressive strength of 3500 psi.

2.2 ACCESSORIES

A. Geotextile Fabric: Amoco 2006 or equivalent.

B. Vapor Retardant: 30 mil thick, polyethylene.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify fill materials to be reused are acceptable.

B. Verify foundation perimeter drainage installation has been inspected.

C. Verify underground tanks are anchored to their own foundation to avoid floatation after backfilling.

3.2 PREPARATION

A. Generally, compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type B fill and compact to density equal to or greater than requirements for subsequent backfill material.

C. Prior to placement of aggregate base course material at paved areas, compact subsoil to 98 percent of its maximum dry density in accordance with ANSI/ASTM D698.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth.

D. Soil Fill: Place and compact material in continuous layers not exceeding 12 inches compacted depth.

E. Employ a placement method that does not disturb or damage foundation waterproofing and protective cover.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

H. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.

I. Make grade changes gradual. Blend slope into level areas.

J. Remove surplus backfill materials from site.

K. Leave fill material stockpile areas completely free of excess fill materials.

3.4 TOLERANCES

Top Surface of Backfilling : Plus or minus one inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D698 and with Section 01400.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1556.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no

cost to Owner.

E. Frequency of Tests: As required by the Engineer.

F. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500

B. Recompact fills subjected to vehicular traffic.

3.7 SCHEDULE

A. Interior Slab-On-Grade:
Type A fill, 6 inches thick.

B. Fill Under Grass Areas:
1. Subsoil fill, to 6 inches below finish grade, compacted to 95 percent.
2. Topsoil fill, final 6".

C. Fill Under Landscaped Areas:
1. Subsoil fill, to 12 inches below finish grade, compacted to 95 percent.
2. Topsoil fill, final 6".

D. Fill for French Drains:
Type B fill, to 12 inches below finish grade, compacted to 90 percent.

E. Fill Under Asphalt Paving:
Type B fill, to 12 inches below finish paving elevation, compacted to 98 percent.

F. Fill to Correct Over-excavation:
Lean concrete to minimum compressive strength of 3500 psi.

SECTION 02225

TRENCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavate trenches for utilities.

B. Compacted bedding under fill over utilities to subgrade elevations.

C. Backfilling and compaction.

1.2 RELATED SECTIONS

A. Section 01400- Quality Control: Testing fill compaction.

B. Section 01500 - Construction Facilities and Temporary Controls: Water control in excavations.

C. Section 02202 - Rock removal: Removal of rock during excavation.

D. Section 02211 - Rough Grading: Topsoil and subsoil removal from site surface.

E. Section 02923 - Landscape Grading: Filling of topsoil over backfilled trenches to finish grade elevation.

F. Section 02222 - Excavation: General building excavation.

G. Section 02223 - Backfilling: General backfilling.

H. Section 03300 - Cast-in-Place Concrete: Concrete materials.

1.3 REFERENCES

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. Rammer and 12 inch Drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.4 FIELD MEASUREMENTS

Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

Types A, B, C, D Subsoil and Concrete materials as specified in Section 02223.

2.2 BED MATERIALS

A. Type 1 Material: As specified for Type A1 in Section 02207.

B. Type 2 Material: As specified for Type A2 in Section 02207.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify fill materials to be reused, are acceptable.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type 2 fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.3 EXCAVATION

A. Excavate subsoil required for storms sewer sanitary sewer water gas and process piping to main lines.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.

D. Hand trim excavation. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock up to ⅓ cu yd, measured by volume. Larger material will be removed under Section 02202.

F. Correct unauthorized excavation at no cost to Owner.

G. Correct areas over-excavated by error in accordance with Section 02222.

H. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.4 BEDDING

Support pipe and conduit during placement and compaction of bedding fill.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous,

wet, frozen or spongy subgrade surfaces.

C. Granular Fill: Place and compact materials in continuous layers not exceeding 6 inches compacted depth.

D. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.

E. Employ a placement method that does not disturb or damage foundation perimeter drainage, conduit, duct in trench, and pipe.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Leave fill material stockpile areas completely free of excess fill materials.

3.6 TOLERANCES

A. Top Surface of Backfilling: Under Paved Areas: Plus or minus one inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus one inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D698 and with Section 01400.

C. Compaction testing will be performed in accordance with ANSI/ASTM D698 and with Section 01400.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.8 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Recompact fills subjected to vehicular traffic.

SECTION 02607

MANHOLES AND COVERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

Modular precast concrete manhole sections with tongue-and-groove joints, covers, anchorage and accessories.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

Section 05500 - Miscellaneous Metals: Placement of fabricated steel items.

1.3 RELATED SECTIONS

A. Section 02222 - Excavating: Excavating for manholes and base pads.

B. Section 02223 - Backfilling: Backfilling after manhole installation.

C. Section 03300 - Cast-In-Place Concrete.

D. Section 04100 - Mortar and Masonry Grout: Mortar and grout.

E. Section 15430 - Plumbing Specialties: Manhole accessories.

F. Section 16118 - Ductbank: Manhole accessories.

1.4 REFERENCES

A. ANSI/ASTM C55 - Concrete Building Brick.

B. ASTM A48 - Gray Iron Castings.

C. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

D. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

E. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate manholes locations, elevations, piping, conduit, and device sizes and elevations of penetrations.

C. Product Data: Provide manhole covers, component construction, features, configuration, dimensions and concrete mix design.

1.6 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hansen Pipe & Products

B. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

B. Mortar and Grout: As specified in Section 04100.

C. Reinforcement: Reinforcing steel shall conform to ASTM A615, Grade 40 deformed bars or ASTM A616, Grade 40 deformed bars.

2.3 COMPONENTS

A. Manhole Lid and Frame: ASTM A48, Class 30B Cast iron construction, machined flat bearing surface, removable, boltable lid, closed lid design; total weight of not less than 400 pounds; sealing gasket; lid molded with identifying name; Model V-2480 manufactured by Vulcan Foundry or equivalent.

B. Manhole Steps: Formed integral with manhole sections.

C. Base Pad: Pipe bedding specified in Section 02223, leveled top surface.

D. Strap Anchors: Bent steel shape, 3 x 16 inch size x ½ inch bitumastic coal tar epoxy finish.

E. Concrete: Precast manholes shall be wet cast utilizing 4,000 psi concrete containing cement Type II with a C_3A content of 5.5% or less. Monolithic manholes shall use 4,500 psi concrete containing Type II cement with a C_3A content of 5.5% or less.

F. Interior Coating: Coal tar epoxy as manufactured by Koppers Company, Bitumastic No. 300-M; or equal. Final dry mils thickness shall be a minimum of 12 mils.

G. Concentric Cone: Each cone shall have a manhole backstep to help with entry into manhole.

H. Manholes shall be constructed to the sizes, shapes, and dimensions as detailed in Section 6.00, titled "STANDARD DRAWINGS", and at the locations shown on the plans. They shall be constructed of precast concrete sections. The depth of the manhole will vary with the location but in all cases it shall be such as will place the cover (or lid) at the finished grade of the pavement or ground surface or as otherwise indicated on the plans. In undeveloped or rural area, manholes shall be furnished to a height of two (2) feet above ground. The invert shall be placed at the elevation shown on the plans. Eccentric cone sections will not be allowed; only concentric cones shall be used, as detailed in Section 6.00, titled "STANDARD DRAWINGS."

I. The design of manhole base sections shall be approved by the Engineer prior to manufacture. Openings in manhole walls for incoming and outgoing sewers shall be precast and after installation sealed with an approved non-shrinking grout. These manholes shall be installed on a choked and compacted stone bedding.

J. Flexible manhole sleeves ("boots") may be approved by the Engineer as an alternate method of sealing the space between the manhole wall and the pipe. Flexible manhole sleeves may be allowed on all pipe 18" and smaller. The flexible sleeve shall be similar to Kor-N-Seal or equal and conform to ASTM Specification C923 and shall be made from ethylene propylene rubber (EPDM). Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to ASTM Specifications C923 and ASTM A167.

K. Precast concrete manholes for sewers 48 inches in diameter and larger shall be as specified above, except that they shall be installed on a saddle constructed on the barrel of the sewer. Precast concrete manholes for sewers 30, 36 and 42 inches shall be saddle-type or precast base types as specified in the Plans. General details of the precast manhole bases and the saddles for various pipe sizes are given in the Drawings. Reinforcing steel in the saddle shall be welded to the reinforcing steel of the pipe. The design of these saddles shall be approved by the Engineer prior to manufacture.

L. All joints for precast manhole stacks shall be tongue and groove with gaskets meeting the approval of the Engineer.

M. Where the difference in the invert elevation of 2 or more sewers, 18 inches in diameter or smaller, intersecting in one (1) manhole is 2 feet or more, a Memphis Tee Manhole (drop manhole) shall be constructed in the manner shown in Section 6.00. They shall be similar in construction to the standard manhole, except that a drop connection of a pipe and fittings of the proper size and material shall be constructed outside the manhole and supported by Class B concrete as indicated on the plans. The manhole and the drop connection shall be placed on 12 inch reinforced concrete base. The drop connection piping assembly shall be bolted to the barrel of the manhole riser using four 5/8 inch diameter stainless steel (316) bolts with suitable washers to prevent failure caused by pulling the bolt head through the manhole wall.

N. Base sections shall be precast with the vertical walls of sufficient height to allow entry of the required pipes as called for on the plans. Manhole inverts shall be constructed of cement mortar and shall have the same cross-section as the invert of the sewers which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.

O. All water standing in the trench shall be removed before placing of concrete is started, and the foundation maintained in a dry condition.

P. Precast manholes shall be constructed using 16" risers or multiples thereof.

Q. The top elevation of manhole frames must be adjusted to grade in areas such as streets, alleys, and parking lots or where indicated on plans. A maximum adjustment of 16 inches will be allowed using brick and mortar. Adjustments greater than 16 inches must be made by changing precast riser sections.

2.4 CONFIGURATION

A. Shaft Construction: Concentric with concentric cone top section; lipped male/female dry joints; sleeve to receive pipe conduit and device sections.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: 48", 60", 72", 84" or 96".

D. Design Depth: 48" to 96" as approved by Engineer.

E. Clear Lid Opening: 26 inches diameter.

F. Pipe and Conduit Entry: Provide openings as required.

G. Steps: 18 inches wide, 16 inches on center vertically steel reinforced copolymer polypropylene, set into manhole wall or aluminum ladder as shown on the drawings.

H. Inserts: Manhole lift system as manufactured by Press-Seal Corporation.

2.5 MISCELLANEOUS CASTINGS

A. Valley gutter inlet shall be Neenah Model R-3382 or equivalent.

B. Curb inlet shall be Neenah Model R-3305 or equivalent.

C. Yard inlet shall be Neenah Model R-3409 or equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.2 PREPARATION

Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.3 INSTALLATION OF MANHOLE AND OTHER STRUCTURES

A. Precast concrete manhole sections shall conform to ASTM Designation C478, except as modified herein:
   1. The joint design of the precast sections consist of a bell or groove on one end of the unit of pipe and a spigot or tongue on the adjacent end of the joining section.
   2. The joint shall consist of a round rubber gasket confined in a groove in the spigot end of the precast manhole section and shall conform to Sections 6.1, 6.1.7., and 9 of ASTM Designation C443, latest revision.

B. Openings in manhole sections for pipe connections shall be cut to the point of manufacture and shall be circular or horseshoe shaped with grooved or roughened surfaces to improve mortar bond. Any additional holes cut in the field shall be accomplished as specified in this Section.

C. Manhole bases shall be cast-in-place concrete, reinforced as shown on the Standard Detail Sheet of monolithic base and first section combination. Manhole bases shall be cast or placed on a minimum of 6 inches of compacted crushed stone.

D. Manhole channels or inverts shall be preformed and poured with Class "B" concrete to the spring line of the connecting pipe. The finished invert shall be semi-circular shaped smooth channel directing the flow to the downstream pipe.

E. Precast manhole sections, when used, shall have the exterior surfaces of each section thoroughly coated with a coal tar epoxy type coating as manufactured by Koppers Company, Bitumastic Nol 300-M; Port Coatings, Taramastic 100; or equal. Monolithic manholes and other concrete structures shall be coated in the field with a coat tar epoxy type coating. Coating shall be 8 mil minimum dry film thickness. Each joint after being fully mortared shall be coated with a coat tar epoxy type coating upon reaching its final set.

F. Connecting pipe shall be connected into manholes by means of a resilient connector between reinforced concrete manhole structures and pipe in accordance with ASTM C923. A waterstop gasket embedded in the manhole barrel similar or equal to Press Wedge II would be acceptable.

G. All PVC pipe entering a manhole shall have manhole waterstop gasket as supplied by the manufacturer firmly clamped around the pipe. If flexible entry type manhole system is used, the waterstop gasket is not required.

H. Manhole frames and lids shall weigh not less than 400 pounds and be of good quality cast iron, conforming to ASTM Designation A481 and as shown in the Contract Documents. Unless specifically designated otherwise, manhole castings shall be the non-locking type. All manhole frames shall be cast or drilled with three holes equally spaced around base of frame and shall be securely anchored to cone section with three ⅜ inch bolts, nuts and washers. The joint between the casting frame and cone section shall be fully mortared or gasketed and coated with a coal tar epoxy coating upon reaching its final set to become a watertight joint.

SECTION 02923

LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

Final grade topsoil for finish landscaping.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Testing fill compaction.

B. Section 02211 - Rough Grading: Site contouring.

C. Section 02223 - Backfilling: Backfilling at building areas.

D. Section 02225 - Trenching: Backfilling trenches.

E. Section 02510 - Asphaltic Concrete paving.

F. Section 02936 - Seeding: Finish ground cover.

PART 2 - PRODUCTS

2.1 MATERIAL

Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify building and trench backfilling has been inspected.

B. Verify substrate base has been contoured and compacted.

3.2 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of ½ inch in size. Remove subsoil contaminated with petroleum products.

C. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment is used for hauling and spreading topsoil and has compacted subsoil.

3.3 PLACING TOPSOIL

A. Place topsoil in areas where seeding, to a nominal depth of 6 inches. Place topsoil during dry weather.

B. Fine grade topsoil eliminating rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks and foreign material while spreading.

D. Manually spread topsoil close to trees, plants and building to prevent damage.

E. Roll placed topsoil.

F. Remove surplus subsoil and topsoil from site.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 TOLERANCES

Top of Topsoil: Plus or minus ½ inch.

3.5 PROTECTION

A. Protect landscaping and other features remaining as final work.

B. Protect existing structures, fences, sidewalks, utilities, paving and curbs.

SECTION 02936

SEEDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, Hydroseeding, mulching and fertilizer.

D. Maintenance.

1.2 RELATED SECTIONS

A. Section 02223 - Backfilling: Rough grading of site.

B. Section 02225 - Trenching: Rough grading over cut.

C. Section 02923 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this Section.

1.3 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

B. Alabama Department of Transportation Standard Specifications.

1.4 DEFINITIONS

Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; and types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.7 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilized in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 MAINTENANCE SERVICE

Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two cuttings.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

A. March thru July
   1. Bermuda Grass (Hulled)

B. August thru February
   1. Bermuda Grass (Unhulled)
   2. Kentucky Blue Grass 40% of mixture

2.2 SOIL MATERIALS

Topsoil: Excavated from site and free of weeds, or if none is available at site topsoil must meet Section 02923.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Manufactured fertilizer shall be 8% nitrogen, 8% phosphorus, and 8% potash with 50% of the elements derived from organic sources.

C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

D. Erosion Fabric: Woven jute fabric, open mesh construction smolder-resistant treated. Fabric shall be Belton Anti-Wash/Geojute.

E. Metal Staples: Softwood lumber, chisel pointed.

F. String: Inorganic fiber.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify that prepared soil base is ready to receive the work of this Section.

3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

C. Scarify subsoil to a depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 6 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.4 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions at 1500 lbs per acre.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.5 SEEDING

A. Apply seed at a rate of 2 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: As per Alabama Department of Transportation Specifications.

D. Do not sow immediately following rain, or when ground is too dry, or during windy periods.

E. Roll seeded area with roller not exceeding 112 lbs.

F. Immediately following seeding and compacting apply mulch to a thickness of ⅛ inches.

G. Apply water with a fine spray immediately after each area has been mulched. Saturate to depth of 4 inches of soil.

3.6 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of 5 lbs per 1000 sq ft evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of ⅛ inches. Maintain clear of shrubs and trees.

D. Asphalt adhesive shall be used in mulching operations on the areas to be grassed.

E. Asphalt adhesive shall be applied per Alabama Department of Transportation Section 860.03.7.

F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.7 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 6 inches. Space stakes at 48 inches.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36 inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.8 MAINTENANCE

A. Mow grass at regular intervals to maintain at a maximum height of 2 ½ inches. Do not cut more than ⅓ of grass blade at any one mowing.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas which show bare spots.

H. Protect seeded areas with warning signs during maintenance period.

I.

3.9 PAYMENT

A. Basis of Measurement: Per Square Yard

B. Basis of Payment: Furnish and install seed, topsoil mulch fertilizer, jute-mat, water, preparation of soil.

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03300 - Cast-In-Place Concrete: Supply of concrete accessories for placement by this Section.

B. Section 04300 - Unit Masonry: Supply of masonry accessories for placement by this Section.

C. Section 05500 - Miscellaneous Metals: Supply of metal fabrications for placement by this Section.

D. Division 15 - Mechanical: Supply of mechanical items for placement by this Section.

E. Division 16 - Electrical: Supply of electrical items for placement by this Section.

1.3 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement.

B. Section 03300 - Cast-in-Place Concrete.

1.4 REFERENCES

A. ACI 347 - Recommended Practice For Concrete Formwork.

B. ANSI/ASME A17.1 - Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks.

C. PS-1 - Construction and Industrial Plywood.

1.5 DESIGN REQUIREMENTS

Design, engineer and construct formwork, shoring and bracing to conform to code requirements; resultant concrete to conform to required shape, line and dimension.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

C. Product Data: Provide data on void form materials and installation requirements.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with ACI Codes.

B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

Design formwork under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located in the State of Alabama.

1.9 REGULATORY REQUIREMENTS

Conform to applicable code for design, fabrication, erection and removal of formwork.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver void forms and installation instructions in manufacturer's packaging.

C. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.11 COORDINATION

A. Coordinate this Section with other Sections of work which require attachment of components to formwork.

B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.

PART 2 - PRODUCTS

2.1 WOOD FORM MATERIALS

Form Materials: At the discretion of the Contractor.

2.2 MANUFACTURERS - PREFABRICATED FORMS

A. At the discretion of the Contractor.

B. Substitutions: Under provisions of Section 01600.

2.3 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

C. Pan Type: Steel of size and profile required.

D. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes required.

E. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.4 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than one inch.

B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.

C. Corners: Chamfered, wood strip type; ¾ inch size; maximum possible lengths.

D. Dovetail Anchor Slot: Galvanized steel, 22 gage thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

E. Flashing Reglets: Galvanized steel, gage thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

G. Waterstops: Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, 9 inches wide in contraction and expansion joints, or 6 inches wide in pumpwell, clearwell and slabs, maximum possible lengths, ribbed profile preformed corner sections, heat welded jointing.

H. Waterstops: Steel waterstops 6" wide shall be saw cut into place when connecting new construction to existing structures or use Greenstreak Model 60951 waterstop.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.2 EARTH FORMS

Earth forms are not permitted.

3.3 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members which are not indicated on Drawings.

F. Provide chamfer strips on external corners of beams and columns.

G. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

H. Remove all wood; organic and deleterious materials from forms before pouring concrete. There shall not be any wood; organic or deleterious materials left in hardened concrete.

I. Bevel strips shall be placed at all points where angles occur in walls and at all tops (exposed edges) of exposed wells.

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Position recessed reglets for brick veneer masonry anchors to spacing and intervals specified in Section 04300.

E. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

F. Install waterstops continuous without displacing reinforcement. Heat seal joints watertight.

G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms, unless formwork and concrete construction proceed within heat enclosure. Use compressed air or other means to remove foreign matter.

E. All forms shall be thoroughly cleaned and washed immediately before beginning a pour.

3.7 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

B. Camber slabs and beams ¼ inch per 10 feet in accordance with ACI 301.

3.8 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

B. Do not reuse wood formwork more than 8 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.9 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Do not remove forms or bracing until a minimum of 72 hours, from the completion of the pour, has passed.

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2 RELATED SECTIONS

A. Section 03100 - Concrete Formwork.

B. Section 03300 - Cast-in-Place Concrete.

C. Section 03346 - Concrete Floor Finishing: Reinforcement for concrete floor toppings.

D. Section 04200 - Unit Masonry: Reinforcement for masonry.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 318 - Building Code Requirements For Reinforced Concrete.

C. ACI SP-66 - American Concrete Institute - Detailing Manual.

D. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.

E. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

G. ANSI/ASTM A496 - Deformed Steel Wire Fabric for Concrete Reinforcement.

H. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

I. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.

J. ANSI/AWS D12.1 - Reinforcing Steel Welding Code.

K. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

L. ASTM A616 - Rail Steel Deformed and Plain Bars for Concrete Reinforcement.

M. ASTM A617 - Axle Steel Deformed and Plain Bars for Concrete Reinforcement.

N. ASTM A704 - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

O. ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

P. ASTM A767 - Zinc-Coated (Galvanized) Bars for Concrete Reinforcement.

Q. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

R. CRSI - Concrete Reinforcing Steel Institute Manual of Practice.

S. CRSI 63 - Recommended Practice For Placing Reinforcing Bars.

T. CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with CRSI Manual of Practice.

B. Maintain one copy of each document on site.

C. Submit certified copies of mill test report of reinforcement materials analysis.

D. Provide Engineer with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

1.6 COORDINATION

Coordinate with placement of formwork, formed openings and other work.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, plain.

B. Reinforcing Steel Mat: ASTM A615, 60 ksi yield grade; steel bars or rods, plain finish.

C. Stirrup Steel: ANSI/ASTM A82, plain.

D. Welded Steel Wire Fabric: ASTM A497 Welded Deformed Type; in flat sheets or rolls; plain finish.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice.

B. Weld reinforcement in accordance with ANSI/AWS D12.1.

C. Galvanized Epoxy Coated Reinforcement: Clean surfaces, weld and reprotect welded joint in accordance with manufacturer's instructions.

D. Locate reinforcing splices not indicated on Drawings, at point of minimum stress. Review location of splices with Engineer.

E. Bends shall be made around a pin having a diameter not less than six (6) times the bar diameter except for bars larger than one (1) inch, in which case the bends shall be made around a pin of eight (8) bar diameters.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as follows:

Item	Coverage
Beams	2 inch
Supported Slabs and Joists	2 inch
Column Ties	2 inch
Walls (exposed to weather or backfill)	3 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Fill	3 inch

E. Length of splices or laps shall be as shown on the Drawings, but in no case shall the length of lap be less than thirty-two (32) bar diameters.

3.2 FIELD QUALITY CONTROL

Field inspection will be performed under provisions of Section 01400.

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete, building frame members, floors, shear walls, foundation walls, supported slabs and footings.

B. Floors and slabs on grade.

C. Control, and expansion and contraction joint devices associated with concrete work, including joint sealants.

D. Equipment pads, light pole base, and thrust blocks.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

Section 03100 - Concrete Formwork:
Placement of joint device in formwork.

1.3 RELATED SECTIONS

A. Section 03100 - Concrete Formwork: Formwork and accessories.

B. Section 03200 - Concrete Reinforcement.

C. Section 05800 - Expansion Control.

D. Section 07900 - Joint Sealers.

E. Section 15050 - Plant and Plumbing Piping: Mechanical items for casting into concrete.

F. Section 16130 - Electrical Boxes: Electrical items for casting into concrete.

1.4 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 302 - Guide for Concrete Floor and Slab Construction.

C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 308 - Standard Practice for Curing Concrete.

G. ACI 3 Building Code Requirements for Reinforced Concrete.

H. ANSI/ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).

I. ANSI/ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.

J. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

K. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

L. ASTM C33 - Concrete Aggregates.

M. ASTM C94 - Ready-Mixed Concrete.

N. ASTM C150 - Portland Cement.

O. ASTM C330 - Light Weight Aggregates For Structural Concrete.

P. ASTM C494 - Chemicals Admixtures for Concrete.

Q. ASTM C618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on joint devices, attachment accessories, admixtures and mix design.

C. Samples: Submit two inch long samples of expansion/contraction joint control joint and waterstop.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Maintain one copy of document on site.

C. Acquire cement and aggregate from same source for all work.

D. Conform to ACI 305R when concreting during hot weather.

E. Conform to ACI 306R when concreting during cold weather.

1.8 FIELD SAMPLES

A. Provide under provisions of Section 01400. Coordinate with Section 03100.

B. Construct and erect a field sample for architectural concrete surfaces receiving special treatment or finish as result of formwork.

1.9 COORDINATION

A. Coordinate work under provisions of Section 01400.

B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I.

B. Fine Aggregate: ASTM C33, natural quartz sand; sand made from crushing stone shall not be acceptable.

Sieve Size	Percent Passing
⅜ "	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60
#50	10-30
#100	2-10

C. Coarse Aggregate: ASTM C33, hard, durable, dense particles of stone or gravel.

Sieve Size	Percent Passing
1 ½ "	100
1 "	95-100
½ "	25-60
#4	0-10
#8	0-5

D. Fine Aggregates: ASTM C33.

E. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Chemical: ASTM C494, Type A - Water Reducing or Type D - Water Reducing and Retarding admixture containing no chlorides; manufactured by W.R. Grace WRDA-64 or equivalent.

B. Fly Ash: ASTM C618; Type F with a loss on ignition of 6% maximum. Maximum allowable alkalies as Na_2 shall be 1.5%.

2.3 ACCESSORIES

A. Bonding Agent: Acrylic manufactured by Thoro Systems or Sonneborne.

B. Vapor Barrier: 6 mil thick clear polyethylene film, type recommended for below grade application.

C. Non-Shrink Grout: Premixed compound consisting of non- metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 4,000 psi in 48 hours and 8,900 psi in 28 days; Sika Grout 212 manufactured by Sika or equivalent.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D1751, ASTM D994; Asphalt impregnated fiberboard or felt, ¼ inch thick; tongue and groove profile. This filler shall be used on sidewalls, curb and gutters, valley gutters and concrete paving slabs.

B. Joint Filler Type B: ASTM D1752, Type 1; Premolded sponge rubber, fully compressible with recovery rate of minimum 95 percent.

C. Ceramar is an acceptable alternative. If used, this filler shall be used on all structures.

D. Sealant and Primer: A type, as specified in Section 07900.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94, Alternative No. 1.

B. Select proportions for normal weight concrete in accordance with ACI 301 2.

C. Provide concrete mix Type 'A' to the following criteria:
   1. Compressive Strength (7 days): 3300 psi
   2. Compressive Strength (28 days): 4500 psi
   3. Slump: 3 to 4 inches
   4. Water/Cement Ratio: 0.43

D. Provide concrete mix Type 'B' to the following criteria:
   1. Compressive Strength (7 days): 1800 psi
   2. Compressive Strength (28 days): 3000 psi
   3. Slump: 3 to 4 inches
   4. Minimum water to cement ratio: 0.59

E. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.

F. Use set retarding admixtures during hot weather only when approved by Engineer.

G. An approved fly ash may be used as a partial cement replacement in Class A or Class B concrete in an amount not to exceed one-half (½) cubic foot provided all applicable requirements for these classes of concrete are met and proposed mix designs are checked by Engineer.

H. Class A shall contain 517 pounds of cement with 100 pounds of Type F fly ash minimum or 564 pounds of cement minimum without any fly ash.

I.

2.6 EPOXY ADHESIVE AND GROUT

A. Epoxy adhesive and grout shall be epoxy-resin systems meeting the requirements of ASTM C 881 and the additional requirements herein.

B. The proper type, grade, and class (ASTM C 881) shall be chosen to suit the job requirements as follows:
   1. Type
      I - For bonding hardened concrete and other materials to hardened concrete and setting anchor bolts and reinforcing bars in hardened concrete.
      II - For bonding freshly mixed concrete to hardened concrete.
      III - For bonding skid resistant materials to hardened concrete and as a binder in epoxy mortars or epoxy concrete.
   2. Grade
      a. - For crack injection and spray application, light viscosity.
      b. - For brush application, medium viscosity.
      c. - For trowel or caulking gun application, non-sagging heavy viscosity for filling voids and gaps.
   3. Class
      A - For use below 40° F.
      B - For use between 40° F and 60° F.
      C - For use above 60° F.
   4. Color
      All epoxy adhesives and grouts shall be concrete grey or clear if they will be visible on the final concrete surface.

C. The epoxy material shall consist of a two-component system conforming to the following requirements:
   1. Properties of mixed components shall meet the following requirements:
      Solids content
      100% by weight
      Pot Life 30 min. (min.) at 75° F
      Contact time 2 hours @ 75° F
      Tank free time 4 hours min. @ 75° F
   2. Properties of cured material shall meet the following requirements.
      Neat Binder
      Tensile Strength
      3,200 psi min. @ 14 days
      ASTM D-638 7° F cure
      Tensile Elongation
      1% min. @ 14 days,
      ASTM D-638 (Modified) 75° F cure
      Compressive Strength
      12,000 psi min. @ 14 days
      ASTM D-695 75° F
      Compressive Modulus 400,000 psi min. @ 28 days, 75° F
      Water Absorption 1% by weight, maximum 14 days 75° F cure 24 hours immersion
      Grout: One part Binder to three-and quarter parts aggregate by loose volume
      Compressive Strength 12,000 psi min. @ 28 days
      ASTM C-109 (Modified) days, 75° F cure (2" cubes)
      Compressive Modulus1,250,000 psi min. 28 days, 75° F cure (Modified)
   3. Aggregate shall meet the requirements of the resin manufacturer.
   4. Chemical acceptance for SPI Classification -2- ('A' Component).
      a. The cured system shall meet the requirements of the U.S. Department of Agriculture for use in food processing plants.

b. The cured system shall meet the requirements of U.S. Government regulations requiring water extractable of less than 0.5 MG per square inch of exposed surface for potable water containers. Tests for water extractables shall meet the requirements of the Environmental Control Administration of the U.S. Public Health Service.
The epoxy shall be "Ecuo Epoxy #615" by the Euclid Chemical Company or "Sikador Hi-Mod" by Sika Chemical Corporation.

2.7 GENERAL CONSTRUCTION GROUT

A. Non-shrink, expanding type.

B. Non-ferrous, non-staining non-bleeding.

C. Compressive strength at 28 days - 5000 psi.

D. Expensive mechanism shall not employ gas-generating or air-release systems.

E. Grout shall conform to ASTM C1107

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01400.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Subgrade and/or surface to be poured against shall be free of sawdust, debris, water, ice, snow, frozen material, extraneous oil, mortar or any other materials that may be deleterious to the concrete.

D. Clean rock surfaces by air-water cutting, a wet sandblasting or wire brush scrubbing. Wet rock surfaces immediately prior to placing concrete.

E. Earth surfaces shall be firm and damp.

F. Do not place Class A concrete on mud, dried earth, uncompacted fill, or frozen subgrade. Mud mats of Class B concrete or six inch minimum of crushed limestone material will be required.

G. Any flow of water into or through the forms shall be diverted through proper side drains into a sump or removed by other approved methods which will prevent washing the freshly deposited concrete.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304.

B. Notify Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and conduit are not disturbed during concrete placement.

D. Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by sealant applied between overlapping edges and ends.

E. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches and seal watertight.

F. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.

G. Separate slabs on grade from vertical surfaces with 1 inch thick joint filler.

H. Extend joint filler from bottom of slab to within ½ inch of finished slab surface. Conform to Section 03300.2.4.D for finish joint sealer requirements.

I. Install joint devices in accordance with manufacturer's instructions.

J. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.

K. Apply sealants in joint devices in accordance with Section 07900.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Place floor slabs in pattern indicated.

P. Saw cut joints within 24 hours after placing. Using 3/16 inch thick blade, cut into ¼ depth of slab thickness.

Q. Screed floors and slabs on grade to floor drains or slope as required.

R. When placing concrete with a tremie, the lower end of the tremie or spout shall be within five (5) feet of the concrete surface.

S. The concrete shall be placed in continuous horizontal layers such that thirty (30) minutes is the maximum elapsed time between placement of successive layers.

T. When placing concrete the discharged concrete shall be within five (5) feet of the concrete surface.

U. Discharge concrete from cement mixer within ninety (90) minutes after water has been added to the mix in the truck.

V. A maximum of one (1) gallon of water per cubic yard of concrete may be added, on the job site.

W. When water is added to concrete at the job site there shall be a minimum of 1½ minutes of mixing per each cubic yard remaining in the truck.

3.4 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed, concrete walls, columns, beams, joists and haunches with smooth rubbed finish as Scheduled in this Section.

B. Finish concrete floor surfaces in accordance with ACI 301.

C. Wood float surfaces which will receive quarry tile with full bed setting system.

D. Steel trowel surfaces which are scheduled to be exposed.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at ⅛ inch per foot nominal as indicated on Drawings.

F. All concrete surfaces of walls, columns, beams, and ceilings shall be rubbed while "green" with a carborundum stone to a smooth even surface.

G. All imperfections in the surface of the concrete (i.e. fins, rough surfaces, honeycomb, mismatched joint marks, pits, etc.), shall be corrected by use of cutting tools, by patching and by rubbing.

H. Rubbing shall be completed within five days after the removal of forms from surfaces.

I. All floors given a monolithic cement top finish shall be completely finished as per Section 03300.3.9 before the concrete has taken its initial set.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure floor surfaces in accordance with ACI 308.

D. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 4 days.

E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

F. Slabs and floors shall be thoroughly wetted and tightly covered with polyethylene film and one (1) inch of sand or burlap bags for a minimum of twenty-one days as soon as they have reached sufficient hardness to allow foot traffic.

G. Finished concrete shall be protected during cold weather (i.e. if the temperature is below 35° F for a period of 4 hours during any consecutive 24 hours) by maintaining a temperature at 50° F minimum during the first 10 days following the pour.

3.6 CONCRETING IN HOT AND COLD WEATHER

A. Concrete, when placed in forms, shall have a temperature greater than 50° F and less than 90° F.

B. The temperatures of neither aggregates nor mixing water shall be greater than 100° F just prior to mixing with the cement.

C. Concrete shall not be poured when the temperature is below 35° F.

D. Concrete shall not be poured when the temperature is above 98° F.

E. When the temperature is between 35° F and 50° F, the Contractor shall take measures that may include insulation of the poured concrete structure, protective covers and heat sources capable of maintaining temperature of the poured structure at 50° F or above.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01400.

B. Provide free access to Work and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to Engineer for review prior to commencement of Work. Adequate time must be given to the Engineer to evacuate the mix design.

D. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

E. Four concrete test cylinders will be taken for every 50 cu yds of each class of concrete placed.

F. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. One slump test will be taken for each set of test cylinders taken.

3.8 PATCHING

A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

C. Patch imperfections as directed.

3.9 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.10 FINISHING OF CONCRETE AND GROUT SURFACES

A. All concrete and grout surfaces shall be true and even, and shall be free from open or rough spaces, depressions, or projections.

B. Accurately screed exposed surfaces of concrete to grade and then float prior to final finishing. Do not use excessive floating or trowel while concrete is soft. Do not add dry cement or water to the surface of screeded concrete to expedite finishing.

C. After removal of forms, remove all bulges, fins, form marks, or other irregularities that may adversely affect the appearance or function of the concrete.

D. Clean and patch all cavities left by form ties or any other device. Use expansive grout for patching.

E. Finish concrete in accordance with the following schedule, unless specifically excepted.

Surface	**Finish**
All exposed vertical surfaces from 6 inches below grade for minor or major structures.	Smooth rubbed finish
Floor slabs of tanks and channel floors	Smooth floated finish
Floor slabs of tanks or channel floors which will receive leveling grout	Brushed finish
Interior building floors not receiving fluid applied resilient flooring	Steel trowel finish
Leveling grout for tank slabs and channel floors	Screeded with steel trowel finish
Exterior horizontal traveled sidewalks and driveways	Brushed finish
Exposed exterior curb and gutters and valley gutter surfaces except as listed above.	Smooth rubbed finish

F. Cement based or acrylic polymer compounds will not be considered as an alternative to rubbing. Preparation and application shall meet the requirements of cement based and acrylic polymer compound manufacturers.

3.11 TESTING

A. The Owner shall employ and pay for the services of an Independent Testing Laboratory to perform the following tests as specified below and as requested by the Engineer.

Perform tests in accordance with the following ASTM Specifications:

Tests	ASTM Specifications
Air Content	C173
Slump	C 143
Test Cylinders	C 31 or C 513
Core Samples	C 42
Fly Ash	C 311

B. Make test cylinders in sets of four, minimum. Field cure one cylinder. Break field cured cylinder at seven days. Laboratory cure the remaining three cylinders from each set of four. Break two laboratory cured cylinders at 28 days. The Engineer shall be responsible for handling and transportation of cylinders. Hold fourth cylinder for possible 56 day break.

C. Make one set of test cylinders for each 50 cubic yards, or fraction of 50 cubic yards, of concrete placed, or at other times requested by the Engineer.

D. Fly ash shall be sampled and tested as specified in ASTM C 311 prior to use as an admixture in concrete.

3.12 CLASS AND TYPES OF CONCRETE AND GROUT PLACEMENT

A. The class and type of concrete to be used shall be as follows in the table below.

	Location	Mix Design	Max Slump
1.	Slab Foundation	Class A Type 1	Walls 6"/Slabs 4.5"
2.	Equipment Pads	Class A Type 1	4"
3.	Sidewalks	Class A Type 1	4"
4.	Pipe Encasement	Class A Type I	6"
5.	Pipe Braces	Class A Type 1	6"

B. The class and type of grout to be used shall be the following class and types:
1. Connection to existing structures
   a. Grout reinforced steel to existing structure - Epoxy adhesive and grout
   b. Non expansive anchors - Epoxy adhesive grout
   c. Anchor bolts dowels - Epoxy adhesive grout
2. Equipment installation - Machine grout
3. General grout for filling of cavities - Construction grout
4. Repairs to new or existing concrete placed, modified concrete, polymer modified concrete. Epoxy Grout.

C. All footings, foundation (excluding caissons) and slabs-on-grade shall have 6" #57 stone foundation bedding.

3.13 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment or as shown on the drawings.
B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel and/or concrete members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

SECTION 03370

CONCRETE CURING

PART 1 - GENERAL

1.1 SECTION INCLUDES

Initial and final curing of horizontal and vertical concrete surfaces.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete.

B. Section 03346 - Concrete Floor Finishing.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 302 - Recommended Practice for Concrete Floor and Slab Construction.

C. ACI 308 - Standard Practice for Curing Concrete.

D. ASTM C171 - Sheet Materials for Curing Concrete.

E. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

F. ASTM D2103 - Polyethylene Film and Sheeting.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on curing compounds, compatibilities, and limitations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products under provisions of Section 01600.

B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound Type A: ASTM C309 Type 1 Class B acrylic dissipating resin type, translucent with fugitive dye.

B. Water: Potable, not detrimental to concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION - HORIZONTAL SURFACES

A. Cure floor surfaces in accordance with ACI 308.

B. Slabs — Option 1 ponding over 100% slab continuously for 4 days.
Option 2 membrane curing compound applied in accordance with manufacturer's instructions.

C. After floor slabs have been cured, they shall be protected from ongoing construction in accordance with Section 03300, 3.5.F.

3.3 EXECUTION - VERTICAL SURFACES

A. Cure surfaces in accordance with ACI 308.

B. Membrane Curing Compound: Apply compound in accordance with manufacturer's instructions in one coat.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit traffic over unprotected floor surface.

SECTION 03732

CONCRETE REPAIR

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparation of concrete and application of repair materials.

B. Rehabilitation of concrete surfaces.

C. Repair of concrete internal reinforcement.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete.

B. Section 04500 - Masonry Restoration and Cleaning.

C. Section 03346 - Concrete Floor Finishing: Applied finish to repaired concrete surface.

1.3 REFERENCES

A. ANSI/ASTM C404 - Aggregates for Masonry Grouts.

B. ANSI/ASTM C882 - Bond Strength of Epoxy-Resin Systems Used with Concrete.

C. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.

D. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.

E. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

F. ASTM A616 - Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.

G. ASTM A617 - Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.

H. ASTM C33 - Concrete Aggregates.

I. ASTM C150 - Portland Cement.

J. ASTM D638 - Tensile Properties of Plastics.

K. ASTM D695 - Compressive Properties of Rigid Plastics.

L. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01300.

B. Submit product data indicating product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Submit manufacturer's installation instructions under provisions of Section 01300.

D. Submit manufacturer's certificate under provisions of Section 01400 that specified products meet or exceed specified requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01700.

B. Accurately record actual locations of structural reinforcement repairs and type of repair.

1.6 QUALITY ASSURANCE

A. Materials Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

B. Applicator: Company specializing in concrete repair approved by materials manufacturer.

C. Welding: ANSI/AWS D1.4.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01600.

B. Store and protect products under provisions of Section 01600.

C. Comply with instructions for storage, shelf life limitations, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Master Builders

B. Sonneborn

C. Thoro Systems

D. Substitutions: Under provisions of Section 01600.

2.2 PATCHING MATERIALS

A. Epoxy Resin: Two-part epoxy adhesive containing 100 percent solids, meeting the following minimum characteristics:

Characteristic	Test Method	Results
Bond Strength	ANSI/ASTM C882	2,700 psi
Tensile Strength	ASTM D638	6,600 psi
Elongation	ASTM D638	2 percent at 7 days at 70 degrees F
Flexural Strength	ASTM D790	8,000 psi
Compressive Strength	ASTM D695	6,500 psi

B. Bonding Agent: Polyvinyl, acetate emulsion, dispersed in water while mixing, non-coagulant in mix, water resistant when cured.

C. Portland Cement: ASTM C150, Type II-V; gray color.

D. Sand: ASTM C33; uniformly graded, clean.

E. Water: Clean and potable.

F. Cleaning Agent: Commercial muriatic acid.

2.3 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet-steel deformed bars, finish.

B. Stirrup Steel: ASTM A82.

2.4 MIXING EPOXY MORTARS

A. Mix epoxy mortars in accordance with manufacturer's instructions for purpose intended.

B. Mix components in clean equipment or containers. Conform to pot life and workability limits.

2.5 MIXING CEMENTITIOUS MATERIALS

A. Mix cementitious mortar in accordance with manufacturer's instructions for purpose intended.

B. Include bonding agent as additive to mix.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.2 PREPARATION

A. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using acid. Rinse surface and allow to dry.

B. Flush out cracks and voids with muriatic acid to remove laitance and dirt. Chemically neutralize by rinsing with water.

C. Provide temporary entry ports spaced to accomplish movement of fluids between ports, no deeper than the depth of the crack to be filled. Limit port size diameter to be no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.

D. For areas patched with epoxy mortar, remove broken and soft concrete 1/4 inch deep. Remove corrosion from steel. Clean surfaces mechanically; wash with acid and rinse with water.

E. Sandblast clean the exposed reinforcement steel surfaces. Mechanically cut away damaged portions of bar.

3.3 REPAIR WORK

A. Repair exposed structural, shrinkage, and settlement cracks of concrete by the epoxy injection paste method.

B. Repair spalling. Fill voids flush with surface.

C. Repair reinforcement by welding new bar reinforcement to existing reinforcement. Strength of welded splices and reinforcement to exceed original stress values.

3.4 INJECTION - EPOXY RESIN ADHESIVE

A. Inject adhesive into prepared ports under pressure using equipment appropriate for particular application.

B. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.

C. Remove temporary seal and excessive adhesive.

D. Clean surfaces adjacent to repair and blend finish.

3.5 APPLICATION - EPOXY MORTAR

A. Trowel apply mortar mix to an average thickness of 2 inches. Tamp into place filling voids at spalled areas.

B. For patching honeycomb, trowel mortar onto surface, working into honeycomb to bring surface flush with surrounding area. Finish trowel surface to match surrounding area.

C. Cover exposed steel reinforcement with epoxy mortar; feather edges to flush surface.

3.6 APPLICATION - CEMENTITIOUS MORTAR

A. Apply spray coating of bonding agent to damp concrete surfaces. Provide full surface coverage.

B. Apply cementitious mortar by steel trowel to an average thickness of 2 inches. Tamp into place filling voids at spalled areas. Work mix into honeycomb.

C. Damp cure cementitious mortar for four days.

3.7 FIELD QUALITY CONTROL

Field inspection and testing will be performed under provisions of Section 01400.

SECTION 11100

GRIT DEWATERING CONTAINERS

PART 1
CONTAINER CONSTRUCTION

1.1 Dewatering container shall be a Park Process GritCat Roll-Off– Model GCRO-15-T-DC, 15 cubic yard Dimpled Core style. as manufactured by Park Process of Houston, TX (855-511-PARK). Alternates or substitutions shall require approval.

1.2 Dimensions shall not exceed 23'L x 8'6"W x 4'H nor shall it weigh over 8,500 lbs. Internal volume shall yield a minimum of 12 cubic yards of waste cake holding capacity.

1.3 Dewatering container shall be constructed of A-36 carbon steel plate with 1/4" plate floor and 3/16" plate walls. The unit shall be of a round bottom design with a 12" radius on the walls where they join the floor plate. Floor cross members shall be made from C3 4.1 lb. channel and shall be spaced on 12" centers.

1.4 Dewatering container shall have two 3" threaded drainage ports on each lower side at opposing ends. Each port shall have a 3" stainless steel hose camlock connection with a stainless steel camlock cap and chain, aluminum or other material will not be allowed. These ports shall be coped into the bottom radius of the container effectively draining water from the installed interior filter system. The drainage system shall drain effluent water from any one of or all 4 of the drainage ports.

1.5 Container long sills (rails) shall be constructed of 6" x 2" x ¼" structural tubing with inside spacing of 36.5.

1.6 Triangular gussets shall be welded to the outside of both rails and to each of the 12" spaced floor cross members for extra strength.

1.7 The dewatering container shall be equipped with four (4) wheels, 8" diameter x 8" wide diagonally braced constructed carbon steel. Tracking wheels shall be 4" diameter x 6" wide and made of carbon steel. All wheel axles shall have grease fittings.

1.8 Wall gussets shall be made of ¼" plate.

1.9 The door sealing face will be totally watertight and have a "T" style EPDM gasket installed around the perimeter of the door face. The door frame shall be made of 4" x 3" x 3/16" structural tubing with 3 steel hinges located on the side. Door sealing shall have 1" ratchets and chain binders, one on each side and two in the middle of the door. Steel 3/8" chain shall be used with a floating ring for easily aligning the chain and ratchet. Hinges are constructed of ½" wall steel tubing, 1" diameter hot rolled bar pins with welded retainer washers, and 1" x 3 ½" x 9" carbon steel hinge plates and shall have grease fittings. The door sheet will be made from 3/16" plate.

1.10 All welded seams inside and outside of the container shall be seal welded for better corrosion protection. Skip welding on the exterior welding joints and using calk prior to painting is not allowed.

1.11 Internal filter support system shall be comprised of carbon steel ¼" angles and cold formed channels welded to the inside of the container. Floor filter support panels shall be 3/16" perforated plate with a hole pattern of ½" holes on 11/16" centers. Wall support filter support shall be polystyrene dimpled core panels that are glued to the inside walls of the container using a glue specially designed for gluing polystyrene to a painted surface. This dimpled core shall be rated for 6,000 lbs./sq.ft.ch panel. Wall support dimpled core panels shall run the length of the container on both long walls and across the front of the container. The floor support perforated plate panels shall be hot dip galvanized. The floor filter media and the floor filter support panels shall be bolted into place using stainless steel fasteners consisting of set screws, flat washers, lock washers and acorn nuts. The wall filter media shall be installed over the dimpled core support panels and bolted to the welded in framework using stainless steel set screws, flat washers, lock washers

and acorn nuts, as well. Galvanized tie down brackets shall be used to secure the filter media to the welded in support structure on the floor and walls.

1.12 The filter media shall be Park Process PPFM-62-350 and shall have the following characteristics

Fiber: Polyester
Count: 62 x 20 per inch
Weave: 6 x 2 satin
Warp Diameter: 500 microns
Weft Diameter: 800 microns
Weight: 42.5 oz. per sq. yd.
Tensile strength: 1560 lbs. Per inch
Air Permeability: 325-355 CFM
Water Permeability: 345mm3/mm2/sec
Thickness: .085”
Micron opening: 0 x 325
Micron retention: 260
Open area: 19%

1.13 A 22-ounce vinyl coated nylon tarp shall be installed on the top of the dewatering container. This tarp shall be a side to side rolling tarp and shall come complete with tarp bows, tarp rolling hardware, ratchets and straps, bungee tie down cords, and aluminum tarp stops.

PART 2
DEWATERING CONTAINER
SURFACE PREP AND COATING

2.1 Exterior – All steel metal surfaces shall be sandblasted to near white metal with a SP-10 blast, with 2-3 mils of anchor profile, primed using Carboguard 890 white at 4-6 mils dry, and top coated with Carbothane Park Process blue at 2-3 mils. The paint shall be Carboline brand, no substitutions allowed.

Interior – All steel metal surfaces except the filter support panels and tie down bars shall be sandblasted to near white metal with a SP-10 blast with 2 to 3 mils of anchor profile, then coated with two coats of Carboguard Park Process blue 4 to 6 dry mils per coat to a total of 10 to 12 dry mils. Paint shall be Carboline, no substitutions allowed. The expanded metal perforated plate support panels shall be hot dip galvanized.

SECTION 11105

SCUM HOPPER

PART 1 MATERIAL SPECIFICATIONS

1.1 Hot-rolled structural steel shapes and plates shall be ASTM A36

1.2 Hot-rolled carbon steel sheet and strip structural quality shall conform to ASTM-A570 grades D & E.

1.3 Hot-formed welded and seamless steel tubing shall conform to ASTM A500 grade B.

1.4 Welded and seamless pipe shall conform to ASTM A53 grade B.

1.5 Stainless steel fasteners shall conform to AISI grade 304/305.

1.6 Welding electrodes are E70S using in gas metal arc process conforming to the specifications for mild steel electrodes for gas metal ARL welding AWS A518.

1.7 All exposed welds shall be cleaned of welding slag and rounded. All exposed sharp edges and corners shall be rounded.

PART 2 MISCELLANEOUS

2.1 Dewatering containers shall be water tested for complete water tightness.

2.2 The manufacturer shall be responsible for supplying written instructions, which shall allow the operator to operate and maintain the equipment supplied. Instructions shall assume that the operator is familiar with pumps, motors, piping, valves and controls, but that he has not previously operated and/or maintained the exact equipment supplied.

The instruction shall be prepared as a system manual applicable solely to the equipment supplied by the manufacturer to these specifications and shall include those devices and equipment supplied by him.

A minimum of two (2) operation and maintenance manuals with spare parts lists shall be provided at no additional cost.

PART 3 DESCRIPTION

3.1 Heavy duty carbon steel construction (optional stainless steel)
3.2 Designed to be handled by a standard fork truck
3.3 Typical (2) 2” drain ports located at the bottom on each side at opposing ends
3.4 Filter media is disposable but can be reused in certain situations
3.5 Filter support panels made of expanded metal and perforated plates (optional materials available for support panels)
3.6 Disposable filter media is available in 6, and 10ounce fabric as well as a woven 40 mesh polypropylene filter and is made into an envelope shape, held in place by bag hooks around the top perimeter of the hopper
3.7 Container to be 2 CY in size

SECTION 11361

GRIT REMOVAL, PUMPING AND DEWATERING EQUIPMENT
ALTERNATE A
PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The contractor shall furnish and install one (1) Model 2.5V PISTA® VIO™ Grit Chamber in accordance with the drawings. Each PISTA® VIO™ Grit Chamber shall be complete with the following equipment: gear motor, gear head, propeller drive tube, axial flow propeller, grit removal pump, secondary grit concentrator, grit screw conveyor, controls and auxiliary equipment as specified herein. All wetted parts shall be constructed of 316 stainless steel.

B. The PISTA® VIO™ Grit Chamber shall operate on the vortex principle and shall be capable of removing grit from raw waste or process water and depositing the grit in a storage hopper. No moving parts subject to wear or stoppage shall be below the water surface. An integral grit transporting means shall be provided to transport the grit from the storage hopper to the disposal means. To minimize the possibility of clogging, all internal openings in the piping to the grit pumping device as well as the grit pumping device shall be large enough to pass a 3" sphere. No bends or elbows will be allowed in the piping on the suction side of the grit pump. All drives, lubrication and bearings shall be readily accessible from walkways above the operating water level. To minimize the possibility of organic capture, the floor of the grit separation chamber shall be flat and there shall be no greater than a 3" opening for grit to pass through to the storage hopper. Sloping floors in the upper chamber will not be allowed due to reduced grit removal efficiency and extra construction costs. The PISTA® VIO™ Grit Chamber Equipment shall be manufactured by Smith & Loveless®, Inc., Lenexa, Kansas.

1.2 REFERENCE STANDARDS

1.3 QUALITY ASSURANCE

A. Qualifications
   1. The specifications and drawings detail Smith & Loveless equipment and represent the minimum standard of quality for both equipment and materials of construction. The contractor shall prepare his bid on the basis of this equipment for the purpose of determining the low bid without consideration of a possible substitute. A single manufacturer shall furnish all the equipment specified under this Section and shall be standard units of proven ability as manufactured by a competent organization that is fully experienced, reputable and qualified in the manufacture of the equipment to be furnished.
   2. The manufacturer shall have a minimum of 10 years of successful experience and a minimum of 50 installations in the design, construction, removal performance, and operation of the equipment specified herein.
   3. All equipment furnished under this Section shall be new and unused and shall be the standard products of the manufacturer.
   4. Five (5) grit removal efficiency tests shall be provided from installations where similar equipment by the Manufacturer is currently in similar service. Each grit removal efficiency test shall meet the removal efficiency in 1.05.A. Manufacturers that do not have test data acceptable to the Engineer shall not be considered as an approved equal or will be required to provide grit testing of the installed equipment, with test results that meet 1.05.A.

5. Manufacturer shall have an operational grit removal system with a minimum 4.0 MGD capacity at their facility, and upon request from the Engineer, the operational unit may be witnessed by the Engineer and/or representative of their choice.
6. These Specifications are intended to give a general description of what is required, but do not Cover all details which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, installation, field testing and field calibration of all materials and apparatus as required. Any additional equipment necessary for the proper operation of the proposed installation not specifically mentioned in these Specifications or shown on the Drawings shall be furnished and installed at no change in Contract Price or Time

1.4 SUBMITTALS

A. Submit in accordance with Section 01300, copies of all materials required to establish compliance with this Section. Any unnamed manufacturer shall be required to provide Submittals shall include at least the following:
   1. Complete catalog information, descriptive literature, specifications, and complete parts list with identification of materials of construction.
   2. Installation instructions (assembly, alignment, and adjustment procedures).
   3. Total weight of the equipment including the weight of the single largest item for each equipment assembly
   4. Certified structural, mechanical, and electrical drawings showing important details of construction, equipment dimensions, size, anchor bolt locations, and locations of external utility piping and electrical connections and requirements.
   5. Motor data including material of construction, dimensions, rpm at full load, frequency, voltage, full load current, code and design letter, efficiency, horsepower, number of phases, time rating, temperature rise, service factor and bearing life rating. Include motor manufacturer's recommended lubrication requirements.
   6. Power and control wiring diagrams including terminals and numbers.
   7. Shop painting systems including specifications to indicate compliance with Contract Documents.
   8. Factory test report of inspection.
   9. Full-scale test data demonstrating the performance and grit removal efficiency of the equipment furnished under this section. Data from a full-scale test previously performed for a unit in a similar installation will be acceptable.
   10. Special shipping, storage and protection, and handling instructions.
   11. A list of manufacturer's recommended replacement parts required to maintain the equipment for a period of one year, with current price information.
   12. A list of special tools, materials, and supplies furnished with the equipment for use prior to and during startup, and for future maintenance.

B. Submit Operation and Maintenance Manuals.

C. Submit an Equipment Warranty and Certification

1.5 CONDITIONS OF OPERATION

A. The grit removal device shall be capable of removing the following at the rated hydraulic peak flow rate, with no decrease in efficiency will be allowed at flows less than this design rate.
   1. 95% of the grit down to 140-mesh (105-microns) in particle size.

B. Before the bid, any alternate grit removal system manufacturer shall submit to the consulting engineer, performance test data showing through previous certified tests the stated grit removal efficiency of 95% down to 140-mesh (105-microns) in particle size. The stated performance must be proven in full scale field testing utilizing certified grit removal efficiency test procedures as performed by qualified, Factory payroll personnel who have at least one (1) year experience performing the test.

C. To maximize grit removal efficiency, the chamber shall have suitable baffling to minimize grit carryover and control velocity through the unit for maximum organic separation. Grit chambers incorporating the gravity principle will not be acceptable due to the turbulence in the flow, which prevents gravity settling from being effective and due to the extra area needed for settling fine grit. Aerated grit chambers, including those incorporating conventional settling criteria, are also specifically unacceptable.

D. To ensure the efficient transport of the grit and simultaneous lifting and discharge of the organic material, the bottom of the upper chamber covering the storage hopper shall be constructed of structural grade 316SS plate, free from rotation and shall be flat.

E. The grit moving across the bottom of the grit chamber shall be hydraulically scoured as the propeller blades, moving within 6" of the grit, pass over the moving grit and cause hydraulic currents to lift up the organics. The grit scouring intensity shall be adjustable. Propellers running with a center line greater than 8" from the bottom of the chamber will not be acceptable. The grit shall pass from the removal chamber through an opening in the transition plate and drop into a grit storage hopper.

F. The PISTA® VIO™ Grit Chamber shall be equipped with integral flow control baffling for both the inlet and outlet of the main chamber. A fabricated stainless steel nozzle shall be installed at the bottom of the influent ramp to direct the grit across the bottom of the separation chamber as well as enhance the chamber vortex flow pattern. The inlet nozzle shall be designed to direct the inlet flow into the chamber beneath a horizontal perimeter baffle in a manner ensuring the proper vortex flow and to prevent short-circuiting and rollover. The PISTA® VIO™ outlet tunnel on the discharge shall retain the grit near the floor of the chamber and also direct the separated flow out of the unit, acting as a horizontal weir to provide a low velocity discharge area, preventing rollover of grit from the bottom portion of the chamber. The broad outlet shelf will direct the flow to the narrowed outlet opening which controls the water level in the main chamber and in the velocity in the inlet channel. No additional downstream flow control device shall be required to keep the velocity between 3.5 fps at

peak flow and 1.6 fps at minimum flow with a 10:1 turn down. The PISTA® VIO™ baffles shall be constructed of stainless steel. The installing contractor shall attach the baffling to the concrete structure using 1/2" anchor bolts, as shown on the drawings.

G. The PISTA® Grit Chamber shall handle all flows equal to, or less than, a hydraulic peak flow of 2.5 MGD. The influent flume, transporting the liquid waste to the grit chamber, shall be of the size and shape shown on the contract drawings to assure that grit does not settle in the inlet flume and to provide for proper operation of the grit chamber. The effluent flume exiting the unit shall be a free-flowing flume for maintaining proper velocity within the chamber.

PART 2 - PRODUCTS

2.1 MECHANICAL DRIVE

A. The PISTA® Grit Removal Unit shall have an axial flow propeller connected by a drive tube through gearing to a 3-phase, 60cycle, 460 volt, totally enclosed helical gear motor. The minimum rated horsepower of the motor shall be 0.75 HP.

B. The drive tube shall be driven by a large, totally enclosed combination spur gear and turntable bearing. The maximum output speed of the drive shall be 21 RPM. Pinions and gears shall be high quality steel, machined and hardened for high strength and long wear. Propeller blades shall be tapered, with generously rounded leading edge, to reduce energy consumption and prevent foreign material from fouling the propeller.

C. A pinion mounted on the output shaft of the helical gear motor shall drive a large spur tooth bull gear enclosed in a heavy cast-iron case. The spur gear pinion shall be cut from heat-treated steel. The bull gear shall rotate with a minimum 21" diameter turntable bearing for durability and stability. The pinion and bull gear shall have a service factor of 5.0 or greater at standard operating speeds.

D. All bearings of the drive unit, including the motor, shall have a minimum B 10 bearing life of 100,000 hours, except for the 21"diameter turntable bearing supporting the propeller assembly which shall have a minimum B 10 life of 20 years.

E. The bull gearbox shall be specifically designed for this service. It shall have an opening for the 10-3/4" diameter torque tube driving the propeller. The gearbox shall be sealed and the bottom opening shall have an air bell around the torque tube to prevent water from entering the gearbox in case of flooding. The top of the gearbox shall have a bolted flanged connection for the grit discharge pipe. Clarifier drives, which are modified to meet the higher propeller speed, specifically will not be acceptable. The drive motor shall have normal starting torque and low starting current. The motor shall not be overloaded beyond the nameplate rating under any normal conditions encountered.

2.2 PISTA® GRIT FLUIDIZER™

A. The PISTA® Grit Collection System shall be equipped with PISTA® Grit FLUIDIZER™ vanes. The fluidizer vanes shall be located within 6" of the elevation of the pump suction inlet. The fluidizer vanes

shall be bolted to the propeller drive tube in a helical fashion so as to gently pump the grit upward and keep the grit fluidized at the grit pump suction inlet.

B. The fluidizer vanes shall be fabricated of the same material as the drive tube. The fluidizer vanes shall be bolted to the drive tube to facilitate easy removal.

C. The PISTA® Grit FLUIDIZER™ shall be a helical pump that provides two (2) functions.
   1. One, the fluidizer vanes shall continuously pump the grit upward at the center of the PISTA® Grit Collection Chamber. This gentle pumping action shall prevent the grit from packing down around the pump suction pipe. The fluidizing action shall prevent grit that has a sticky or greasy consistency from packing together to the point where the pull of water created by the pump might not break it loose. The fluidizer vanes shall keep the grit fluidized at the suction inlet so packing cannot occur.
   2. Second, the upward pumping action of the fluidizer vanes shall enhance the performance of the propeller in keeping organics in suspension. This shall cause the heavier grit to fall downward through the gently circulating water, and enable the organics to be more readily swept away by the currents induced by the PISTA® propeller.

2.3 GRIT STORAGE HOPPER

A. A grit storage hopper with a 60° sloped bottom shall be provided. The effective storage volume shall be 32 cubic feet. To prevent squatty storage chambers the maximum diameter shall be 3'- 0". The minimum depth shall be 5'-0". This is to allow for adequate volume for grit pile expansion if backwashing is performed plus allow adequate storage to prevent excessive numbers of grit removal cycles and grit handling equipment wear. As an integral part of the equipment installation, the Manufacturer shall supply a floor plate to cover the storage hopper. The plate shall consist of two (2) sections with lifting slots to allow access to the storage area. Attaching this plate as part of the rotating assembly will not be allowed.

2.4 PISTA® TURBO™ GRIT PUMP - TOP MOUNTED

A. The Grit Pump shall be a (4") vertical, close coupled type with curved 5 vane flow inducer completely out of the flow path between the pump inlet and discharge connection, so that the grit pumped is not required to pass through the impeller. All internal clearances shall provide for the passage of a 3" spherical solid to preclude clogging of the pump and suction line. The pump shall be designed to be in line mounted directly to a flange on top of the straight (4") suction line. The suction line shall be vertical, passing up through the PISTA® Grit Chamber Drive to prevent accumulated grit from flowing into the suction pipe during idle periods and clogging the suction line. The pump shall be vertical, for easy removal of the motor and impeller, to facilitate maintenance of the suction line by providing a straight path to any potential blockage.

B. The pump shall be of Ni-Hard construction, with Ni Hard impeller, and especially designed for the use of mechanical seals and vacuum priming. Horizontal belt-driven pumps are specifically not acceptable.

C. In order to minimize seal wear caused by lineal movement of the shaft, the shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing. To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of (1 7/8"). The dimensions from the lower bearing to the top of the impeller hub shall not exceed 6".

D. The bottom bearing of the motor shall be locked in place and designed to handle all thrust loads and the necessary radial load. The upper bearing shall be free to move up and down and, thus, carry only radial load. This movement allows for thermal expansion of the shaft.

E. The shaft shall be solid stainless steel through the mechanical seal to eliminate corrosion and abrasive rust particles. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified (1 7/8") minimum diameter. Carbon steel shafts are not acceptable.

F. The impeller shall produce a turbine like flow pattern within the casing, generating flow. To prevent grit from entering the seal area, all impellers less than full diameter shall be trimmed with the back shroud remaining full diameter so that a minimum clearance from shroud to casing is maintained. Both the end of the shaft and the bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft.

G. The pump shall be specifically designed for vacuum priming service and have been proven in this service for a period of at least ten (10) years. The pump shall have an adapter providing a large water reservoir above the impeller to provide for positive exclusion of air from the impeller. The seal shall be inside this area to assure lubrication and grit shall be excluded from this area by a full size impeller shroud. Pumps, which do not use hollow priming adapters for positive lubrication of the seal, will not be acceptable.

H. The pump shall be arranged so that the complete rotating element can easily be removed from the casing without disconnecting the electrical wiring or disassembling the motor, impeller, backhead or seal.

I. The pump shall be sealed against leakage by a single mechanical seal, constructed so as to be automatically drained and automatically primed each time the pump is drained and primed. Water which lubricates the mechanical seal shall be automatically drained from around the seal if the pump loses prime in order to allow both the pump and the seal to be drained; thereby, preventing freezing and breakage of the seal during power outages in sub freezing temperatures.

J. The seal shall be of carbon and ceramic materials with the mating surface lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless steel spring

K. The PISTA® TURBO™ Grit Pump shall be capable of delivering 250 GPM against a total dynamic head of '. The maximum allowable speed shall be RPM. The rated horsepower of the PISTA® TURBO™ Grit Pump motor shall be HP.

L. The pump motor shall be vertical, solid shaft, TEFC NEMA P base, squirrel cage induction-type, suitable for 3-phase, 60cycle, 460 volt, electric current. It shall have Class F insulation, but the motor shall have Class B temperature limits. The motor shall have normal starting torque and low starting current, as specified for NEMA Design B characteristics. It shall have a 1.15 service factor.

M. The motor pump shaft shall be centered, in relation to the motor base, within 0.005". The shaft run out shall be limited to 0.003".

N. A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant.

O. The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor.

P. A pneumatically controlled discharge pinch valve shall be furnished for installation in the vertical discharge piping run, and the controls shall be located in the vacuum priming control panel. The controls shall include an oil-less air compressor and solenoid valve. The operation of the discharge pinch valve shall be tied into the cycle timer and the SONIC START level sensor, so as to be fully automatic.

Q. MINIMUM REQUIREMENTS

1.	Shaft through seal:	1 7/8" Diameter, Solid Stainless Steel
2.	Lower bearing to impeller distance:	6" Maximum
3.	Shaft run out:	0.003" Maximum
4.	Shaft end play:	Limited to bearing shake
5.	Shaft to motor base:	0.005" Maximum
6.	Impeller to shaft fit:	Tapered
7.	Impeller:	
	a. Type:	Recessed 5 Vane PISTA® TURBO™
	b. Material:	Ni Hard High nickel iron
	c. Shroud:	Untrimmed Full diameter
8.	Seal housing:	Bronze
9.	Fronthead to casing:	One piece
10.	Backhead & motor adapter:	One piece
11.	Upper bearing:	Axially free
12.	Lower bearing:	Locked in place
13.	Motor insulation:	Class F
14.	Motor temperature rise:	Class B
15.	Motor service factor:	1.15

R. Pumps will only be considered if all of the above requirements are met as a minimum. These requirements are specified for long service life and ease of operator maintenance. Deviations from the grit pump specifications will be cause for rejection.

2.5 VACUUM PRIMING SYSTEM

A. The vacuum priming system shall be located adjacent to the PISTA® TURBO™ Grit Pump in a weatherproof enclosure mounted on the drive unit for the PISTA® Grit Chamber. It shall be complete with vacuum pump, air compressor for the pinch valve, priming logic controls, heater and a float-operated check valve installed in the system ahead of the vacuum pump to prevent liquid from entering the vacuum pump. The vacuum control solenoid valve and the resonant frequency prime level sensor shall be mounted on the PISTA® TURBO™ Grit Pump. The float operated check valve shall have a transparent body for visual inspection of the liquid level and shall be automatically drained when the vacuum pump shuts off. All hoses and tubing used in the priming system shall be at least 3/8" nominal diameter.

B. The vacuum pump shall have corrosion-resistant internal components. It shall be capable of priming the PISTA® TURBO™ Grit Pump and grit removal piping in not greater than 60 seconds under rated

static lift conditions.

C. Liquid level in the pump priming chamber shall be monitored by a SONIC START resonant frequency liquid level probe. The SONIC START probe shall be equipped with a piezoelectric drive and sensitive circuits to detect frequency shifts when the probe is covered by liquid. The SONIC START probe shall be completely sealed and have a 316L stainless steel housing for corrosion resistance. It shall be provided with a wiring connector molded of PolyPhenylSulfone, an amorphous high performance thermoplastic for impact and chemical resistance. The SONIC START probe shall have a plug-in connector to facilitate easy removal.

D. The SONIC START® probe shall be provided with light emitting diodes. This diagnostic tool shall indicate connectivity, prime status or a fault condition. Systems utilizing an electrode, mechanical means such as a float, or that require any type of electrical or moving parts inside the priming chamber, which may accumulate debris, short out, bind or fail will not be acceptable.

E. The priming system shall automatically provide positive lubrication of the mechanical seal each time the PISTA® TURBO™ Grit Pump is primed. To prevent excessive stoppage due to grit accumulation, no passageway in the priming system through which grit must pass shall be smaller than the equivalent of a 2 1/2" opening. Priming from high-pressure (gauge) connections will not be acceptable.

2.6 PROPAK BASE WITH INTEGRATED FIBERGLASS ENCLOSURE (OPTIONAL)

A. The supporting base floor shall be minimum 1/2" thick metal with reinforcing, as required, to prevent deflection and ensure an absolutely rigid support.

B. To allow on-site maintenance of the pump, an epoxy coated carbon steel stanchion with lifting arm shall be provided. The lifting arm shall have a hook over the center of the pump motor to support a hoist (provided by Installing Contractor) for removal of the motors, impellers and pumps from the station.

C. The PISTA® base shall be constructed of DURO-LAST® corrosion-resistant stainless steel.

D. All fasteners attaching to PISTA® base shall be 304 stainless steel. All other required fasteners shall be galvanized.

E. The pump, PLC controls, vacuum priming controls, and PISTA® drive assembly shall be enclosed by a two-piece, sliding fiberglass cover integrated to the base, with a thick resilient gasket at the joint between the sections and a suitable drip-lip around all the edges. The cover shall be provided with means to allow the equipment to be locked with a padlock and the fiberglass enclosure sections shall be secured to their mounting hardware with tamperproof fasteners to prevent unauthorized removal.

F. Both halves of the fiberglass cover shall be completely removable without the use of tools or hoisting equipment, for 360 degree access to all parts of the equipment. The dimensions of the enclosure shown on the drawings shall be considered a minimum, for internal component clearances and accessibility, and nothing smaller will be acceptable.

G. The fiberglass cover must be of the horizontal sliding design to eliminate lifting loads for service personnel, and minimize the effects of wind forces during opening and closing. Designs which require lifting loads in excess of 25 pounds during normal use or hood not integral to the base shall not be acceptable. The enclosure slide mechanism, hardware and exterior latches shall be constructed of

corrosion-resistant materials, with anodized extruded aluminum tracks and precision machined Acetyl rollers, which do not require lubrication. Hinged covers will not be acceptable for this application.

H. Heavy extruded aluminum, adjustable ventilating louvers shall be provided on each end of the fiberglass cover, which are capable of being closed during cold weather operation.

I. The fiberglass two-piece cover shall be made of molded reinforced orthophthalic polyester resins with a minimum of 30% glass fibers with a minimum average length of 1-1/4". The outside of the enclosure shall be coated with a polyester protective in-mold coating for superior resistance to weathering, ultraviolet radiation, yellowing and chalking. The completed fiberglass enclosure shall be resistant to mold, mildew, fungus and corrosive liquids and gases normally found in wastewater environments.

J. The enclosure shall have a cold climate package to include four (4) 500 watt dual range auxiliary heater with automatic circulating fan, thermostat control and On/Off switch. The auxiliary heater shall be plugged into the enclosures duplex receptacle. In addition, the fiberglass cover shall have a minimum of 1" thick urethane insulation, protected by fiberglass, with an "R" value of 7 or more.

2.7 PLC ELECTRICAL CONTROLS FOR AUTOMATIC GRIT REMOVAL

A. The grit system control equipment shall be mounted in a NEMA Type 4X-316 stainless steel enclosure with hinged, lockable doors.

B. All components within the control panel shall be UL listed or recognized, and the complete grit system control panel itself shall be labeled as a UL 508A General Use Industrial Control Panel.

C. To facilitate wire tracing and servicing, the control wiring shall be run in enclosed wireways, with removable covers, rather than tied up in bundles.

D. Control relays up to 6-amp capacity shall be the modular, plug-in type, with integral LED indicating lights to show activation. Larger control relays shall be enclosed to be "finger safe".

E. A duplex GFI protected convenience outlet shall be provided in the panel for operation of 120-volt AC devices.

F. Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short-circuit protection of all auxiliary circuits, and thermal magnetic circuit breakers with lockout capability shall be provided for each drive and pump motor, matched to the motor inrush current.

G. Magnetic across-the-line starters with 24-volt coils and solid-state overload protection for each phase shall be provided for each motor to give positive protection against phase unbalance, thermal overload, phase loss and ground fault. To provide the fastest trip speed and for ground fault protection, only solid-state overload protection will be used, and motor starters using heater coils will not be acceptable. Each single-phase auxiliary motor shall be equipped with an over-current protection device in addition to the branch circuit breaker, or shall be impedance protected. Circuit breakers shall be used in lieu of fuses, to eliminate the need for stocking spare fuses. All switches shall be labeled and a coded wiring diagram shall be provided.

H. Individual NEMA 4 oil-tight Hand-Off-Automatic selector switches shall be provided for the pump and

dewatering device drives and the flush water solenoid control.

I. An On Off selector switch shall be provided to operate the propeller drive motor starter.

J. To control the operation of the grit removal and dewatering system, and monitor the control, environmental and alarm functions, a specially preprogrammed, dedicated Alan Bradley MicroLogix PLC control system shall be provided. The controller shall interface with the panel display unit, motor starters, flush water, accessories and alarm functions through digital and analog input and output ports as required. The digital controls shall operate on 24 volts or less, to eliminate shock hazard.

K. The 24-volt DC power supply shall be overload protected to be "crowbar safe" and will return to operation when a short is removed. Program integrity shall be maintained by battery-backed RAM. A surge suppressor with power filter shall be provided for the control circuits.

L. A NEMA 4 rated display unit shall be mounted through the front of the panel to provide operator input to and visual output from the microprocessor controller. An aluminum hood to shade the HMI display from direct sunlight shall be mounted on the face of the control panel. The metal shade shall cover the entire display, shield the top and sides of the display, and shall be hinged to fold over the display and stow against the front of the panel.

M. This interface shall be a 10.4" graphic interface with color active-matrix TFT Liquid Crystal Display with backlighting and resistive-type touch screen, with audible feedback on touch, for data input and programming. The display shall have a "sleep" feature to prolong screen life. Menu screens shall be available for display and management of grit system control functions listed below:

    1. Display Functions:
        a. "Run - Off" indication for drives and pump.
        b. Grit removal cycle time settings and indication of remaining run time.
        c. Set time intervals for pump run time, prime fail alarm, dewatering device run time.
        d. View current status.
        e. Alarm list/status and diagnostics.

N. Provisions shall be made to allow interfacing the grit system PLC with a Customer supplied SCADA system, using an Ethernet IP connection.

O. A properly sized insulating-type control transformer with fused primary and secondary shall be provided by the controls Manufacturer to supply power for controls and auxiliary devices necessary to semi-automatic operation. The control transformer shall have 208/230/460 Volt AC primary, 120-volt AC secondary, Class F insulation; with temperature rise not to exceed 115°C above a 40°C ambient.

P. Individual NEMA 7 Hand-Off-Automatic selector switch and E-stop button shall be provided for the grit pump, grit screw classifier, and flush water solenoid control.

Q. A prime failure alarm shall be initiated if pump does not prime within a programmable pre-set time. Interlocks shall be provided to prevent the PISTA® TURBO™ Grit Pump from operating if the pump

is not primed. A common alarm contact shall be provided to indicate any of the following faults: Vacuum Prime Fail, Conveyor fail to start, Overload Trip (Paddle Drive, Grit Pump or Dewatering device). A manual push button alarm reset shall be provided.

R. Provisions shall be made to allow interfacing the grit system PLC with a Customer supplied SCADA system, using an Ethernet IP connection.

S. To control the operation of the PISTA® TURBO™ Grit Pump, a manual Hand-Off-Automatic selector switch shall be provided. In the Automatic position, control shall be from the PLC program, with a manual push button to override the timed program and initiate a pumping cycle. A manual push button shall also be provided to reset the grit removal cycle. The program shall be capable of initiating grit pumping cycles at adjustable intervals throughout the day. The pumping cycle and dewatering device cycle lengths shall also be programmable.

T. All necessary capacitors, relays, diodes, etc., shall be provided as shown on the schematic diagram. In order to ensure continuity of operation, the Manufacturer of the PISTA® Grit Chamber shall provide these controls, and the full opening pneumatically controlled pinch valve for installation on the grit discharge line as shown on the drawings.

2.8 PISTA® GRIT CONCENTRATOR - 250 GPM

A. The second stage PISTA® 250 GPM Grit Concentrator shall be provided as shown on the drawings for secondary treatment of organics and secondary grit dewatering. The PISTA® 250 GPM Grit Concentrator shall operate on the constant rate vortex principle. Design shall be such that a small volume of water and the grit will discharge at the bottom for final dewatering and ultimate disposal of the grit.

B. As a minimum, 93 to 94 percent of the water pumped to the PISTA® 250 GPM Grit Concentrator and 95 to 96 percent of the residual organic material shall flow out the top and be returned to the inlet channel to the PISTA® Grit Chamber. The unit shall be capable of intermittent operation with minimal variation in removal efficiency. There shall be less than 5% putrescible material in the recovered grit from the underflow.

C. The 2-piece 250 GPM Grit Concentrator shall be constructed of a Ni-Hard top section, with a minimum thickness of 1/2" in high wear areas, and a bottom cone constructed of the same material, with a minimum thickness of ¾", and which shall be readily replaceable. Inlet and outlet connections shall be as shown in the drawings. The 250 GPM Grit Concentrator shall be provided by the Manufacturer of the PISTA® GRIT CHAMBER™, for installation by the contractor. The operating range shall be compatible with the total PISTA® GRIT REMOVAL SYSTEM™ as described herein.

2.9 MODEL 15 PISTA® GRIT SCREW CONVEYOR WITH PARALLEL PLATE SEPARATOR

A. The PISTA® Grit Screw Conveyor shall be constructed of 316SS with an inlet hopper to receive the mixture of water and grit. The hopper shall be equipped with an energy dissipation zone to prevent turbulence in the remaining portion of the hopper. The hopper shall have parallel plates located in the settling zone to improve retention of the fine grit. An overflow weir trough shall be provided to return the water to the system. The conveyor shall be freestanding with support legs to hold the conveyor at an angle of approximately 22°. The discharge shall be 8" diameter, plain-end pipe. The drive assembly shall be located at the discharge end.

B. The PISTA® Grit Screw Conveyor shall have an open, 3/16" steel U trough. The screw shall be 9" in

diameter. The conveyor shall be 15' in length, with overall dimensions as shown on the drawing. The hopper shall have a 4" full-length outlet weir trough to minimize the overflow rate and carryover of the fine grit. The projected separator plate settling area shall be a minimum of 15.1 square feet.

C. The screw shall run on anti friction bearings at the outlet end, and a bronze bushing at the inlet end. The inlet end shaft bushing shall be capable of being greased. The inlet end shall have two 2" drains. Clearance between the legs and the discharge outlet shall be as shown on the drawing.

D. The drive to the conveyor shall be a direct-driven, shaft-mounted helical gear reducer. The motor shall be 1 HP, TEFC, 3-phase, 60 cycle, 460 volt. The screw speed shall be 9 RPM. The drive shall be mounted on a plate at the discharge end and the plate shall be bolted to the flanges on the trough.

E. An solid 316SS cover shall be provided over the hopper and trough openings. The 30" x 60" opening over the hopper shall not be covered.

F. All carbon steel surfaces shall be cleaned and coated with 6-8 mils dry film thickness of VERSAPOX® epoxy coating, Factory-applied prior to shipment.

2.10 CORROSION PROTECTION

A. All structural carbon steel surfaces shall be Factory-blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Surface preparation shall comply with SSPC-SP6 specifications. Immediately following cleaning, a single 3-mil (0.08 mm) dry film thickness of red oxide primer shall be Factory-applied prior to shipment.

B. Stainless steel, aluminum and other corrosion-resistant surfaces shall not be coated. Carbon steel surfaces, not otherwise protected, shall be coated with a suitable non-hardening rust preventative compound. Auxiliary components, such as the grit pump, gear motor, etc., shall be furnished with the original Manufacturer's coating.

C. Final touch-up and finish coating of the primed surfaces shall be the responsibility of the purchasing contractor, and shall be accomplished in the field. The purchasing contractor shall be responsible for ensuring that the finish coating is compatible with the above specified primer.

PART 3 - EXECUTION

3.1 MANUFACTURING QUALITY

A. The specified Manufacturer markets, designs, fabricates and manufactures the grit chamber equipment at its own U. S. facility. The Manufacturer shall have on staff registered engineers, both in process and design. This would be for providing current capabilities in these areas as well as future capabilities after the equipment is installed and operating, for the best long term interest of the Owner. Alternate manufacturers will be required to show that they meet these criteria also.

3.2 INSTALLATION AND OPERATING INSTRUCTIONS

A. Installation and operation shall be in accordance with instructions provided by the Manufacturer.

3.3 MANUFACTURER'S INSURANCE

A. ALL EQUIPMENT MANUFACTURERS, either direct or subcontractors to the general or mechanical contractors, SHALL HAVE in effect at TIME OF BID, CONTRACT AWARD, CONTRACT PERFORMANCE, and WARRANTY TERM, PRODUCT AND COMPREHENSIVE LIABILITY INSURANCE, INCLUDING SUDDEN AND ACCIDENTAL POLLUTION COVERAGE, in the amount of FIVE MILLION DOLLARS ($5,000,000) through an insurance company with a minimum rating of A+ (SUPERIOR) XV according to the BEST'S INSURANCE REPORTS. All policies must be written on an OCCURRENCE BASIS. Policies written on a CLAIMS MADE BASIS are not acceptable. The CERTIFICATE OF INSURANCE attesting to the specified coverage issued by the responsible carrier naming the ENGINEER OF RECORD and the OWNER as ADDITIONAL INSURED, must be presented to the named additional insured prior to contract award. A FAILURE TO COMPLY with this requirement BY THE BIDDER will require DISQUALIFICATION of the BID and CONTRACT AWARD.

3.4 START-UP

A. The Manufacturer shall provide the services of a Factory-trained representative for a maximum period of three (3) days in one (1) trip on-site to assist with the initial startup, and to instruct the Owner's operating personnel in the operation and maintenance of the equipment.

3.5 WARRANTY

A. The Manufacturer of the equipment shall warrant for one (1) year from date of startup, not to exceed eighteen (18) months from date of shipment, that all equipment he provides will be free from defects in material and workmanship.

B. In the event a component fails to perform as specified, or is proven defective in service during the warranty period, the Manufacturer shall repair or replace, at his discretion, such defective part. The cost of labor and all other expenses resulting from replacement or replacement of parts is not included.

C. The repair or replacement of those items normally consumed in service such as seals, grease, light bulbs, etc., shall be considered as part of routine maintenance and upkeep.

D. It is not intended that the Manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material, workmanship or delays in delivery, replacement or otherwise.

SECTION 11362

Grit Removal, Pumping and Dewatering Equipment Alternate B

PART 1: GENERAL

1.01 SCOPE

A. The contractor shall furnish and install [ ] vortex grit system and grit classifier as indicated on the drawings. Each grit collector and classifier unit shall be manufactured from AISI 304L stainless steel shapes. Fabrication and assembly shall be in conformance with these specifications and drawings.

B. Each grit system shall include a grit collector with a drive head, motor, drive tube, propeller, cover plate, suction pipe, fluidizing pipe, a grit pump and a grit classifier with a grit tank, grit screw and geared motor. Also included will be anchor bolts and controls, and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation.

C. The contractor shall coordinate all details of the equipment with other related parts of the work. He shall verify that all structures, piping, wiring, and equipment components are compatible. The contractor shall be responsible for all structural and other alterations required to accommodate equipment differing in dimensions, weight, or other characteristics from these specifications and drawings.

D. The contractor shall install the equipment according to instructions and recommendations of the equipment manufacturer.

E. The main power supply is 480 V, 60 Hz, 3-phase.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

1. Section A322: Carbon and Alloy Steel Bar Specifications.
2. Section A507-10: Standard Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold Rolled

B. ISO 281:2007 Calculation Method for Fatigue Life for Roller Bearings.

C. American Institute of Steel Construction (AISC) Publications

D. American Welding Society (AWS), European Welding Federation (EWF), and International Institute of Welding (IIW) Publications

E. American Structures Painting Council (ASPC) Publications

F. International Organization for Standardization (ISO) Publications.

1.03 SUBMITTALS

The manufacturer will provide an electronic submittal for review by the engineer in accordance with Section 01300.

A. Product Data: Include the following:

1. Descriptive literature, brochures, catalogs, cut-sheets and supplementary material to define the equipment.
2. Motor characteristics and performance information.

3. Gear reducer data including service factor, efficiency, torque rating, and materials.
4. Parts list including a list of recommended spare parts.

B. Shop Drawings: Include the following:
1. Manufacturer's installation drawings.
2. Wiring and schematic diagrams.

C. Operations and maintenance manual.

D. Detailed mechanical and electrical installation instructions and procedures.

E. Equipment weights and lifting points.

F. Recommendations for short and long-term storage.

G. A copy of the manufacturer's warranty.

H. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental Protection Management System according to ISO 14001.

I. Failure to include all drawings applicable to the equipment specified in this section will result in rejection of the entire submittal with no further review.

1.04 QUALITY ASSURANCE

A. To ensure quality, conformance, reliability, and environmental practices with regard to the manufacturing and production of the machinery described in this section, the equipment manufacturer shall meet the requirements listed in this section.

B. Manufacturer shall have established an ISO 9001 certified quality management system. Manufacturers without an ISO 9001 certified quality management program must provide complete documentation of their existing quality management system with supplemental information clarifying why areas do not meet ISO 9001 standards. Meeting national quality management standards alone shall not be considered an acceptable substitute because ISO standards exceed national quality management standards.

C. Manufacturer shall have established an ISO 14001 certified environmental protection management system. Manufacturers without an ISO 14001 certified environmental protection management system must provide complete documentation of their existing environmental protection management system with supplemental information clarifying why areas do not meet ISO 14001 standards. Meeting national or local environmental protection management standards alone shall not be considered an acceptable substitute because ISO standards exceed national and local environmental protection management standards.

D. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid (pickling bath) to remove any residues that may be present on the material because of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer, which is critical to the long life of the stainless steel.

E. No stainless steel components may be fabricated or assembled in a factory where carbon steel products are fabricated, in order to prevent contamination by rust.

F. All welding is performed in accordance with American Welding Society (AWS), European Welding Federation (EWF), International Institute of Welding (IIW), or equivalent.

G. Manufacturer shall provide grit equipment, motors, gear reducers, controls, control panels, and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.

H. Manufacturer shall provide services by a factory-trained service technician, specifically trained on the type of equipment specified. Service technician requirements include, but are not limited to the following:

1. Manufacturer shall have a minimum of ten (10) service technicians based in the United States for field service of the equipment. Manufacturer shall have multiple service locations with a minimum of one dedicated service location for both the eastern and western regions of the US.
2. Service technician shall be present during initial energizing of equipment to determine directional testing.
3. Service technician shall inspect and verify location of anchor bolts, placement, leveling, alignment and field erection of equipment, as well as control panel operation and electrical connections.
4. Service technician shall provide classroom and/or field training on the operation and maintenance of the equipment to operator personnel.
5. Manufacturer shall state field service rates for a service technician to owner and contractor. In the event that the field service time required by this section should not be sufficient to properly place the equipment into operation, additional time shall be purchased by contractor to correct deficiencies in installation, equipment, or material without additional cost to owner.

I. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or installation, defective workmanship or materials, and breakage or other failure. Materials shall be suitable for service conditions.

J. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service prior to delivery, except as required by testing.

K. Each major component of equipment shall have the manufacturer's name, address and product identification on a nameplate securely affixed to the equipment.

1.05 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT

A. Equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.

B. Contractor shall be responsible for unloading and shall have equipment on-site at the time of delivery permitting proper hoisting of the equipment.

1.06 PRE-SUBMITTAL OF ALTERNATE EQUIPMENT

Manufacturers of alternative equipment shall submit a pre-approval package to the engineer at least two (2) weeks prior to bid date. Alternative manufacturers shall submit the following information and supporting documentation:

A. A complete set of drawings, specifications, catalog cut-sheets, and detailed descriptive material. Drawings shall show all relevant details of the unit. This information shall identify all technical and performance requirements stipulated on the drawings and in the specification. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.

B. Detailed installation drawings illustrating how the proposed grit removal unit and grit classifier will be installed. The drawings shall include plan, elevation, and sectional views of the installation. Drawings shall include details of the anchor bolt locations.

C. Structural calculations by a Professional Engineer either confirming the existing structural design is sufficient for the alternate equipment or detailing any changes required for the building design to use the alternate equipment.

D. Motor characteristics and performance information. Vendor data shall be furnished to confirm the torque and thrust rating of the drives.

E. Complete reference list of all installations of same and similar equipment including contact names and phone numbers, showing at least 20 municipal installations of the same size as the alternate equipment located in the United States.

F. Complete bill of materials for all equipment, showing dimensions and materials of construction of all components.

G. Certification by the manufacturer that all stainless steel equipment will be manufactured in a stainless steel only factory.

H. Certification that the entire equipment will be passivated by submersion in an acid bath as specified in chapter 2.03.

I. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001. Manufacturers without an ISO 9001 certified quality management program must provide complete documentation of their existing quality management system with supplemental information clarifying why areas do not meet ISO 9001 standards. Meeting national quality management standards alone shall not be considered an acceptable substitute because ISO standards exceed national quality management standards.

J. A copy of documents proving certification of the Environmental Protection Management System according to ISO 14001. Manufacturers without an ISO 14001 certified environmental protection management system must provide complete documentation of their existing environmental protection management system with supplemental information clarifying why areas do not meet ISO 14001 standards. Meeting national or local environmental protection management standards alone shall not be considered an acceptable substitute because ISO standards exceed national and local environmental protection management standards.

K. Details of the control and instrumentation system including wiring diagrams. A Professional Engineer shall note any required changes to the project electrical drawings.

L. Information on equipment field erection requirements including total weight of assembled components and weight of each sub-assembly.

M. List of recommended spare parts and current cost of each spare part.

N. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants and other items required at each regular preventative maintenance period, including all ancillary equipment provided.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Vormax Size 0.5 grit collector by HUBER Technology, Inc.

B. RoSF3 Size 1 Grit Classifier by HUBER Technology, Inc.

C. Gorman Rupp T-3 Pump

D. Pre-approved alternate manufacturer(s), as per chapter 1.06. Alternates shall not be acceptable unless they have been pre-approved.

2.02 DESIGN AND PERFORMANCE DATA:

GRIT COLLECTOR

A.	Number of units:	One (1)
B.	Peak Design flow per unit:	0.5 MGD
C.	Flow path	270
D.	Maximum head loss	___ inches
E.	Inlet channel width	XX'
F.	Outlet channel width	XX'
G.	Upper chamber diameter	XX'

H. Lower chamber diameter XX’
I. Drive Tube 10.75” diameter
J. Four bladed propeller XX” diameter
K. Static floor plate XX” diameter
L. Drive 1.0 HP
M. Grit separation efficiency at peak flow:
1. Greater than 50 mesh (300 mm) in size 95%
2. Greater than 70 mesh (212 mm) in size 85%
3. Greater than 100 mesh (150 mm) in size 65%

GRIT PUMP

A. Number of units: One (1)
B. Maximum flow capacity: 150 gpm
C. TDH (Total Dynamic Head): ___ feet
D. Suction inlet diameter: 3-inch
E. Discharge outlet diameter: 3-inch

GRIT CLASSIFIER

A. Number of units: One (1)
B. Design flow of grit slurry from grit trap per unit: ___ gpm
C. Maximum flow of grit slurry from grit trap per unit: 150 gpm
D. Grit processing capacity per unit: 1.0 ton/hr.
E. Minimum capture rate of 200 micron quartz sand at design flow: 95 %
F. Minimum weir length: ____ feet
G. Tank water surface area: ____ ft^2
H. Weir Overflow rate less than: ____ ft^2/sec

2.03 MATERIALS

A. The grit chamber shall be a concrete structure as shown on the contract drawings. The Grit Collector shall include a bull gear enclosed within a heavy-duty cast iron casing. The rotating mechanism including the drive tube, propeller, static cover plate, and grit classifier is to be manufactured from AISI 304L austenitic stainless steel. All mechanical parts must be designed to handle the forces that may be exerted on the unit during fabrication, shipping, erection, and proper operation according to the O&M manual.

B. The grit transfer pump shall be manufactured from materials specified in part 2.05 of this specification that are recommended for handling abrasive material.

C. All stainless steel components shall be manufactured in a stainless steel only factory to prevent contamination of the stainless steel with foreign contaminants.

D. The stainless steel equipment, after its fabrication, shall undergo a passivation (pickling) process to ensure maximum resistance to corrosion. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid to remove any residues that may be present on the material because of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be classified with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Submergence insures complete coverage. Spray on chemical treatments and glass bead

blasting are specifically not acceptable due to their inability to provide complete and uniform corrosion protection.

2.04 VORMAX GRIT COLLECTOR:

A. The screened wastewater containing grit shall enter the grit chamber tangentially via an offset approach channel, creating a toroidal flow path enhanced by a slow vortex to maximize grit maximize grit removal efficiency. The flow will pass around the upper separation chamber and exit through an elevated outlet channel 360 degrees around the chamber from the inlet. The bottom of the outlet shall be a minimum of 12 inches above the bottom of the inlet.

B. Each grit collection system will comprise of a helical gear motor, drive head, drive tube, four bladed propeller and static cover plate.

C. The drive head will include a heavy-duty steel base that supports a turntable bearing with a minimum B-10 life of 20 years, enclosed within a cast iron cover. The contractor will centrally mount the assembly on a steel reinforced concrete walkway spanning the chamber.

D. The drive tube will be rotated at 21 RPM by a heavy-duty spur tooth bull gear wheel bolted to the turntable bearing. A steel drive pinion mounted on the output shaft of the helical gear motor will drive the bull gear. The motor shall be a 1.0 hp,Class 1, Divison 2, 460VAC, 60Hz, 3ph, 60Hz motor.

E. The drive tube will pass through the opening in the bull gear and run down the center of the grit chamber. The four bladed propeller will bolt to the lower end of the drive tube. The rotation of the propeller will generate a radial flow path that will move grit particles toward an opening in the center of the upper chamber where they will drop down into the lower grit collection hopper. A two-piece static cover plate will sit above the grit collection hopper leaving a 3” gap allowing grit to pass but prevent larger solids that might block the pump suction pipe. The cover plate must be designed to enable replacement without disturbing the drive tube or drive head.

F. The grit will be stored in the grit collection hopper until the pump cycle is automatically initiated.

2.05. GRIT PUMP – TOP MOUNTED/DRYWELL (OPTIONAL)

A. The equipment manufacturer shall supply a 4” diameter pump suction pipe and 1.5” fluidizing pipe that will pass through the drive tube and terminate no less than 4” from the bottom of the chamber. The equipment manufacturer shall supply one 1.5” solenoid valve and two manual PVC isolation valves for installation, by the contractor, as shown on the drawings. The wash water supply for agitation must be a minimum of 15 GPM @ 40 PSI at the point of suction.

The contractor shall supply a 4” suction pipe and 1.5” fluidizing pipe that will pass through the grit collection hopper and terminate no less than 4” from the bottom of the chamber. The equipment manufacturer shall supply one 1.5” solenoid valve and two manual PVC isolation valves for installation, by the contractor, as shown in the drawings. The wash water supply for agitation must be a minimum of 15 GPM @ 40 PSI at the point of suction (OPTION).

B. The grit pump shall be a horizontal, self-priming centrifugal type designed to pass a 3” solid. The casing shall be cast iron Class 30 with integral volute scroll, mounting feet, 3 ½” Class 30 cast-iron fill port cover plate, 1 ¼” NPT drain plug and a liquid volume and recirculation port. The cover plate is sealed to the housing with two Buna-N O-Rings and shall have a pressure relief valve that shall open at 75-200 PSI.

C. The rotating assembly (impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing) must be replaceable as a single unit without moving the casing or piping.

D. The impeller will be a two-vane, semi-open non-clog type with pump out vanes on the back shroud, and shall be manufactured from Aus tempered Ductile Iron with a AISI alloy steel shaft. The clearance between the impeller and wear plate is to be incrementally adjustable via the cover plate.

E. The suction check valve will be steel reinforced molded neoprene with a blow-out center to protect against hydraulic shock and additional pressure. It is to be replaceable through the cover plate opening without moving the pipe work.

F. Cast iron Class 30 spool pieces on both suction and discharge port will have one 1 ¼" NPT and one ¼" NPT tapped hole for mounting gauges (by others).

G. Each pump will be supplied with a drain kit that consists of a 10' plastic hose and factory installed fittings including stainless steel pipe nipple, busing and ball valve, and an aluminum male quick connect fitting.

H. Each pump will have a minimum 5 hp. ,Class 1, Divison 2, 460VAC, 60Hz, 3ph, 60Hz motor. The power to each pump will be transmitted by two V-belts providing a minimum safety factor of 1.5. Pumps that use a direct drive are not acceptable. The drive assembly must be totally enclosed by a removable fabricated steel guard supplied by the pump manufacturer including their standard paint finish.

I. All exposed pump surfaces will be finished with one coat of gray W.R non-lift primer and one coat of white acrylic low VOC W.R semi-gloss enamel for optimum illumination. The final coat will be 1.0 to 1.2mm dry film thickness.

2.06 COANDA GRIT CLASSIFIER

A. GRIT CLASSIFIER TANK

1. Water containing grit from a grit chamber shall be introduced through a ___ inch inlet into the vortex chamber, creating a rotating flow pattern, and through the Coanda tulip into the grit classifier tank. The maximum allowable influent velocity into the grit classifier tank shall be less than 0.5 ft/s. Designs incorporating a tangential side inlet entry or an inlet entry that does not dissipate velocity shall not be acceptable.
2. The water flow is directed by the Coanda from an axial flow to a radial flow towards the overflow weir that is provided at the circumference of the grit classifier tank. This change of the flow direction leads to effective sedimentation of the grit towards the bottom of the grit classifier tank.
3. The classified water shall pass over the circumferential overflow weir with a length of ____-feet and discharge out of a single ___ inch clean water outlet.
4. The inlet connection of the grit classifier unit shall be freely rotatable 360 degrees for site adjustment. Designs that incorporate a fixed inlet connection that does not freely rotate shall not be allowed.
5. Effective stratification of particles, depending on their specific density, but not depending on their particle size and weight, shall be achieved within the conical portion of the grit classifier tank.
6. Designs incorporating Hydro-cyclones/concentrators shall not be acceptable.

B. GRIT SCREW

1. Classified grit shall be removed through a central tube at the bottom of the grit classifier. The stirrer shall move classified grit to the central tube. The grit to be removed shall drop into an inclined auger. This auger shall dewater and convey the grit above the level of the overflow weir. The classified and dewatered grit is discharged at the upper end of the auger.
2. Its inlet hopper shall be flange-connected to the grit discharge tube. The auger shall have a discharge height of ____ inches above the floor. Its inlet hopper shall be provided with a 3" diameter (DN

80) drain connection that is provided with a ball valve. The drain connection shall also be provided with a 3/4" flush connection with ball valve.

3. The auger shall have a minimum diameter of ____ inches and a minimum ___-inch material thickness. The auger shaft shall have minimum diameter of ___-inches and a minimum material thickness of ___-inches.
4. The screw conveyor trough shall be made of minimum 10/64 inch (4 mm) thick stainless steel and shall have a minimum trough diameter of ____-inches.
5. The screw shall be shafted and shall be made of stainless steel. A shaft-less screw is not acceptable. A chilled cast-iron stub bearing with a maintenance-free ceramic sleeve shall support the lower end of the screw shaft. Wear strips, wear shoes, or liners are not acceptable.
6. The grit screw design shall have screw flights incorporating varying flight pitches of ___-inch/___-inch in order to prevent clogging issues within the grit screw. Screws with flight pitches all at the same distance shall not be acceptable.
7. A screw drive shall be provided at the upper end of the auger. The motor shall be continuous duty rated and shall be selected to match the duty of the particular grit conveying screw. The drive unit shall be directly coupled to the grit conveying screw drive shaft.

C. MOTORS

1. Grit Screw
    a. Maximum Motor Speed: 1760 rpm.
    b. Service Factor: 1.00
    c. Torque must be sufficient to start and operate grit classifier without exceeding nameplate ratings for current and power.
    d. Rating: 230/460V, 3-phase, 60 Hz.
    e. Location Rating: Class 1, Division 1
    f. Nominal power screw drive motor: 1.5 hp

2.07 ANCHOR BOLTS

1. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to securely anchor each item of equipment. Anchor bolts, hex nuts, and classifiers shall be stainless steel. Anchor bolts shall be wedge or epoxy type.
2. The contractor shall set anchor bolts. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout

2.08. CONTROL SYSTEM

1. All controls necessary for the fully automatic operation of the grit removal system shall be provided, including a single combined NEMA 4X main control panel, and a NEMA 7 local control station per each machine.
2. Main control panel shall be suitable for outdoor, wall mounting. Enclosure shall be NEMA 4X Stainless Steel with continuous hinge and lockable door latch, and shall include the following:
    a. Door-interlocked and fused disconnect
    b. 600 VAC terminal block

c. NEMA motor starter and Circuit Breaker Branch Circuit Protection for grit collector paddle motor
d. NEMA motor starter and Circuit Breaker Branch Circuit Protection for grit pump
e. Panel heater with thermostat (OPTION)
f. Control power transformer with 120 VAC transient voltage surge compressor (TVSC) and fused primary and secondary
g. Programmable logic controller (PLC), Allen Bradley Micro 800
h. Operator Interface (OIU), Allen Bradley Panelview 800
i. Pilot lights for:
    i. Control power on (white)
    ii. Grit Collector paddle running (green)
    iii. Grit Collector paddle fault (red)
    iv. Grit pump running (green)
    v. Grit pump fault (red)
    vi. Grit Screw running (green)
    vii. Grit Screw fault (red)

a. E-stop push button (red)
b. Reset push button (black)
c. Door mounted elapsed time meters for the following:
    I. Grit paddle drive
    II. Grit classifier screw drive

a. Remote dry contact output for the following:
    i. Grit classifier start
    ii. Grit collector paddle running
    iii. Grit collector paddle fault
    viii. Grit pump running (green)
    iv. Grit pump fault (red)
    v. Grit collector E-stop
    vi. One spare output

a. Flashing alarm light and alarm horn with silencer-reset button
    i. Plastic Nameplates

3. Each Vormax shall be provided with a NEMA 7 or (NEMA 4X option), Cast Aluminum Local Control Station. Each Local Control Station Shall be equipped with the following devices

    a. Hand-Off-Auto selector switches for the following
        i. Paddle Drive
    b. E-stop pushbutton (red)

4. Each Grit Pump shall be provided with a NEMA 7,or (NEMA 4X option), Cast Aluminum Local Control Station. Each Local Control Station Shall be equipped with the following devices
    a. Grease pump hand-off-automatic
    b. E-stop pushbutton (red)

3. Each grit classifier shall be provided with a NEMA 7 or (NEMA 4X option), Cast Aluminum Local Control Station. Each Local Control Station Shall be equipped with the following devices
    a. Hand-Off-Auto selector switches for the following
        i. Classifier drive
    b. Classifier forward-off-reverse
        i. Classifier drive
    c. E-stop pushbutton (red)

PART 3: SPARE PARTS

3.01 SPARE PARTS

A. The following spare parts shall be included and supplied with the equipment:

1. One (1) grit pump mechanical seal
2. One (1) set of O-Rings for grit pump cover plate
3. One (1) set of impeller clearance adjustment spacers
4. One (1) set of grit pump V-belts
5. One (1) lower bearing assembly for grit classifier

B. Spare parts shall be packaged with labels including a description of the contents.

PART 4: EXECUTION

4.01 INSTALLATION, START-UP AND OPERATOR TRAINING

A. Contractors shall verify all dimensions in the field to ensure compliance of equipment dimensions with the drawings. Contractor shall notify engineer of significant deviations.

B. The installation of the equipment shall be in strict accordance with the contract documents and the manufacturer's instructions and shop drawings. The manufacturer shall supply anchor bolts for the equipment. Contractors shall install the anchor bolts in accordance with the manufacturer's recommendations.

C. After installation, touch-up paint shall be applied to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting. The Contractor shall passivate all field welds.

D. Supplier shall furnish the services of a factory-trained service technician for one (1) trip including a total of four (4) workdays to inspect the installation, observe start up, and provide operator training.
   1. Equipment shall not be energized, or "bumped" to check the electrical connection for motor rotation without the service technician present.
   2. The service technician shall make all necessary adjustments and settings to the controls.
   3. The service technician shall demonstrate proper and sequential operation of the grit removal and classifier system. The grit removal and classifier system shall be able to operate fully automatically.

4.02 WARRANTY

A. The manufacturer will warrant against any defects in material or workmanship to the vortex and classifier system and framework. This warranty will commence upon delivery of the products and will expire on the earlier to occur of one (1) year from initial operation of the product or 18 months from delivery thereof (the "Warranty Period").

End of Section

SECTION 11421

SPECIFICATIONS FOR VERTICAL RECIRCULATING SCUM PUMPS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the contract, including the General and Supplementary Conditions and General Requirements (if any) apply to the work specified herein.

1.02 DESCRIPTION OF WORK:

A. Work required for this project includes installation of replacement scum pump(s) at the existing facility, as specified herein and as shown on the Plans. The new pump(s) shall be located as indicated on the Plans, and shall be intended for the mixing and discharge of the sum.

B. The pump shall be installed as shown on the Plans. The pump shall be as specified herein, and shall be the vertical recirculating chopper type, provided with all of the required appurtenances as specified or as shown on the Plans. The pump shall be of heavy-duty construction intended for services requiring reliable solids handling, high pump efficiency, and low NSPHR characteristics, and shall be specifically designed for the mixing and removal of captured scum from the clarifiers. The work required at the scum pump installation shall include (but is not limited to) the following:

1. Modifications to the existing scum pump structure as may be required to fit the new pump(s). The contractor shall review the dimensional drawings that are provided for the new pumps, and make any/all changes to the concrete slab, etc... as may be required to facilitate installation of the new pump. It is noted that the new/current design of the specified pump is slightly larger than the originally-provided equipment, and minor changes to the existing concrete top slab are likely to be required. These changes shall be closely coordinated with the scum pump provider.

2. Installation of new factory-assembled vertical recirculating chopper pump(s) in the location shown, to be utilized with the existing electrical controls, piping, valves, quick-connect fittings, and all other appurtenances as indicated on the Plans.

3. Ancillary piping and equipment required for each pump, including all valves and fittings, specialized equipment and accessories, pressure gauges, inlet/discharge structures/piping, contractor-furnished piping and valves, air release valves, force main piping, and any other items specified herein or as shown on the Plans. Modifications to the existing piping shall be made as required to accommodate any dimensional changes required.

4. Electrical work as required for each installation, to include electrical service, lighting as shown on the Plans, conduit or wiring, installation of pump control panel(s) as indicated on the Plans, and any other necessary electrical work for installation of the equipment described herein.

C. The pump provided for this project shall be Model V3LR-080 as manufactured by Vaughan Company, Inc. of Montesano, WA, and shall comply with the detailed Specifications which follow.

1. It is the specific intention of this specification that the new pump(s) provided duplicate, to the greatest possible extent, the existing equipment that is currently in service at the wastewater treatment plant.

D. The requirements of Section 1.05 (Manufacturer's Experience requirements) shall be strictly enforced in its entirety on this project. The bidders shall be responsible for ensuring that the equipment suppliers and/or proposed manufacturers are able to meet ALL requirements of this Section. Rejection of any equipment due to non-compliance with this section shall not entitle the bidder to a project change order or any additional compensation for providing the specified equipment.

1.03 QUALITY ASSURANCE:

A. Materials, physical and chemical characteristics of the components and tests or test requirements shall conform to current AWWA, ANSI, and ASTM standards.

B. All electrical equipment provided shall be manufactured in complete accordance with the requirements of the National Electric Code.

C. The contractor shall submit the manufacturer's standard warranty as well as a manufacturer-provided performance affidavit (as described herein) for new pumping equipment to be furnished in accordance with this section. Specific requirements for this information is found in Section 1.07 and 2.08 of the following.

D. The contractor shall submit the pump manufacturer's standard warranty, as well as a performance affidavit for equipment to be furnished in strict accordance with the requirements of this Section. The warranty for workmanship and materials shall be the manufacturer's standard for one (1) year from startup, not to exceed eighteen (18) months from the date of shipment from the factory.

1. In the performance affidavit, the manufacturer must certify to the Contractor and the Owner that the Contract Documents have been examined, and that the equipment will meet in every way the performance requirements as set forth in the Contract Documents for the application that is specified. Shop drawing/submittals will not be reviewed prior to the receipt of an acceptable performance affidavit by the Engineer.

2. The performance affidavit shall be signed by an officer of the company that is manufacturing the equipment, and witnessed by a notary public. The performance affidavit must include a specific statement that the equipment will not clog or bind on solids typically found in the application set forth.

E. The naming of a manufacturer in this Specification Section is not an indication that the manufacturer's standard equipment will be acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of Engineering and supplying the pumps as specified herein. The manufacturer shall clearly note on his bid proposal and submittal data any and all deviations to this specification.

F. All pumping equipment provided for this project shall be completely produced and supported by a domestic manufacturer located within the continental United States. The pump manufacturer shall show evidence of their production facilities and the location of the same upon request, and shall demonstrate their history of providing spare parts, support, engineering, and production of the specified equipment within the U.S. for a minimum of not less than twenty (20) years. The use of foreign or imported equipment is expressly prohibited and will not be allowed.

1.04 SUBMITTALS AND O&M MANUALS:

A. For approval: eight (8) copies of manufacturer's certified drawings and descriptive data showing the principal dimensions, construction details, and materials of construction for all components of the scum pumps shall be provided for review and approval by the Engineer.

1. Submittal data provided for review by the Engineer shall reflect the specific equipment proposed for each installation. Generic or non-specific submittals shall not be considered acceptable.

2. Complete control schematic diagrams shall be provided with the submittal data, as well as to-scale CAD drawings showing the exact equipment to be provided and dimensions for the same.

B. After fabrication: The pump and control manufacturers shall deliver eight (8) copies of suitable support literature (installation, operation and maintenance manuals) to the Engineer for the pump and all related equipment specified herein. Installation of pump and related appurtenances shall be performed in strict accordance with written instructions provided by the manufacturer.

1. If electrical control panels are provided as part of a pump package, electrical schematic diagram of the control system shall also be provided, prepared in accordance with NMTBA and JIC standards. The schematics shall illustrate (to the extent of authorized repair) pump motor branch, control and/or alarm system circuits, and all interconnections between these circuits. Wire numbers shall be clearly indicated on all schematic diagrams.

a. Schematics for individual components that are not normally repairable by station operators need not be included, and the details for such components shall not be provided in lieu of the overall system schematics.

b. Partial schematics of the components, block diagrams, or simplified schematics will not be provided in lieu of overall system schematic diagrams.

2. Complete, comprehensive O&M manuals for pump and controls shall be provided to the Owner by the equipment supplier.

a. O&M manuals shall be provided in a single three-ring binder, and shall include all published O&M information for the pump, motors, and electrical controls.

C. In addition to the printed O&M manuals as outlined above, two (2) copies of a repair DVD demonstrating the pump disassembly and reassembly shall also be provided by the manufacturer of the specified chopper pump as outlined herein, for storage and use by the Owner.

1.05 MANUFACTURER'S EXPERIENCE REQUIREMENTS:

A. It is the express intent of these Specifications to accurately describe equipment that is a regular production item of the specified manufacturer, and that has a proven record of performance in identical or similar applications in other treatment facilities. The pump manufacturer shall have a minimum of twenty (20) years of documented experience in the design and production of wastewater pumps of all types, and not less than five (5) years of experience in the production of the exact equipment as specified herein.

1. Pre-submittal data for proposed alternates shall be submitted for review and approval by the Engineer no less than fourteen (14) calendar days prior to the bid date for this project. Information provided with proposed alternates shall include complete data for the proposed pump, specifically by model number, and not just representative brochures or a compilation of general data. All data presented shall strictly pertain to the requirements of this specific job.

    2. Pre-submittal data provided shall be accompanied by a list of not less than twenty five (25) reference installations of horizontal chopper pumps in similar service applications. At least five (5) of the reference installations provided for approval shall be the exact model pump specified herein. All references shall be for equipment that has been in continuous service for a period of not less than five (5) years, and only pumps that are currently in service at the time of referral will be considered. Pumps that have been removed from service for any reason will not be considered as references. Telephone numbers and contact names shall be provided for any references upon request from the Engineer.

    3. Provision of performance bonds or other means of circumventing the above requirements for historical references and verification of past performance in identical applications are not considered an acceptable means of verifying the required manufacturers experience.

    4. Project-specific CAD drawings showing the arrangement of the pump, to scale, shall be provided, along with a complete list of every single deviation to the letter or intent of this specification, and an explanation of how the proposed alternate provides superior performance and/or longevity to the requirements of these Specifications.

B. Any pre-approved alternates shall be listed by addendum not less than seven (7) days prior to the bid date. The decision of the Engineer with respect to acceptability and compliance with these Specifications will be considered final, and the provision of additional data for review will not be allowed.

C. Manufacturers not able to comply with the minimum experience requirements or the number and/or size of the required reference installations will not be considered. No consideration will be given to any manufacturer who cannot comply with ALL of the requirements of Section 1.05.

D. Only manufacturers completely compliant with the requirements of 1.03 (F) will be considered for this project. The use of imported equipment is strictly prohibited on this project.

E. New pumps provided shall duplicate the existing equipment to the greatest possible extent.

1.06 MANUFACTURER'S ABILITY TO PERFORM:

A. Upon request from the Owner or Engineer, the manufacturer will provide adequate proof of financial security relative to performance and his ability to meet delivery schedules. Also, if requested by the Owner or the Engineer, the manufacturer shall provide evidence of facilities, equipment, and expertise as may be required to produce the equipment specified herein.

    1. Such evidence shall be demonstrated exclusively by a visit to the pump manufacturer's facility by the Engineer and Owner.

1.07 QUALITY ASSURANCE AND MANUFACTURER SUPPORT:

A. The contractor shall submit manufacturer's standard warranty and a performance affidavit for all new equipment to be furnished in accordance with this section.

B. The factory warranty for the new pumps and related equipment (motors, electrical controls, etc...) shall be the respective manufacturer's standard warranty against defects in workmanship and materials, as outlined in Section 2.06. The warranty shall apply for one (1) year from the date of startup, not to exceed 18 months from factory shipment.

C. An extensive parts inventory shall be maintained by the manufacturer such that ALL pump parts (except electric motors) are available from factory inventory for overnight delivery during the life expectancy of the pump. For the purpose of defining the extent fo the manufacturer's parts inventory support, minimum expected service life for the specified pumps is set at twenty (20) years. Upon request by the Engineer, the manufacturer shall provide digital photos of their parts inventory, as well as sworn statements verifying the specific parts in stock to support the proposed pumps, to verify compliance with this requirement.

PART 2 PRODUCTS

2.01 VERTICAL RECIRCULATING CHOPPER PUMP:

A. The scum pump(s) furnished for this project shall be new and unused, and shall be fully capable of successfully handling heavy concentrations of clarifier scum and floating (skimmed) grease, and shall be specifically designed to allow mixing of the wet well contents to homogenize the same prior to pumpout. The pumps shall be proven in the anticipated service by numerous successful installations, and shall be capable of handling heavy concentrations of rags, debris, grit, plastic, hair, and other foreign material that can be expected to be present in a typical scum pumping application.

B. The chopper pump shall be specifically designed to pump waste solids at heavy consistencies. Materials shall be macerated and conditioned by the pump as an integral part of the pumping action. The pump must have demonstrated the ability to chop through and pump high concentrations of solids such as thick sludge, heavy rag loadings, plastics, grease and hair balls, wood, paper products, sanitary products, wipes, and stringy materials without plugging, both in tests and field applications.

C. The pumps provided for this project shall be proven in similar applications including scum mixing, digester recirculation, and sludge mixing/handling. Adaptations of standard centrifugal pumps that do not incorporate the specified chopper design, the adjustable recirculation system, or dry-run pump capability will not be acceptable, and will constitute basis for rejection of the equipment by the Engineer.

D. Equipment shall meet the necessary performance characteristics outlined below, and shall be selected to conform to the requirements of the intended application. Pump performance criteria for each installation are as follows:

- Design rating: 200 GPM @ 45' TDH
- Hydraulic efficiency: 47% (minimum)
- Secondary rating: 400 GPM @ 26' TDH
- Hydraulic efficiency: 45% (minimum)
- Minimum shutoff head: 53'
- Maximum motor size: 7.5 HP
- Maximum motor speed: 1750 RPM
- Impeller design: 8.00" chopper (see specs)
- Vaughan Model Number: V3LR-080

E. The naming of a specific manufacturer and/or model number in these Specifications shall not be interpreted as an indication that the manufacturer's standard equipment is acceptable in lieu of the specific component features noted herein. Naming of a specific model, brand, etc... is only an indication that the manufacturer may have the capability of Engineering and supplying the pumps as specified herein. The manufacturer shall clearly note on his bid proposal and submittal data any and all deviations to this specification.

2.02 PUMP CONSTRUCTION:

A. It is the specific intent of these Specifications to describe equipment that is a regular production item of the specified pump manufacturer, and that has a proven record of performance in identical (not just similar) applications in other treatment facilities. The chopper pump manufacturer shall meet the minimum experience requirements of Section 1.05 as outlined above.

B. The chopper pumps shall be specifically designed to agitate and pump waste solids at heavy consistencies. Materials shall be macerated and conditioned by the pump as an integral part of the pumping action.

C. The pumps must have demonstrated the ability to chop through, mix, and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in factory testing and in field applications. If required by the Owner or the Engineer, a pump performance affidavit shall be provided by the manufacturer, as outlined in Section 1.07 above.

D. Chopper pump casing shall be of semi-concentric design, with the first half of the circumference being cylindrical beginning after the pump outlet, and the remaining circumference spiraling outward to a Class 125 flanged centerline discharge. The casings shall be constructed of A536 ductile cast iron. All water passages shall be smooth and free of blowholes or other imperfections that might hinder good flow characteristics.

1. The use of fabricated casing construction is not considered acceptable. All of the fasteners used for assembly of the pump liquid end shall be 316 stainless steel.

E. Pump impeller shall be the semi-open chopper type. Chopping/maceration of the materials must be accomplished ONLY by the action of the curved, cupped and sharpened leading edges at the bottom of the impeller blades as they move across the cutter bar, creating a smooth, efficient "slicing" effect. Chopper mechanisms or designs that extend past the entrance of the pump volute are not acceptable.

1. The pump impeller shall be constructed of ASTM A148 cast alloy steel, dynamically balanced, and heat treated to a minimum 60 Rockwell C Hardness.

2. The use of fabricated impellers (in lieu of cast construction specified herein) is not considered acceptable, and will constitute basis for rejection of the equipment.

3. Pump out vanes shall be provided across the entire diameter of the impeller on the backing plate, in order to reduce pressure in the seal area, and to draw lubricant down from the oil reservoir should seal leakage occur.

4. The impeller shall have a maximum of three (3) blades, to minimize chances of jamming and/or plugging, and shall be held in place with a key and cutter nut. The impeller shall have no axial adjustments or set screws, and shall not extend past the cutter bar.

F. An opposing cutter bar shall be provided in the suction inlet of the chopper pump. The cutter bar plate will be recessed into the pump bowl providing a funnel-shaped opening, and shall extend diametrically across the entire pump suction opening.

1. The cutter bar shall be a single cast component recessed into the pump bowl, with a funnel shaped inlet opening. As a part of the casting, segment bars shall extend inwardly, to within .015" of the cutter nut. The set clearance between the cutter bar and impeller shall be adjustable to .005" to .020".

2. The cutter bar shall be constructed of ASTM A148 cast alloy steel and heat treated to a minimum 60 Rockwell C Hardness.

3. The use of fabricated cutter bars (in lieu of cast construction specified herein) is not considered acceptable, and will constitute basis for rejection of the equipment.

G, The impeller pump-out vanes shall be specially modified to shear against an upper cutter assembly mounted into the back side of the casing, in order to eliminate any build up of rags, hair, or other stringy material in the seal area or between the impeller and the pump casing. The upper cutter shall consist of no more than 2 cutting anvils to minimize the potential for binding. The set clearance between the impeller and upper cutter shall be adjustable to .010" or less. The upper cutter shall be ASTM 148 cast alloy steel and heat treated to a minimum 60 Rockwell C Hardness.

H. A cutter nut shall be used to secure the pump impeller to the shaft, and to eliminate binding or wrapping of stringy materials at the pump inlet. The cutter nut shall consist of a hex head sufficiently sized for ease of removal, and shall include an integral cast anvil which shears against the adjacent surface of the segment bars on the cutter bar. The cutter nut shall be constructed of ASTM A148 cast alloy steel and heat treated to a minimum 60 Rockwell C Hardness.

I. The pump shaft and impeller shall be fully supported by ball bearings. There shall be an AISI 4140 heat treated stub shaft through the pump casing connected through a solid steel shaft coupling to an AISI 1045 stress-proof shaft extension to the top of the pump.

1. All pump shafting shall have a minimum diameter of 1.5 inches in order to minimize deflection during heavy solids chopping.
2. Intermediate shafting sections shall be fabricated of alloy steel, with steel couplings joining sections as outlined above. Steel couplings shall be keyed and provided with set screws to prevent slipping.

J. Shaft support column shall be 4 inch O.D. precision steel tubing welded to steel flanges, and machined with piloted bearing fits to provide concentricity of all components. All support column tubes shall be leak tested. Distance between shaft bearings shall not exceed critical speed dimensions as determined by the pump manufacturer.

K. All pump shafting shall be supported by oil-lubricated ball bearings, with the exception of the top-most bearing which shall be permanently grease packed. With the exception of the top bearing, all shaft bearings shall operate fully submerged in oil as outlined herein. An oil level monitor as described herein shall prevent operation in the event of oil loss.

1. The use of bronze sleeve bearings lubricated by grease fittings or an oil drip is not considered equal to the specified ball bearing assembly.

2. Pump shaft bearings will be oil bath lubricated by an ISO Grade 46 non-foaming turbine oil, with the exception of the top bearing, which shall be grease packed. All column bearings shall be secured by locking collars, and bearings shall have a minimum B-10 bearing life of 100,000 hours.

3. The complete chopper pump assembly shall be capable of operating when completely dry (i.e., with no water in either the pump volute or impeller) for extended periods of time.

L. Shaft thrust developed shall be taken up by either a double row angular contact ball bearing or two back-to-back mounted single row angular contact ball bearings, which bear against a machined shoulder on one side and the seal sleeve on the other side.

1. Overhang from the centerline of the lower thrust bearing to the seal faces shall be a maximum of 1.2". Shaft overhang exceeding 1.2 inches from the center of the lower thrust bearing to the seal faces shall be considered unacceptable.

M. A mechanical seal shall isolate the bearings from the pumped media at operating temperatures up to 250 F. The mechanical seal shall be fitted with silicon carbide stationary and rotating faces to provide long life expectancy in the presence of grit and abrasive solids.

1. The seal shall ride on a 316 stainless steel shaft sleeve, with the seal tension to be set and held by a minimum of three (3) set screws. Mechanical seals shall be tested for flatness within 2 helium light bands using a helium light source and an optical flat.

N. An automatic oil level monitor shall be located above the mounting plate, and be fitted with an internal 50 watt capacity oil level switch to detect oil level and shut off the motor in event of low oil level. The electrical control panel provided shall continuously monitor the oil level in the monitor reservoir, and shall be wired in such a manner as to stop the pump and illuminate an alarm light in the event of a low oil level.

1. The oil monitor shall be easily accessible without removal of the pump from its mounted position, and shall be wired to the control panel using standard type SO cable and a manufacturer-provided sealing cap and hub. It shall not be necessary to remove the pump to inspect the oil, and addition to the oil level shall be easily accomplished from the top of the structure.

O. The pump assembly shall be mounted vertically on a common steel base plate with 150 pound standard discharge flange. Pump discharge piping shall be 3" O.D. fabricated steel tubing, with a Class 125 flanged discharge connection.

1. Discharge piping shall extend above the floor plate, and will be connected to the system piping as indicated on the Plans. A 3" Class 125 flanged connection shall be provided as shown on the Plans to connect to the system piping.

2. The discharge flange shall be provided with a 1/4" NPT pressure tap. The contractor shall provide an isolation cock, tee, and a pressure gauge on each pump. All pipe fittings used to pipe pressure gauges shall be 304 or 316 stainless steel.

3. Pump and motor alignment shall be ensured by means of piloted alignment provided by the mounting stool, and the complete pump and motor assembly shall be properly mounted to the base with spacers, shims, etc... as may be required for perfect alignment of the pumping unit.

4. Lifting lugs shall be provided on the pump base to facilitate handling during installation. Anchor holes shall be provided in the base plate to facilitate field bolting to the concrete mounting slab as shown on the Plans.

P. A T.B. Woods Sureflex elastomeric type flexible coupling shall be provided to transmit power from the drive motor to the stub shaft at the top of the pump. The coupling shall be sized with a minimum service factor of 1.5, based on the drive rated horsepower, and shall be protected with a suitable coupling guard meeting OSHA requirements. Couplings shall be completely enclosed to prevent accidental contact by the operating personnel.

Q. A motor support base shall be provided with each chopper pump, which shall also be fabricated of carbon steel weldment, and furnished with piloted fits to positively aligning the drive motor and pump shaft without need of external adjustments. The motor support base shall be accurately machined to accept the C-flange motor described below without need for adjustment or shims.

R. The pump assembly cover plate shall be fabricated of carbon steel with a minimum thickness of ½", and suitably reinforced as necessary to support all components without overload or undue stress under any conditions.

1. The pump manufacturer shall provide certified drawings to the contractor outlining required slab openings for installation of the pump. Lifting eyes or lugs shall be provided on the base plate of all pumps to facilitate on-site handling and installation, as well as future removal by the Owner.

2. Pump base plates shall ***not*** be grouted by the contractor after installation to facilitate future removal by the Owner if required.

S. Stainless steel nameplates shall be permanently attached to each pump and drive motor, and shall provide the manufacturer's model number, serial number, rated capacity, head, speed and all other pertinent data. All nameplate data shall be stamped or engraved on the plate.

T. Each scum pump shall be provided with an externally-adjustable recirculation valve and nozzle assembly which shall be mounted on the pump discharge flange. The assembly shall allow the operator to direct pump flow either through the recirculation and mixing nozzle into the wet well, or out the pump discharge piping, and shall permit recirculation of the pit contents prior to or during discharge.

1. The recirculation valve assembly shall be specifically designed for use in the breaking up of floating plastic, scum, solid matter and grease, and mixing the wet well contents with liquid present in the same. The recirculation nozzle arrangement provided for this project shall be field-proven in numerous other installations, specifically for the purpose of mixing scum and grease. The experience requirements of these Specifications shall be enforced to ensure that the pumps provided have been proven in prior installations.

2. The recirculation pumps will be provided with an adjustable discharge nozzle assembly, as well as manual operating controls as described herein. The recirculation nozzle shall be adjustable minimum of 170 degrees horizontally and 70 degrees vertically.

3. Recirculation valve assembly shall be fabricated of A536-72 ductile cast iron with a 316 stainless steel valve disk, and shall be a normal production item of the scum pump manufacturer. Valve and nozzle operating levers shall be located on the fabricated steel deck/mounting plate for easy access and adjustment by the operator during pump operation.

4. An internal diverter valve will be provided, and shall allow operator selection of recirculation of total (100%) of the rated pump capacity, or an infinitely variable portion from zero to 100%. Valve operating handles shall extend through the deck plate for ease of adjustment, and shall be capable of being locked into place during operation. Pump manufacturer's representative will be responsible for the adjustment of the pumpout/recirculation flow from each pump to match site conditions, under the direction of the Engineer.

5. Pump flow shall be either directed out the discharge pipe or through the adjustable nozzle, which shall be located approximately three feet above the bottom of the wet well for the complete mixing and conditioning of the floating solids, scum and grease. Nozzles shall be located in the wet well as indicated on the Plans, to provide efficient up-blast or down-blast mixing.

6. Small diameter recirculation nozzles mounted on pump volutes, and which rely on pump pressure or hydraulic/electric actuation for proper operation, and which are adjustable neither vertically or horizontally as specified above, are not be considered acceptable. Fixed recirculation systems, which do not allow the operator to adjust the direction of the recirculated flow to adapt to and/or accommodate irregularities in the wet well, shall not be acceptable. No special modifications to any portion of the pumps shall be allowed to achieve the required mixing.

7. The plant operators shall be fully trained in the effective use and operation of the specified recirculation system by the pump manufacturer or by their authorized representative during startup of the equipment.

2.03 MOTOR REQUIREMENTS:

A. Scum pump(s) shall be driven by a vertical solid shaft electric motor of the size as indicated above. Motor shall be a premium efficient design, TEFC severe duty rated, and be sized for non-overloading conditions throughout the entire range of published performance for the specified pump.

B. Motor shall be suitable for operation on 460/3/60 electrical service, and shall be the vertical solid shaft, ball bearing type, totally enclosed fan cooled, premium efficiency design suitable for mounting in the space shown on the Plans. Motors shall be provided with three (3) winding thermostats (one per phase) in the windings of each phase to afford protection of the motor against excessive operating temperature. Thermostats shall be the Klixon type, suitable for use with 120VAC control power, with leads routed to the conduit box for connection to monitoring circuitry separate from the power wiring. Special purpose relays will not be required for the operation/monitoring of the thermostats provided.

1. The pump motors shall be manufactured in accordance with all applicable standards of NEMA, IEEE, AFBMA, NEC, and ANSI. The motors shall be a premium efficiency squirrel cage induction type, with normal starting torque and slip characteristics.

2. Motor shall be provided with a C-flange mounting face for direct connection to the pump motor stool as specified above.

2. Winding insulation shall be non-hygroscopic, rated as Class F or better.

3. The motor shall be capable of carrying full load current continuously, without injurious temperature rise, in an ambient temperature of 40 degrees C.

4. All motors shall be provided with a minimum service factor of 1.15.

5. Motors located outdoors will be provided with 120VAC silicon space heaters in the windings of each motor to prevent the formation of condensation. The space heaters shall be sized by the motor manufacturer for the frame size provided, and shall be installed prior to shipment. Location of the space heaters shall not interfere with operation of the winding thermostats specified above. Leads from the space heaters will be routed to the conduit box that is mounted on the side of the motor frame. Wiring of the space heaters to 120VAC power shall be provide by the contractor, and shall be interlocked with auxiliary contacts from the motor starter sot that they are energized only when the respective pump is off line.

C. Pump motors shall be sized to be non-overloading above the rated nameplate horsepower under any condition of operation from shut-off head to runout capacity. All motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of pump operation from zero head to shut-off.

2.04 O&M REQUIREMENTS:

A. Eight (8) printed operation and maintenance manuals and parts lists shall be provided to the Owner for future reference, prepared in accordance with the requirements of these Specifications. All O&M manuals shall be provided in hard-backed binders, specifically labeled as to job name, equipment type and/or designation, or any other identification that allow the operations staff to easily identify the equipment it pertains to. Loose leaf O&M data is not acceptable and will not be accepted.

2.05 PAINTING:

A. All exposed metal surfaces of the pump shall be prepared for painting by means of a commercial sandblast meeting the requirements of SSPC-SP6. Immediately after blast cleaning, the pump and any replacement parts provided shall be provided with a single coat of Tnemec Perma-Shield PL Series 431 epoxy primer. After curing, a single finish coat of Tnemec Perma-Shield PL Series 431 epoxy shall be applied, for a total thickness of 30 MDFT. All coatings shall be applied in strict accordance with the coating system manufacturers instructions. Motors shall be provided with the manufacturer's standard enamel paint finish, for field finish painting by others.

B. Coatings shall be applied by the pump manufacturer prior to shipment of pumping equipment to the job site.

2.06 PUMP ACCESSORIES AND SPARE PARTS REQUIRED:

A. Each pump shall be equipped with a glycerin-filled pressure gauges and diaphragm isolator assemblies to enable the operator to monitor pump discharge pressures. Gauge shall be a minimum of 6 inches in diameter, and shall be scaled to read directly in feet of water column. Rated accuracy shall be 1.5 percent of full scale. Pressure range of all gauges shall be 0-46 feet of water column. Gauges shall be manufactured by PIC, or approved equal.

1. Gauges shall not be screwed directly into the pump discharge piping, but shall be provided with a diaphragm isolator to prevent contact of the gauge internals with the pumped media. Gauges and diaphragm isolators shall be pre-assembled prior to shipment to the job site, and both the gauge and interconnecting piping shall be filled with glycerin. Gauges shall be mounted with 304 stainless steel fittings and shall be provided with ball valves for both isolation and venting purposes.

2. Pressure gauges shall be all-304 or 316 stainless steel construction. Cases shall be 304 or 316 stainless, and wetted parts shall be 316 stainless. Elastomers shall be neoprene. Diaphragm seals shall include 316 stainless steel diaphragms, as well as 316 top & bottom housings. Gaskets shall be Teflon or neoprene.

3. Connections and all interconnecting piping, including valves, shall be 304 stainless steel, ½" diameter. A separate vent and isolation valve shall be provided to allow the operator to remove system pressure from the gauge assembly after use.

B. After installation and startup of the new pump, the Owner shall provide the following spare parts and equipment to the Owner for use during normal operation and/or maintenance of the new equipment:

1. One (1) cutter bar assembly and all required shims

2. One (1) upper cutter assembly and all required shims

3. One (1) set of any special pump maintenance tools

4. One (1) flexible coupling insert

5. One (1) mechanical seal assembly

C. Only one set of parts need be provided for identical model pumps, but a complete set is required for each separate pump model furnished. All spare parts provided shall be new and unused, and shall be packed in sturdy containers with indelible identification markings as to their use. Spare parts shall be provided to the Owner after acceptance of the project by the Engineer. Storage of the parts prior to that time shall be the responsibility of the contractor. Any spare parts consumed during equipment startup shall be replaced by the manufacturer without cost to the Owner.

D. Printed operation and maintenance manuals and parts lists shall be provided to the Owner for future reference, in strict accordance with the requirements of Section 1.04 of these Specifications. Repair videos shall also be provided by the pump manufacturer, for future use by the Owner.

2.06 MANUFACTURER'S WARRANTY:

A. The pump manufacturer shall warrant the equipment provided to be of the highest quality and construction, free of defects in material and workmanship. A written warranty will be provided for all equipment, and shall indicate specific parts and labor covered.

B. New equipment will be generally warranted for a period not to exceed one year from date of initial startup and/or beneficial use, not to exceed eighteen (18) months after date of shipment. The warranty shall cover all parts of the equipment furnished, excepting only those items that are normally consumed in service, such as oil and grease, packing, gaskets, O-rings, etc...

1. It is not intended that the manufacturer assume liability for consequential damages or contingent liabilities arising from the failure of any product or parts thereof to operate properly, however caused; whether by or resulting from or arising from any defects in design or manufacture, delays in delivery, replacements or otherwise.

2. Components failing to perform as specified by the Engineer, or represented by the manufacturer, or proven defective in service during the warranty period will be replaced, repaired, or satisfactorily modified by the pump manufacturer without cost of parts or labor to the Owner.

3. The equipment warranty shall become effective upon acceptance by the Owner or the Owner's authorized agent, or upon beneficial use of equipment by plant operating staff, whichever occurs first.

PART 3 EXECUTION

3.01 EXAMINATION:

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Equipment manufacturers shall provide written instructions for proper handling of the equipment. Immediately after off-loading, contractor shall inspect all equipment and appurtenances for shipping damage or missing parts. Any damage or discrepancies shall be noted in written claim form with the shipper prior to accepting delivery. Validate all serial numbers, etc... with the shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION:

A. The contractor shall install, level, align, and lubricate the pump, controls, piping, and related equipment as indicated on project drawings or outlined in the manufacturer's O&M manuals. Installation must be performed in strict accordance with the written instructions supplied by the manufacturer at time of delivery.

B. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

C. Prior to applying electrical power to any motors or control equipment, check all the wiring for tight connections. Verify that protective devices (fuses & circuit breakers) conform to project design documents. Manually operate all of the circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.03 FIELD QUALITY CONTROL:

A. Prior to final acceptance by the owner, an operational test of the pump, and control system shall be conducted to determine that the installed equipment meets the stated purpose and intent of the Specifications. Tests shall demonstrate that all of the equipment provided (1) is electrically, mechanically, structurally, and otherwise acceptable, (2) is safe and in optimum working condition, and (3) performs in strict accordance with the specified operating criteria.

B. After construction debris and foreign material has been removed, contractor shall supply clear water volume adequate to operate the pump and verify suitability for service. Observe and record operation of pump, including discharge gage readings, ampere draw, pump controls, and any other related measurements. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to undue noise, vibration or other operational problems.

C. Coordinate system start-up with the manufacturer's technical representative. The representative or factory service technician will inspect the completed installation, calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.04 CLEANING:

A. Prior to acceptance, inspect the equipment provided for dirt, splashed material or damaged paint. Clean or repair accordingly. Touch up all areas that may have been scratched or otherwise damaged during installation or startup. Remove from the job site all tools, surplus materials, scrap and debris.

3.05 PROTECTION:

A. The scum pumps shall be placed back into service immediately after startup by the manufacturer's representative. If operation is delayed, equipment is to be stored and maintained per the manufacturer's written instructions.

3.06 PAYMENT FOR RECIRCULATING SCUM PUMPS:

A. Payment for the described pump and related work shall be at the lump sum bid noted in the Bid Schedule. The bid shall be full payment for the specified screw centrifugal pump, piping, electrical work, fencing, access roadway, and all other work that may be required for a fully operational pumping system acceptable to the Engineer and the Owner.

END OF SECTION

SECTION 11422

RAS PUMPS
PART 1 - GENERAL

1.1 PERFORMANCE CRITERIA

A. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

B. The pump manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.

C. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 8" suction connection, and 8" discharge connection. Pump rating 1000 GPM @ 16' TDH.

D. Pump Performance Certifications

1. Solids Handling Capability
   a. All internal passages, impeller vanes, and recirculation ports shall pass a 3" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the engineer, manufacturer's certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

E. Reprime Performance

1. Consideration shall be given to the sanitary sewage service anticipated, in which debris is expected to lodge between the suction check valve and its seat, resulting in the loss of the pump suction leg, and siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.
2. During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic repriming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.
3. Pump must reprime 22 vertical ft. at the specified speed and impeller diameter. Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full capacity within five minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:
   a. A check valve to be installed down stream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.
   b. A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.
   c. The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90o elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.

d. Impeller clearances shall be set as recommended in the pump service manual.

e. Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.

f. Liquid to be used for reprime test shall be water.

g. Upon request from the engineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

F. Manufacturer's Warranty

1. The pump manufacturer shall warrant the pump equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.
2. All equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as oils, grease, packing, gaskets, O rings, etc. The pump manufacturer shall be solely responsible for warranty of the pump equipment and all components.
3. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.
4. It is not intended that the pump manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.
5. This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment from the factory, whichever occurs first.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The contractor shall prepare his bid based on the specified equipment for the purpose of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

B. After execution of the contract, the contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be superior in construction and performance to that specified in the contract, and the higher quality must be demonstrated by a list of current users of the proposed equipment in similar installations.

C. In event the contractor obtains engineer's approval for equipment substitution, the contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the engineer prior to acceptance.

D. It will be assumed that if the cost to the contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.

2.2 PUMP DESIGN

A. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.

B. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

C. Materials and Construction Features
   1. Pump casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate following features:
   2. Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.
   3. Fill port coverplate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, hand nut threads must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.
   4. Casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.
   5. Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.

D. Coverplate shall be cast iron Class 30. Design must incorporate following maintenance features:
   1. Retained by hand nuts for complete access to pump interior. Coverplate removal must provide ample clearance for removal of stoppages, and allow service to the impeller, seal, wearplate or check valve without removing suction or discharge piping.
   2. A replaceable wearplate secured to the coverplate by weld studs and nuts shall be AISI 1015 HRS.
   3. In consideration for safety, a pressure relief valve shall be supplied in the coverplate. Relief valve shall open at 75-200 PSI.
   4. Two O-rings of Buna-N material shall seal coverplate to pump casing.
   5. Pusher bolt capability to assist in removal of coverplate. Pusher bolt threaded holes shall be sized to accept same retaining capscrews as used in rotating assembly.
   6. Easy-grip handle shall be mounted to face of coverplate.

E. Rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, sealplate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:

   1. Sealplate and bearing housing shall be cast iron Class 30. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.
      a. The bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.
      b. The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.

c. Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.

2. Impeller shall be ductile iron, two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lockscrew and conical washer.

3. Shaft shall be AISI 4140 alloy steel unless otherwise specified by the engineer, in which case AISI 17-4 pH stainless steel shall be supplied.

4. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.

5. Shaft seal shall be cartridge oil lubricated mechanical type. The stationary and rotating seal faces shall be tungsten titanium carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the sealplate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.

6. Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same capscrews as used for retaining rotating assembly.

F. Adjustment of the impeller face clearance (distance between impeller and wearplate) shall be accomplished by external means.

1. Clearances shall be maintained by a four point external shimless coverplate adjustment system, utilizing a four collar and four adjusting screw design allowing for incremental adjustment of clearances by hand as required. Each of the four points shall be lockable to prevent inadvertent clearance increases or decreases due to equipment vibration or accidental operator contact. The four point system also allows for equal clearance gaps at all points between the impeller and wear plate. Requirement of realignment of belts, couplings, etc., shall not be acceptable. Coverplate shall be capable of being removed without disturbing clearance settings. Clearance adjustment systems that utilize less than four points will not be considered.

2. There shall be provisions for additional clearance adjustment in the event that adjustment tolerances have been depleted from the coverplate side of the pump. The removal of stainless steel shims from the rotating assembly side of the pump shall allow for further adjustment as described above

3. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

G. Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the coverplate opening, without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

H. Spool flanges shall be one-piece cast iron, class 30 fitted to suction and/or discharge ports. Each spool shall have one 1-1/4" NPT and one 1/4" NPT tapped hole with pipe plugs for mounting gauges or other equipment.

I. Serviceability

1. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs.

2. No special tools shall be required for replacement of any components within the pump.

J. Pump Base Package

1. Pump shall be mounted on a fabricated steel base consisting of pump, motor, V-belt drive unit, and belt guard.

2. The pump motor shall be horizontal, TEFC, inverter duty type, with normal starting torque and low starting current characteristics, suitable for operation on 460 volt, 3 phase, 60 Hz electrical service. The motor shall be non-overloading over the entire operating range of the pump. Each motor shall be of NEMA design cast iron frame with copper windings.

3. Power shall be transmitted from the motor to the pump by means of a V-belt drive assembly. The drive assembly must be selected to establish proper pump speed to meet the specified operating conditions. The drive assembly shall have a minimum of two belts, and provide a safety factor of no less than 1.5 (BHP to motor HP). Computation of safety factors shall be based on performance data published by the drive manufacturer, and copies of drive selection computations shall be included as part of the submitted data for approval by the engineer.

4. Pump drive transmissions shall be enclosed on all sides in a guard constructed of any one or combination of materials consisting of expanded, perforated, or solid sheet metal. Expanded or perforated openings shall not exceed 1". The guard shall be manufactured to permit complete removal from the pump unit without interference with any unit component.

5. The pumps and exposed steel framework shall be cleaned with an industrial grade chemical cleaner. The prime coat shall be a zinc base synthetic primer and the finish coat shall be an automotive grade acrylic enamel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, contractor shall inspect complete pump and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all pump serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 INSTALLATION

A. Install, level, align, and lubricate pump(s) as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

B. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to control panel.

D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

E. After all anchor bolts, piping and control connections are installed, completely fill the grout dam in the pump station base with non-shrink grout.

3.3 FIELD QUALITY CONTROL

A. Operational Test
   1. Prior to acceptance by owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
   2. After construction debris and foreign material has been removed form the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

SECTION 13526

DATA COLLECTION SYSTEM

PART 1 - GENERAL

1.1 MANUFACTURERS

A. The SCADA hardware and integration shall be provided by: Hydra Service, Inc - Hydralink System.

I.2 GENERAL SPECIFICATIONS

A. Basis of site communications shall be cellular utilizing the latest IoT (Internet of Things) hardware and service providers.

B. All communications (router) hardware shall be off the shelf "non-proprietary" devices. End user shall be able to utilize existing devices or purchase new devices not tied to a specific manufacturer.

C. End user shall acquire cellular data plan directly from IoT M2M providers. Manufacturers that resell data and require contracts for cellular service will not be considered.

D. End user shall own "on-premise" all software and hardware to communicate, display, historically log, and notify for alarms. No third-party servers, remote web servers, or remote callout will be acceptable.

E. Equipment must be compatible of communicating with standard HMI packages such as VT SCADA, IFix, Wonderware, etc.

F. All field units shall be interchangeable without the need for custom code.

G. System shall be a complete "ICT System" (install, configure, test) without the need for additional programming.

H. The communications system shall not require any Virtual Private Networks for site connectivity.

I. End user shall have access to an escrow repository for all Hydralink source code in the event the product is no longer supported by the manufacturer.

1.3 HARDWARE SPECIFICATIONS

A. Hydralink Pump Controller

1. Unit shall be DIN rail mountable

2. On-site configuration, process viewing, and historical log viewing shall be accomplished via any VNC connection or Hydralink 5" / 7" touch screen display. Unit shall be fully functional without VNC or display after configuration is complete.

3. All inputs and outputs shall be fixed operation - all inputs that are not used can be added to SCADA HMI as spare.

4. Hardware shall have the following inputs and outputs:
   a. Fourteen (14) sourced digital inputs (Pump 3 Inputs if not used are spare)
   b. Pump Running (1-3)

c. Pump Seal Fail (1-3)
d. Pump In Auto (1-3)
e. Phase Loss
f. Battery Low
g. Generator Running
h. High Level Float
i. Redundant Control Active
j. Eight (8) relay outputs (configurable 2-5) functions below:
k. Pump Call (1-3)
l. Station Pump Cut
m. Alarm Active
n. Alarm buzzer Reset
o. Router power cycle
p. PLC power cycle
q. Redundant Control Reset
r. Two (2) 4-20mA analog inputs
s. Wetwell Level Transmitter
t. Pressure Transmitter (Force Main or Water)
u. Two (2) 4-20mA analog outputs - VFD Control
v. Two (2) ethernet ports

5. Hardware IO Expansion and Modbus Expansion
   a. The unit shall have plug and play / Configuration Wizard selectable expansion IO
   b. The unit shall have plug and play / Configuration Wizard selectable modbus communications to specific Modbus compatible phase monitors to read phase to phase or phase to Neutral voltages for each leg and read the fault code of the failure event (phase reversal, over, under, loss of leg, imbalance)

6. Graphics shall include the following selectable displays
   a. Submersible
   b. Smith and Loveless above grade
   c. IEEE grey scale

7. Upon initial deployment or reset to default, a wizard shall be available to configure the following operations:
   a. Controller operation
   b. Duplex/Triplex
   c. Constant/Variable Speed control
   d. Communications Type (None, Hydralink, Modbus)
   e. Graphics type - Submersible, Smith and Loveless, or Greyscale
   f. Ethernet Connection
   g. Hydralink Communication
   h. Site to Site control operations

8. The integrated pump controller shall function as follows:
   a. Alternation between pumps for each cycle or timed (8, 12, or 24Hr)
   b. Forced alternation in the event any currently running or called pump fails
   c. Setpoints for all control and alarm operation when using a transducer
   d. Setpoints for all control and alarm timers
   e. Analog scaling blocks for both analog inputs and failure alarms
   f. Software Auto/Off selector
   g. Historical logging for all triggered alarms
   h. Wet well level bar graph and control display shall include the following

i. Level simulator with touch screen slider to test operations

9. Communication updates shall be as follows:
   a. Immediate (after debounce delay) for any status change - alarms, digital input (pump status), analog value
   b. Time based for analog or digital status - in the event an update is not sent for a status change for "x" minutes the values are sent, max resolution for trending
   c. Setpoint and configuration changes - sent on HMI or local changes only
   d. Totalizers - sent once a day at "XXXX" time or when requested from HMI
   e. All setpoints shall be stored in the Hydralink Server and be retrievable in the event a Hydralink Control needs to be replaced

B. Hydralink Monitoring Unit
   1. Unit shall be DIN rail mountable.

   2. On-site configuration, process viewing, and historical log viewing shall be accomplished via any VNC connection or Hydralink 5" / 7" touch screen display. Unit shall be fully functional without VNC or display after configuration is complete.

   3. All inputs and outputs shall be dynamically configurable.

   4. Hardware shall have the following inputs and outputs:
      a. Ten (10) sourced digital inputs shall be configurable
      b. Choice of 20 labels - name of input
      c. Selectable for Alarm, RTM, Counter with time delay
      d. Control any output if state is true
      e. Operator notes available to allow description of operation
      f. Eight (8) relay outputs shall be controllable from any configured input
      g. Two (2) analog inputs shall be configurable
      h. Choice of 15 labels - name of input
      i. Selectable for Alarm, Totalizer with time delays
      j. Three control/alarm setpoints - (High, Low, and Signal Fail)
      k. Control any output with (High, Low, or Signal Fail)
      l. Totalizer selectable for Gallons, KGallons, or MGD
      m. Scaling and decimal setpoints
      n. Two (2) ethernet ports

   5. Configuration screens shall be available for the following:
      a. Hydralink Communications
      b. Site to Site Configuration
      c. Password protection
      d. Input / Output configuration

   6. Communications updates shall be as follows:
      a. Immediate (after debounce delay) for any status change - alarms, digital input, analog value
      b. Time based for analog or digital status - in the event an update is not sent for a status change for "x" minutes the values are sent, max resolution for trending
      c. Setpoint and configuration changes - sent on HMI or local changes only
      d. Totalizers - sent once a day at "XXXX" time or when requested from HMI

C. General Information for the Hydralink Control and Monitoring Unit
   1. Power Supply 20.4 - 28.8 VDC
   2. 0.46A @ 24VDC

3. IP20 / NEMA 1 Housing
4. -20 to 55 C Deg. Operation Temperature
5. 5 to 95 % Non-Condensing Relative Humidity

D. Hydralink Communication Servers (Cloud or Local)
1. Servers shall have redundant capabilities with automatic failover and restoration
2. Servers shall have an installation and configuration wizard to allow customer customization of security and LAN configuration.
3. No custom (one off) communications systems will be acceptable. The servers must be fully functional without any additional programming requirements to communicate with any Hydralink device and compatible HMI platform
4. In the event of any loss of communications to a Hydralink field device the server shall deliver a communications failure to the HMI or Alarming system
5. In the event of a loss of communication to the HMI system the server shall store the last communications from all Hydralink field devices and immediately deliver the information when the HMI communications is restored
6. Failover between servers shall be less than 1 second to reconnect field communications
7. Local Server hardware shall be an industrial style, fanless, ductless housing for ease in maintenance
8. All historical data shall be passed through the servers to the HMI system for storage

E. HMI Computers and Display
1. Integrator must provide the following computer hardware
   a. Two (2) each Dell Inspiron Desktop Computers
   b. The HMI computer must meet the latest design requirements per the selected HMI software requirements
   c. Must be a RAID 1 configuration with hard drives capable of 3 years historical data
   d. Two (2) each 40" curved screen monitors
   e. One (1) each 60" wall mounted monitor to display the overview of plant operations
   f. Two (2) each alarm callout modems compatible with the selected HMI software

1.4 HUMAN MACHINE INTERFACE SOFTWARE

A. The integrator shall supply the following HMI software licensed to the Owner
1. Dual Redundant Development 1000 Tag
2. Alarm Callout
3. Two (2) Client Connections
4. Redundant Historian
5. The HMI software shall be VTSCADA by Trihedral

1.5 SYSTEMS INTEGRATION AND TESTING

A. The HMI integrator shall be a VTSCADA certified systems integrator

B. HMI graphics design
1. The integrator shall provide a WWTP plant overview screen to display the following:
   a. Bar Screen Off, Running, Fault

2. The integrator shall create a pop-up screen for a more detailed view of each process a listed above in item a-k to include:
    a. Motor running times
    b. Motor start counter
    c. Trending of all data
    d. Valve positions
    e. UV detailed information

3. The integrator shall generate automatic reports as required by the owner.

4. The integrator shall be a certified Hydralink integrator and create all drivers and connectivity from the HMI to the Hydralink Servers

5. The system supplier shall provide startup, loop testing, and training for all Hydralink sites back to the HMI system. Testing shall include:
    a. Plant Overview screen operation
    b. Site specific HMI pop screen operation
    c. Alarm Callout for all system critical alarms
    d. Report Generation

1.6 SITE HARDWARE

A. The following sites will require the Hydralink Control Unit
    1. Influent Pumps
    2. Lagoon Pumps
    3. County shop Pumps

B. The following sites will require the Hydralink Monitor Unit
    1. Blower 1-3
    2. Bar Screen & Conveyor
    3. Grit removal
    4. Aeration basins 1 & 2
    5. Clarifiers 1-4
    6. UV has multiple outputs it would be connected by cat 5 cables
    7. Parshall flume

C. All Hydralink units are to be provided as follows:
    1. Prewired and tested in a NEMA 4X polycarbonate enclosure
    2. Hydralink 7" Display for all control sites
    3. Cellular router and antenna
    4. Power Supply with battery backup system
    5. All inputs and outputs must be wired to terminal blocks
    6. Main Breaker

SECTION 15050

PLANT AND PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Sanitary sewer piping system.

C. Domestic water piping system.

D. Storm water piping system.

E. Natural gas piping system.

F. Process piping system.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

Section 03300 - Concrete: Placement of pipe sleeves.

1.3 RELATED SECTIONS

A. Section 02222 - Excavating.

B. Section 02223 - Backfilling.

C. Section 02225 - Trenching.

D. Section 02675 - Disinfection of Water Distribution System.

E. Section 09900 - Painting.

F. Section 15140 - Supports and Anchors.

G. Section 15190 - Mechanical Identification.

H. Section 15440 - Plumbing Fixtures.

1.4 REFERENCES

A. ANSI B31.1 - Power Piping.

B. ANSI B31.2 - Fuel Gas Piping.

C. ANSI B31.4 - Liquid Petroleum Transportation Piping Systems.

D. ANSI B31.9 - Building Service Piping.

E. ASME - Boiler and Pressure Vessel Code.

F. ASME Sec. 9 - Welding and Brazing Qualifications.

G. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.

H. ASME B16.3 - Malleable Iron Threaded Fittings.

I. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.

J. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.

K. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.

L. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.

M. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.

N. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

O. ASME B16.32 - Cast Copper Alloy Solder-Joint Fittings for Sovent Drainage Systems.

P. ASTM A47 - Ferritic Malleable Iron Castings.

Q. ASTM A53 - Pipe, Steel, Black and Hot-Dipped
Zinc Coated, Welded and Seamless.

R. ASTM A74 - Cast Iron Soil Pipe and Fittings.

S. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.

T. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

U. ASTM B32 - Solder Metal.

V. ASTM B42 - Seamless Copper Pipe.

W. ASTM B43 - Seamless Red Brass Pipe.

X. ASTM B75 - Seamless Copper Tube.

Y. ASTM B88 - Seamless Copper Water Tube.

Z. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.

AA. ASTM B302 - Threadless Copper Pipe (TP).

BB. ASTM B306 - Copper Drainage Tube (DWV).

CC. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.

DD. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

EE. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

FF. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

GG. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.

HH. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

II. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

JJ. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.

KK. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

LL. ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.

MM. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.

NN. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

OO. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

PP. ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.

QQ. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

RR. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

SS. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

TT. ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System.

UU. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

VV. ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

WW. ASTM F845 - Plastic Insert Fittings for Polybutylene (PB) Pipe.

XX. AWS A5.8 - Brazing Filler Metal.

YY. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

ZZ. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

AAA. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.

BBB. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

CCC. AWWA C651 - Disinfecting Water Mains.

DDD. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

EEE. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

FFF. CAN-3 B281 - Auminum Drain, Waste, and Vent Pipe and Components.

GGG. NCPWB - Procedure Specifications for Pipe Welding.

HHH. NFPA 54 - National Fuel Gas Code.

III. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Record actual locations of valves, cleanouts and bends.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 QUALITY ASSURANCE

A. Pipe: Manufacturer's name and pressure rating marked on pipe.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with NCPWB Standard Procedure Specifications.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section.

1.10 REGULATORY REQUIREMENTS

A. Perform work in accordance with Local Plumbing Code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from Local Authority indicating approval of installation of backflow prevention devices.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Accept piping on site in shipping containers with labeling in place. Inspect for damage.

C. Load and unload all pipe, fittings and appurtenances by hoists or skidding. Use slings, hooks and pipe tongs in such a manner to prevent damage to products. No inward projecting lifting device shall be allowed.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.12 ENVIRONMENTAL REQUIREMENTS

Do not install underground piping when bedding are wet or frozen.

1.13 EXTRA MATERIALS

Furnish under provisions of Section 01700.

PART 2 - PRODUCTS

2.1 GENERAL

All pipe, fittings, and appurtenances shall be as shown on the drawings and specified in this section. All pipe, fittings, and appurtenances shall be new and unused.

2.2 BURIED PRESSURE PIPE AND FITTINGS

A. Stainless Steel Pipe and Fittings
   1. Pipe
      a. Stainless steel pipe shall meet the requirements of ASTM A 778 and shall be TP 304L, "as welded" grade. Design and manufacture pipe in accordance with ANSI B31.3 for a working pressure of 15 psi, the depth of cover indicated on the Drawings, and a H-20 traffic loading.
      b. Stainless steel pipe shall have steel-pipe- equivalent outside diameter.
      c. Pipe joints shall be butt-welded.
   2. Fittings
      a. Fittings shall be stainless steel. Fitting wall thickness shall match pipe wall thickness. Fittings shall meet the requirements of ASTM A 774 and shall be 304L, "as welded" grade.
      b. All elbows shall be long radius.
      c. Fitting joints shall be butt-welded.
   3. Welding and Filler Rods

a. Welding rods for shielded metal arc process shall be AWS 5.4, E 308L
b. Filler rod for gas tungsten or gas metal arc process shall be AWS 5.9. ER 308L.

B. Polyvinyl Chloride Pipe and Fittings, Smaller than 4-inch
1. Pipe and Fittings
a. Pipe and fittings shall be manufactured from unplasticized, polyvinyl chloride which meets the requirements of ASTM D1784. Polyvinyl chloride shall be Class 12454-B.
b. Polyvinyl chloride pipe, smaller than 4-inch, shall meet requirements of ASTM D1785.
c. Polyvinyl chloride fittings, smaller than 4- inch, shall meet the requirements of ASTM D2466.
d. Pipe and fittings shall be Schedule 80. Pipe and fitting joints shall be socket solvent weld type.
e. Pipe and fittings shall be by the same manufacturer.
2. Welding Rod
Welding rods shall be same material as pipe and fittings.
3. Primer
Primer shall be stabilized tetrahydrofuran, or equal primer supplied by pipe and fitting manufacturer, for hot, windy conditions.
4. Solvent Joint Cement
Solvent joint cement shall meet the requirements of ASTM D2564. Cement containers shall be no larger than one pint and shall have a dauber secured to the container lid.

C. Copper Pipe and Fittings
1. Pipe
Copper pipe shall meet the requirements of ASTM B88. Type and temper shall be as follows:

Conveyed Material	**Pipe Type and Temper**
Water	Type K, hard drawn
Air	Type K, hard drawn

2. Fittings
Fittings shall be commercially pure wrought copper and shall meet the requirements of ASTM B75. Fitting dimensions shall meet the requirements of ANSI B16.22. Joints shall be socket type.
3. Solder
Solder shall be 95-5 wire solder and shall meet the requirements of ASTM B32 for Grade 95 TA. Do not use cored solder.
4. Tape Wrap
Tape wrap shall be 15 mil butyl rubber adhesive, polyethylene-backed tape as manufactured by Polyken Division of the Kendall Company, Royston Laboratories,Inc., or equal.
5. Heat Shrink Wrap
Heat shrink wrap shall be cross-linked polyolefin wrap or sleeve with a mastic sealant. Wrap or sleeves shall be Raychem WPC, TPS, flange steel, or equal. Wrap type shall be as recommended by the manufacturer for the specific joint.

2.3 EXPOSED PIPE AND FITTINGS

A. Steel Pipe and Fittings, 4-inch and Larger
1. Pipe and Fittings
a. Pipe and fittings shall meet the requirements of AWWA Standard C200. Design and manufacture pipe fittings for a 250 psi working pressure. Minimum thickness shall be as follows:

6-inch and smaller	Schedule 40
8-inch thru 12-inch	Schedule 20
14-inch and larger	Schedule 10

b. Pipe and fitting joints shall be butt weld joints or flange joints.
2. Coating
Coat the exterior surfaces of steel pipe and fittings as specified in Section 09900.

3. Flange Joints
   a. Flanges shall be steel and shall meet the requirements of AWWA Standard C-207. Flange shall be Class D.
   b. Gaskets shall meet the requirements of AWWA Standard C207. Gaskets shall be full face. Gaskets shall be neoprene.
   c. Nuts and bolts shall meet the requirements of AWWA Standard C-207. Nuts and bolts shall be cadmium plated.

B. Polyvinyl Chloride Pipe and Fittings
   1. Pipe and Fittings
      a. Pipe and fittings shall be manufactured from unplasticized, polyvinyl chloride which meets the requirements of ASTM D1784. Polyvinyl chloride shall be Class 12454-B.
      b. Polyvinyl chloride pipe shall meet the requirements of ASTM C1785.
      c. Pipe and fittings shall be Schedule 80. Pipe and fitting joints shall be socket solvent weld, threaded or flanged.
      d. Socket solvent weld fittings shall meet the requirements of ASTM D2467.
      e. Threaded fittings shall meet the requirements of ASTM D2464.
      f. Flanges shall be polyvinyl chloride. Flanges shall be 150 psi lbs., flat face, with ANSI Drilling.
      g. Pipe and fittings shall be by the same manufacturer.
   2. Welding Rod
      Welding rods shall be same material as pipe and fittings.
   3. Primer
      Primer shall be stabilized tetrahydrofuran, or equal primer supplied by pipe and fitting manufacturer, for hot, windy conditions.
   4. Solvent Joint Cement
      Solvent joint cement shall meet the requirements of ASTM D2564. Cement containers shall b no larger than one pint and shall have a dauber secured to the container lid.
   5. Threaded Joint Sealant
      Threaded joint sealant shall be ½ inch wide teflon tape in thickness recommended by manufacturer of threaded fittings.
   6. Gaskets
      a. Gaskets for flange joints shall be ethylenepropylene terpolymer rubber, 1/8 inch thick, and full face with a Durometer hardness of 80.
      b. Gaskets in polyvinyl chloride unions and strainers shall be viton.
   7. Bolts and Nuts
      a. Bolts and nuts used in water piping shall be as follows:
         1) bolts shall be semi-finished regular hex head cap screws, type 304 stainless steel, ASTM A193, Grade B8, NC threads;
         2) nuts shall be semi-finished regular hex head nuts, type 303 stainless steel, ASTM A194, Grade 3F, NC threads.
      b. Bolts and nuts used in chemical piping shall be monel metal, hex head, NC threads.

C. Copper Pipe and Fittings
   1. Pipe
      Cooper pipe shall meet the requirements of ASTM B88. Type and temper shall be as follows:

Conveyed Material	Type and Temper
Water	Type M, hard drawn
Air	Type K, hard drawn

   2. Fittings
      Fittings shall be commercially pure wrought copper and shall meet the requirements of ASTM B75. Fittings dimensions shall meet the requirements of ANSI B16.22. Joints shall be socket type.
   3. Solder and Flux
      a. Solder shall be 95-5 solid wire solder and shall meet the requirements of ASTM B32, Grade 95 TA.

b. Flux shall be noncorrosive.

D. Stainless Steel Pipe and Fittings.

1. Pipe shall be manufactured from ASTM-A240 annealed and pickled sheets and plates in accordance with ASTM A778 in type (304L or 316L) stainless steel. Pipe shall be manufactured to nominal pipe sizes as listed in ANSI B36.19, Table 2, and shall have the following nominal wall thicknesses:

Nominal Pipe Size (IN.)	Actual O.D. (IN.)	Schedule/Gauge/Plate	Nominal Wall Thickness (IN.)
3	3.500	Sch. .5s	0.083"
4	4.500	Sch. .5s	0.083"
6	6.625	Sch. .5s	0.109"
8	8.625	Sch. .5s	0.109"
10	10.750	12 GA Sheet	0.109"
12	12.750	12 GA Sheet	0.109"
14	14.000	11 GA Sheet	0.125"
16	16.000	11 GA Sheet	0.125"
18	18.000	11 GA Sheet	0.125"
20	20.000	10 GA Sheet	0.140"
24	24.000	3/16 Plate	0.188"
30	30.000	3/16" Plate	0.188"
36	35.000	3/16" Plate	0.188"
42	42.000	1/4" Plate	0.250"
48	48.000	1/4" Plate	0.250"
54	54.000	5/16" Plate	0.312"
60	60.000	5/16" Plate	0.312"

2. Fittings shall be butt weld type manufactured in accordance with ASTM-A-774 of the same raw material and in the same thicknesses as the pipe. Long radius elbows up to 24" diameter shall be smooth flow; i.e. centerline to end of elbow equals 1.5 times the nominal pipe size. All short radius, special radius, and reducing elbows and long radius elbows greater than 24" diameter shall be of mitered construction with at least (5) miter sections for 90 degree bends, (3) mitered sections for 45 and 60 degree bends, and (2) mitered sections for 30 degree and smaller bends. Reducers shall be straight tapered, cone type, tees, crosses, laterals and wyes shall be shop fabricated from pipe.
3. Flanges
Flanged pipe ends shall be made up of type (304L or 316L) stainless steel slip-on type rolled angle face rings and primed or hot dipped galvanized) ductile iron back-up flanges drilled to ANSI 16.1 class 125 standard. The angle face ring thickness shall be equal to or greater than the wall of the pipe or fitting to which it is welded and it shall be continuously welded on both sides to the pipe or

fitting. The angle leg shall not interfere with the flange bolt holes. The back-up flanges shall be supplied with the following nominal thicknesses.

Nominal Pipe Size Thickness (IN.)	Flange (IN.)
2 ½ - 3	½
4	9/16
6 - 10	5/8
12 - 16	3/4
18 - 20	7/8
24 - 30	1
36	1 1/8
42	1 1/4
48	1 3/8
54	1 3/8
60	1 ½

4. The piping will be shop prepared for pipe coupling where shown on the drawings or specified herein.
   a. Sleeve type couplings shall be of standard steel construction (specify gaskets, coating, etc). Pipe shall be plain end with external weld beads ground smooth to insure proper gasket seating. For pressure pipe lines, sleeve coupling joints will be restrained by the use of harness rods connecting across the joint to flange lugs on adjacent flange joints, stainless steel harness lugs shall be welded to the pipe to receive the harness rods. All sleeve couplings, flange lugs, harness rods and hardware will be provided by the Contractor.
   b. Arched band type couplings shall be stainless steel of equal or superior alloy and wall thickness as the pipe and will be Depend-O-Lok type as manufactured by Brico or equal. Couplings will be Fixed-FxF, Expansion - ExE, or Fixed by Expansion - FxE as noted on the drawings or as required. The pipe shall be plain end with external weld beads ground smooth and with S.S. restraining rings shop welded to the piping for fixed type couplings.
   c. Split type couplings shall be malleable iron or ductile iron. Gaskets shall be suitable for the service conditions. The pipe ends shall be roll grooved to the coupling manufacturers specifications. Where roll grooving is impractical, the pipe shall have heavy wall machine grooved pipe nipples or machined ring collars fully welded to the pipe or fittings. Nipples shall be taper bored to the I.D. of the adjoining pipe to allow full weld penetration. Collars shall be welded on both sides to the piping. Nipples and collars shall be of the same allow as the piping.
   d. Expansion couplings shall be flanged rubber arch type as specified in Section 15050. Pipe flanges shall be provided for these couplings where shown on the drawings.
5. Threaded pipe, gauge or instrument connections shall be made using stainless steel 150-pound threaded half couplings conforming to ASTM-A182 or ASTM-A-276, shop welded to the pipe at the locations shown on the drawings.
6. Joints
   a. Flanges shall be provided as a minimum at all flanged valves, meters, couplings, and other equipment. Couplings will be provided as shown on the drawings.
   b. Pipe and fitting spools shall be shop fabricated to the fullest extend possible in 40' - 0" maximum lengths with 7' - 6" maximum widths for efficient commercial transport to the

project site. Spools with fittings may exceed 40' - 0" so long as length allows commercial transport. Smaller pipe spools shall be provided with joints as shown on the drawings for special handling, installation, and/or disassembly requirements.

c. All other joints required for shipping, handling and installation of the piping spools shall be (field welds, flange joints, sleeve couplings, band couplings, or split couplings.

E. Stainless Steel Pipe and Fittings, 3/4" through 3"

1. Pipe
   a. Stainless steel pipe shall meet the requirements of ASTM A312 and shall be TP 304, Schedule 40S, seamless.
   b. Pipe joints shall be screwed.
2. Fittings
   a. Stainless steel fittings shall meet the requirements of ASTM A183 and shall be Grade 304, 150 pound, rated 1,000 pound-CWP, forgings. Fittings shall be Schedule 40S. Fitting dimensions shall meet the requirements of ANSI B16.3.
   b. Fitting joints shall be screwed.
3. Thread Lubricant
   Thread lubricant shall be teflon tape.

F. Stainless Steel Pipe and Fittings, Smaller than ¾"

1. Pipe
   Stainless steel pipe shall be Type 304L and shall meet the requirements of ASTM A269. Minimum pipe thickness shall be Schedule 40S.
2. Fittings
   Fittings shall be 316 stainless steel with compression type ends. Fittings shall be Crawford "Swagelok". "Hobe Gyrolok", Parker Hannifin "CPI", or equal.

G. Steel Pipe and Fittings, Smaller than 4"

1. Pipe
   Steel pipe shall meet the requirements of ASTM A106, Grade B. Pipe shall be Schedule 80 and shall have screwed ends. Screwed ends shall meet the requirements of ANSI B16.11.
2. Fittings and couplings
   Fittings and couplings shall be forged steel and shall meet the requirements of ASTM A105, Grade II. Fittings shall be 3,000 pound. Fittings and couplings shall have screwed ends. Screwed ends shall meet the requirements of ANSI B16.11.
3. Unions
   Unions shall be ammonia type.
4. Tape
   Tape for joints shall be teflon type.

2.4 EXPANSION JOINT

The rubber expansion joints, where required, shall be Class 125 lb. flange, pressure rating of 250 psi and of the size as shown on the Drawings. The tube and cover shall be made of neoprene rubber. The joint shall include split retaining rings made of ductile iron, control rods and back-up rings and shall be as manufactured by Mercer Rubber Company, or equivalent.

PART 3 - EXECUTION

3.1 INSPECTION

A. General

1. The quality of all materials, the process of manufacture, and the finished products shall be subject to inspection and approval by the Engineer. Such inspections may be made at the place of manufacture or on the work after delivery, or at both places; and the products shall be subject to

rejection at any time on account of failure to meet any of the specifications' requirements even though sample products have been accepted as satisfactory at the place of manufacture.

2. Prior to being installed, each pipe, fitting, valve, and hydrant shall be carefully inspected, and those not meeting the specifications shall be rejected and at once removed from the work.

B. Reinforced Concrete Pipe

1. The Engineer shall have the right to cut cores from such pieces of the concrete pipe as he desires for such inspection and tests as he may wish to apply.
2. Holes left by the removal of cores shall be filled in an approved manner by and at the expense of the manufacturer of the pipe.
3. The Engineer shall also have the right to take samples of concrete after it has been mixed, or as it is being placed in the forms or molds, and to make such inspection and tests thereof as he may wish.
4. Any pipe which has been damaged after delivery will be rejected and replaced solely at the Contractor's expense.

3.2 INSTALLATION OF BURIED PIPE

A. Laying Piping

1. The Contractor shall provide proper implements, tools, and facilities for the safe and expeditious prosecution of the work.
2. Every pipe, fitting, and valve shall be cleaned of all debris, dirt, and other foreign material before being laid and shall be kept clean until accepted in the completed work.
3. Lay and maintain pipe to the lines shown on the drawings, except as specified in this Article. Lay and maintain pipe to the grade shown on the drawings or to the minimum depth specified in this Article. Install fittings and valves, in the locations shown on the drawings.
4. Where the piping is to be constructed parallel to and close to existing buried utilities, the exact location of which is unknown, adjust the alignment of the piping to least interfere with these utilities, unless otherwise shown or specified.
5. Potable water piping shall be laid at least ten feet horizontally from any existing sanitary sewer or sewage force main. The distance shall be measured from edge of pipe to edge of pipe. Potable water piping crossing sanitary sewers or sewage force mains shall be laid to provide minimum vertical distance of 18 inches between the outside of the potable water piping and the outside of the sewer or force main. The 18 inch separation shall apply whether the potable water piping is over or under the sewer or force main. Lay potable water piping at crossings of sewers and force mains so a full length of pipe is centered on the sewer or force main whenever possible. No potable water piping shall pass through or come in contact with any part of a sanitary sewer manhole.
6. Lay pressure piping to a depth so not less than 4'-6" of cover is provided over all 10 inch and smaller pipe and 4'-0" of cover is provided over all 12 inch and larger pipe, unless otherwise shown. Cover shall be measured as the vertical distance from the top of the pipe to the finish grade elevation.
7. Do not lay pipe in water or when the trench or weather conditions are unsuitable for proper installation.
8. Lower pipe, fittings, and valves into the trench by hand, by means of hoists or ropes, or by other suitable tools or equipment which will not damage products, coatings, or linings. Do not drop or dump pipe, fittings, or valves into the trench.
9. Pipe laying shall proceed upgrade, beginning at the lower end of the pipe line.
10. The Contractor shall use laser beam equipment, surveying instruments, or other proven techniques to maintain accurate alignment and grade.
11. Deflection of pressure pipe from a straight line or grade shall not exceed the limits specified in this Section. If the alignment requires joint deflections in excess of the allowable deflection per joint, furnish and install fittings or a sufficient number of shorter lengths of pipe.
12. Provide thrust restraint at horizontal and vertical deflection fittings and at tees, plugs, tapping sleeves, and tapping saddles.

13. Laying of ductile iron piping shall meet the requirements of ANSI/AWWA C600, unless otherwise specified in this Section.
14. Open excavation shall be satisfactorily protected at all times. At the end of each day's work, the open ends of all pipes shall be protected against the entrance of animals, children, earth, or debris by bulkheads or stoppers. The bulkheads or stoppers shall be perforated to allow passage of water into the installed pipe line to prevent flotation of the pipe line. Any earth or other material that may find entrance into the main sewer or into any lateral sewer through any such open end of unplugged branch must be removed at the Contractor's expense. The cost of all such plugs, and the labor connected therewith, must be included in the regular bid for the sewers.

B. Pipe Bedding and Foundation Backfill
1. Pipe Bedding shall meet the requirements of Section 02223.
2. Pipe Foundation Backfill shall meet the requirements of Section 02233.

C. Jointing
1. The ends of the pipe shall be satisfactorily cleaned just before laying, and the joint shall be made in satisfactory manner in accordance with the recommendations of the manufacturer on particular type of joint and the directions of the Engineer. All joint work shall be done by experienced workmen.
2. Joints shall be as specified in this Section.
3. Each length of pipe shall be mechanically pulled "home" with a winch or come-along against the section previously laid and held in place until the trench and bedding are prepared for the next pipe section. Care shall be taken in laying the pipe so not to damage the bell end of the pipe. Mechanical means consisting of cable placed inside the pipe with a winch, jack, or come-along shall be considered to pull the pipe home where pushing the pipe will not result in a joint going completely home and staying in place. Pushing the pipe home shall be done by means of a block and push bar. Use of hydraulic excavating equipment as the means of pushing or moving the pipe to grade will not be permitted.
4. Piping shall be tested as specified in this Section.

D. Copper Pipe Tape Wrapping
Coat of buried copper pipe by hand taping with pipe tape. Solvent clean and wire brush pipe surface to remove all dirt and loose scale and immediately prime the pipe surfaces as recommended by the pipe tape manufacturer. Solvent cleaning shall meet the requirements of SSPC-SP-1. Wire brushing shall meet the requirements of SSPC-ST-3. Apply the tape to the pipe after the primer has dried. Spirally apply the tape with a 50 percent overlap. Tape wrap or heat shrink wrap pipe joints. Wrap joints above grade or excavate a sufficient bell hole to permit joint wrapping without contamination.

3.3 INSTALLATION OF EXPOSED PIPING

A. Alignment
All pipe shall be installed to accurate lines and grades with fittings, valves, and appurtenances at the required locations. Wherever possible, piping shall be parallel to walls and floors.

B. Installation
1. All piping shall be cleared of debris, dirt, etc., before being installed and shall be kept clean until accepted at completion of work. During installation, no debris, tools, clothing, lumber, or other materials shall be placed in the pipe.
2. Piping shall be installed in a neat workmanlike manner. Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All piping shall be carefully installed in such a manner as to prevent damage to piping materials, protective coatings, and liners.
3. The pipe, fittings, valves, and appurtenances shall be inspected for defects prior to installation.
4. Piping shall be installed such that no undue strain is placed upon piping joints, equipment, or structures.

C. Supports

1. The Contractor shall provide all supports necessary to hold the pipe and appurtenances in a firm, substantial manner at the lines and grades shown on drawings or as directed, and without strain upon the piping and connected equipment.
2. Piping shall be supported from concrete slabs by suitable saddle stands or concrete piers. Piping along walls shall be supported by suitable wall brackets with attached roll or saddle, or by wall brackets with hanger rods. For piping supported from overhead, approved rod anchors of a type capable of screw adjustments after erection of the pipe and with suitable adjustable concrete inserts or beam clamps shall be used.
3. Supports shall be located wherever necessary and in no case shall exceed the following:
   a. Ductile Iron Pipe and Steel Pipe

Pipe Size	Maximum Support or Hanger Spacing
1-inch and smaller	4 feet
1-1/4 inch thru 2-inch	6 feet
3-inch and 4-inch	8 feet
6-inch and 8-inch	8 feet
10-inch and 12-inch	10 feet
14-inch thru 18-inch	10 feet
20-inch and larger	12 feet

   b. Polyvinyl Chloride (PVC) Pipe

   Hanger spacing for PVC pipe shall be as recommended by the pipe manufacturer for the temperature of the material conveyed in the pipe.

   c. Copper Pipe

Pipe Size	Maximum Support or Hanger Spacing
1-inch and smaller	5 feet
1 1/4 inch thru 2-inch	6 feet
3-inch and 4-inch	8 feet

   Copper pipe shall be supported with plastic coated clamps, hangers, and supports.

   d. Stainless Steel Pipe

Pipe Size	Maximum Support or Hanger Spacing
1-inch and smaller	6 feet
1-1/4-inch thru 2-inch	8 feet
3-inch thru 6-inch	10 feet
8-inch thru 16-inch	11 feet
18-inch and larger	12 feet

   Stainless steel pipe, smaller than 4-inch shall be supported with stainless steel clamps, hangers, and supports. Fasteners for stainless steel clamps, hangers, and supports shall be stainless steel.

3.4 INSTALLATION OF SMALL PIPE AND FITTINGS

A. Piping shall be installed in a neat and workmanlike manner. Exposed piping shall be installed parallel to the walls and slabs wherever possible. Piping shall be supported where necessary.

B. After cutting to final lengths, all pipe ends shall be reamed. Threads shall be cleaned. Screwed joints shall be made up with Teflon tape in thickness recommended by the manufacturer of threaded fittings.

C. All joints showing evidence of leaking shall be reworked.

D. All plumbing installations shall be in accordance with local plumbing code.

3.5 SETTING APPURTENANCES

Install all valves, fittings, and appurtenances in the lines as indicated on the drawings.

3.6 CONNECTING TO EXISTING PIPE

A. The Contractor shall locate existing pipe horizontally and vertically and verify the exact size of existing pipe. Locate existing pipe sufficiently in advance of making connections to allow ample time for making changes in the connection location and size.

B. Make each dry connection with fittings and valves indicated on the drawings. Furnish and install sleeves required to complete connections. All required pipe, fittings,, valves, tools, and equipment shall be at the connection site prior to starting connection. Wash interior of new potable water pipe, fittings, and valves with a solution containing 50 mg/l of chlorine prior to making connection. Make connections at night and on weekends when required. The Owner will operate existing valves. Install sufficient pipe and restrain joints so existing pipe can be put in service immediately after connection is completed. Inspect joints and eliminate leaks immediately after connection is completed and existing pipe is put in service. Install watertight plugs on open ends of pipe and valves and backfill excavation if new piping is not connected to dry connection within 48 hours after completing dry connection.

3.7 JOINTS

A. Shouldered Type Joints
   1. Remove antirust coatings from machined surfaces. Clean joint surfaces of the pipe, fittings, adapters, and valves being joined. Wipe surfaces clean of all dirt, oil, grease, and other foreign matter. Wipe surfaces dry. Wipe each gasket clean of all dirt, dust, and other foreign matter.
   2. Slip a gasket over one of the shoulder joints. Apply a thin layer of lubricant to the sealing surfaces of the joint. Use the lubricant furnished by the joint manufacturer. Align the joint of the adaptor or valve being installed with the joint of the receiving adapter or valve. Support the adapter or valve being installed so that the joint is properly aligned until jointing is completed. Install the gasket on the joint shoulders. Equalize gasket stretch. Install the joint coupling. Loosely assemble the joint bolts and nuts. Evenly tighten the nuts. The tightening torque shall not exceed the limits recommended by the joint manufacturer.
   3. Deflect pipe, fittings, adapters, or valves after jointing, if deflection is required. The amount of deflection shall not exceed limits recommended by the joint manufacturer.

B. Threaded Joints
   1. Threading of steel pipe shall be done after bending, forging, heat treating, or welding operations.
   2. Threads shall be concentric with the outside of the pipe and shall conform to ANSI B2.1.
   3. Threaded joints which are not to be seal welded shall be made leaktight by use of Teflon tape. Teflon tape shall not be applied to the first two threads on the pipe.
   4. When threading chemically cleaned pipe, use trichlorethane (menthyl chloroform), inhibited, as the cutting fluid.
   5. Care shall be taken to avoid overtightening of threaded joints and care shall be taken to avoid damaging the pipe exterior with the pipe wrench.
   6. Backing off of made-up threaded joints to facilitate fit-up or alignment will not be permitted.

C. Flange Joints
   1. Remove antirust coating from machined surfaces. Clean joint surfaces of the pipe, fitting, and valves being joined. Wipe surfaces clean of all dirt, oil, grease, and other foreign matter. Wipe surfaces dry. Wipe each gasket clean of all dirt, dust, and other foreign matter.
   2. Align the flange of the pipe, fitting, of valve being installed with the flange of the receiving pipe, fitting, or valve. Support the pipe, fittings, and valves being joined so the flanges are properly aligned. Lubricate bolts and nuts with a graphite and oil mixture prior to installation of bolts and nuts. Install gasket between the flanges. Loosely assemble bolts and nuts. Check gasket to insure the gasket is in proper position. Evenly tighten bolts and nuts. Tighten bolts and nuts so the joint will not leak. Do not overtorque bolts and nuts.

D. Welded Joints

1. Welding

   Welding shall be in accordance with the latest editions of Section IX, ASME Boiler and Pressure Vessel Code and the American National Standard Code for Pressure Piping, ANSI B31.3.

2. Welding Procedure Qualifications

   Furnish Engineer for prior review procedure specifications and qualification records of welding procedures for all pipe welding to be per-formed under this section, in accordance with Section IX, Article II of the ASME Boiler and Pressure Vessel Code.

3. Welding Performance Qualifications

   a. All welders and welding operators shall be qualified at Contractor's expense by an approved testing laboratory before performing any welding under this section. Qualification tests shall be in accordance with Section IX, Article III of the ASME Boiler and Pressure Vessel Code. Welders and welding operators shall be qualified for making groove welds in carbon steel pipe in positions 2G and 5G for each welding process to be used.

   b. Prior to start of the work, Contractor shall submit a list of the welders he proposes using and the type of welding for which each has been qualified.

4. Carbon Steel Piping Fabrication

   a. End Preparation

      Pipe edges shall be prepared preferably by machine shaping. Oxygen or arc cutting are acceptable only if the cut is reasonably smooth and true and all slag is removed either by chipping or grinding. Beveled ends for butt welding shall conform to ANSI B16.25.

   b. Cleaning

      Surfaces shall be clean and free of paint, oil, rust, scale, slag, or other material detrimental to welding.

   c. Alignment and Spacing

      Align ends to be joined within existing commercial tolerances on diameters, wall thicknesses, and out-of-roundness. Root opening of the joint shall be as stated in the procedure specification.

   d. Procedure

      1) The shielded metal-arc process shall be used for all field welding, unless otherwise approved. Shop fabrication shall be in accordance with the submittal welding procedure qualifications.

      2) No welding shall be performed if there is impingement of any rain or high wind on the weld area or if the ambient temperature is below 32°F. If the ambient temperature is less than 32°F, local preheating to a temperature warm to the hand is required.

      3) Tack welds, if not made by qualified welder using the same procedure as for the completed weld, must be completely removed. Tack welds which are not removed shall be made with an electrode that is the same as, or equivalent to, the electrode to be used for the first weld pass. Tack welds which have cracked shall be removed.

      4) Each layer of deposited weld metal shall be thoroughly cleaned prior to the deposition of each additional layer of weld metal, including the final pass, with a power-driven wire brush. Surface defects which will affect the soundness of weld shall be chipped out or ground out.

      5) There shall be a minimum of three weld passes on all pipe sizes using the specified covered electrode.

      6) Welds shall be free of cracks, incomplete penetration, weld undercutting, excessive weld reinforcement, porosity, slag inclusions and other defects in excess of the limits prescribed in Chapter V of ANSI B31.3.

      7) Branch connections shall be fitted and groove-welded in accordance with the details described and shown in Chapter V of ANSI B31.3.

5. Fabrication and Installation

   a. All stainless steel pipe and fittings shall be pickled by immersion in an air agitated tank containing an ambient 25% solution of Nitric and Hydrofluoric acids for 40 to 50 minutes. A clean water rinse shall follow the acid pickle.

   b. Welding shall be performed by qualified welders in conformance with standard procedures.

Piping with wall thickness up to 11 gauge (0.125") shall be welded with the TIG (GTAW) process. Heavier walls shall be properly beveled and have a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Filler wire of ELC grades only shall be added to all welds to provide a cross section at the weld equal to or greater than the parent metal. Weld deposit shall be smooth and evenly distributed and have a crown of no more than 1/16 inch on the I.D. and 3/32 inch on the O.D. of the piping. Concavity, undercut, cracks or crevices shall not be allowed. Butt welds shall have full penetration to the interior surface, and inert gas shielding shall be provided to the interior and exterior of the joint. Excessive weld deposits, slag, spatter, and projections shall be removed by grinding. Angle face rings shall be continuously welded on both sides to the pipe or fitting. Welds on gasket surfaces shall be ground smooth.

c. Spools shall be fabricated to the "Pipe Fabrication Institute" fabricating tolerances ES-3 (1981).
d. After welding, all welded joints shall be treated with a pickling solution, brushed with stainless wire brushes and rinsed clean.
e. All fabricated piping shall have openings plugged and flanges secured for storage and/or transport after fabrication. All fabricated piping shall be piece marked with identifying numbers or codes which correspond to the contractors layout and installation drawings. The marks will be located on the spools at opposite ends and 180 degrees apart.
f. The piping supplier during manufacturing, fabrication and handling stages, and the contractor during handling and installation stages, shall use extreme care to avoid the contact of any ferrous materials with the stainless steel piping. All saws, drills, files, wire brushes, etc., shall be used for stainless steel piping only. Pipe storage and fabrication racks shall be non-ferrous or stainless steel or rubber lined. Nylon slings or straps shall be used for handling stainless steel piping. Contact with ferrous items may cause rusting of iron particles embedded in the piping walls. After installation, the contractor shall wash and rinse all foreign matter from the piping surface. If rusting of embedded iron occurs, the contractor shall pickle the affected surface with Oakite Deoxidizer SS or equal, scrub with stainless steel brushes and rinse clean.
g. After installation, the contractor shall paint all steel or iron flanges, couplings and appurtenances in accordance with Section 09900. Painting of the stainless steel pipe is not required. However, the contractor shall be responsible for supplying and installing the stainless steel piping with a consistently clean surface. Identifying spool piece marks shall be removed with paint thinner or solvents and the entire stainless steel surface shall be washed with detergent and hot water and rinsed clean.

E. Workmanship on spool fabrication shall be of the highest quality and appearance equal to that furnished by Felker Brothers Corporation, Marshfield, WI. Fabricators shall have had a minimum of ten years experience supplying stainless steel fabrication to sewage treatment plants.
1. Only weld procedures which have been qualified under ASME Section IX and only welders who have successfully completed performance qualification tests per ASME Section IX on these qualified procedures shall be utilized in pipe spool fabrication.
2. Only inert gas shielded welding processes, namely, GTAW(TIG), GMAW(MIG), PAW (plasma arc welding) shall be used in spool fabrication.
3. Inert gas shielding shall be utilized on the back as well as the torch side of a weld joint to prevent atmosphere contamination of the molten and adjacent metal.
4. Filler metal shall be added to all welds to provide a cross section of weld metal equal to or greater than parent metal.
5. Butt welds shall have 100% penetration to the interior or back side of the weld joint.
6. Weld joints shall be accurately fitted and cleaned of all foreign material prior to welding.
7. Weld reinforcement on both sides of the weld shall be smooth, uniform and no more than 7/16" in height.
8. Weld concavity and undercut shall not be acceptable on either side of the weld.
9. Only extra low carbon (ELC) filler metals shall be used.
10. Each spool piece shall be marked with identification relatable to the spool drawing and/or system line to facilitate job site assembly.

11. Spools shall be fabricated to the "Pipe Fabrication Institute" fabricating tolerances ES-3 (1981).
12. All spool pieces shall be immersion pickled after fabrication and prior to shipping in a pickling solution of 6-10% nitric acid and 3-4% hydrofluoric acid. Temperature and exact concentrations to be such that only a modest etch is produced but that all oxidation and ferrous contamination is removed from the metal surface. All residues of the pickling solution to be neutralized after pickling.
13. Backing flanges shall be secured to pipe ends for shipping protection and pipe spools shall be loaded and blocked and tagged as necessary to ensure protection from damage during shipping.

3.8 RESTRAINING AND SUPPORTS

A. Thrust Blocking
1. Construct thrust blocks of concrete having a 28-day compressive strength of not less than 2,000 psi.
2. Lubricate fitting surfaces to prevent bonding between fittings and thrust blocks.
3. Construct thrust blocks between fittings and undisturbed soil. The area of thrust blocking bearing on undisturbed soil shall not be less than the area indicated on the drawings. Construct thrust blocking so pipe and joints are accessible for repair and joint flexibility is not impaired.

B. Mechanical Joint Rod Restraint
1. Mechanical joint rod restraint shall be from fitting to fitting.
2. The number of rods shall conform to the following table:

Pipe Size	Rod Size	Minimum No. of Rods
4"	3/4"	2
6"	3/4"	2
8"	3/4"	4
10"	3/4"	4
12"	3/4"	6
14"	3/4"	6
16"	3/4"	8
18"	3/4"	8
20'	3/4"	10
24"	3/4"	16
30"	1"	14
36"	1"	20
42"	1-1/4"	18
48"	1-1/4"	24

C. Pipe Supports
1. Furnish and install supports required to hold pipe, fittings, and valves at the lines and grades indicated on the drawings and without strain upon pipe, fittings, and valves.
2. Support piping by suitable saddle stands, concrete piers, or hangers.

3. Locate supports where necessary and not less than eight feet on center.

3.9 HYDROSTATIC TEST

A. Test procedures shall meet the requirements of AWWA Standard C600.

B. The piping shall be complete, and thrust blocks shall have been in place for not less than 10 days prior to being tested.

C. Test closed-end pressure piping as follows:
   1. Expel all air from the piping prior to the application of test pressure. Tap the piping at high points, if necessary, to release all air form the piping. Plug taps after the test is successfully completed. Plugs shall be watertight.
   2. Test piping at a static pressure of 150 pounds per square inch over a period of not less than eight consecutive hours. The test will be considered successful when the pressure drop over the test period is five pounds per square inch of less. If the pressure drop exceeds five pounds per square inch, repair the leaks and repeat the test. Repair leaks and repeat the test until the pressure drop over the test period is five pounds per square inch or less.

D. Test open-end pressure piping and ductile iron sewer piping as follows:
   1. The ends of piping being tested shall have test plugs or caps adapted with a tap of adequate diameter to fill and pressurize the system with water.
   2. Water shall be introduced into the section to be tested at the lower end. The upper end shall have an orifice at the top of the plug or cap to expel air when filling the system with water. All air shall be expelled from the pipe.
   3. The test plugs or caps shall be capable of withstanding an internal pressure of 175 psi.
   4. Pumped flow systems shall be subjected to an internal pressure equal to 50% more than the maximum operating pressure, but in no case less than 50 psig or greater than 120 psig.
   5. Hydrostatic test may be dangerous if, because of ignorance or carelessness, a line is improperly prepared. It is extremely important that the various plugs be installed in such a way as to prevent blowouts. Inasmuch as a force of 2500 pounds is exerted on an 8-inch plug by an internal pipe pressure of 50 psi, it should be realized that sudden expulsion of a poorly installed plug or cap can be dangerous.

3.10 FLUSHING

A. Potable Water
   1. Flush piping with a flushing velocity of at least 2.5 feet per second. Following are flows required to provide flushing velocity of 2.5 feet per second:

Pipe Size	Inside Diameter	Flow at a Velocity 2.5 Feet Per Second
4"	4"	98 gpm
6"	6"	220 gpm
8"	8"	390 gpm
10"	10"	620 gpm
12"	12"	880 gpm
14"	14"	1,200 gpm
16"	16"	1,600 gpm
18"	18"	2,000 gpm
20"	20"	2,500 gpm
24"	24"	3,600 gpm

   2. Flush piping and hydrants until the water discharge is clear.
   3. Flush potable water piping to disinfection.

B. Air and Chemical Piping
Piping system conveying the following services shall be cleaned after erection and testing by purging with dry compressed air (DCA) or nitrogen (N) until the specified dew point is reached and held for 5 minutes.

Services	Purge Gas	Dew Point
Dry Compressed Air - Plant & Instrument	DCA	-40°F
Chlorine	N	-40°F
Caustic	N	-40°F
Alum	N	-40°F
Fluoride	N	-40°F

3.11 DISINFECTION

A. Disinfect potable water piping prior to placing the piping in service. Disinfect pipe, fittings, and valves with a chlorine solution containing to 50 mg/l plus or minus 5 mg/l of available chlorine.

B. The chlorinating material shall be chlorine gas, calcium hypochlorite, or sodium hypochlorite. Calcium hypochlorite shall be 5.25% to 14.7% available chlorine. Placing chlorine tablets in the spring during construction is not an acceptable method of disinfection. The following table shown the quantity of chlorine or hypochlorite required to produce 50 mg/l of available chlorine per 100 feet of pipe.

Pounds	Ounces	Qua rts

Pipe Size	Inside Diameter	Chlorine Gas	Cal. Hycl. (70%)	Cal. Hycl. (70%)	Sod. Hycl. (14.7%)	Sod. Hycl. (5.25%)	Sod. Hycl. (14.7%)	Sod. Hycl. (5.25%)
4"	4"	0.027	0.039	0.62	3.0	8.3	0.09	0.26
6"	6"	0.061	0.087	1.4	6.7	19	0.21	0.58
8"	8"	0.11	0.16	2.5	12	33	0.37	1.0
10"	10"	0.17	0.24	3.9	19	52	0.58	1.6
12"	12"	0.24	0.35	5.6	27	75	0.83	2.3
14"	14"	0.33	0.48	7.6	36	100	1.1	3.2
16"	16"	0.44	0.62	10	47	130	1.5	4.1
18"	18"	0.55	0.79	13	60	170	1.9	5.2
20"	20"	0.68	0.97	16	74	210	2.3	6.5
24"	24"	0.98	1.4	22	110	300	3.3	9.3
30"	30"	1.5	2.2	34				
36"	36"	2.2	3.1	50				
42"	42"	3.0	4.3	69				
48"	48"	3.9	5.6	90				
54"	54"	5	7.2	110				

C. Taping where required to inject chlorine solution into all pipe, fittings, valves, and hydrants installed and repaired. Inject chlorine solution into piping. Leave the chlorine solution in the piping for 24 hours or longer. Open and close valves in piping being disinfected. Open and close valves several times during contact period. Following the contact period, flush the piping with potable water until the chlorine residual is 1.0 mg/l or less.

D. Collect and submit samples for bacteriological analysis. Repeat disinfection and bacteriological testing until the water mains are approved for service.

3.12 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counterflash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor, shower and mop sink drains watertight to adjacent materials.

E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

F. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

G. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.13 SLEEVES

A. Set sleeves in position in form work. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch above finished floor level. Calk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing fire stopping insulation and calk, air tight . Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel plastic stainless steel escutcheons at finished surfaces.

SECTION 15051

DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. General: The CONTRACTOR shall furnish and install Ductile Iron Pipe and all appurtenances, complete in place, all in accordance with the requirements of the Contract Documents. Where standards, specifications or methods are cited without dates, the reference shall be construed to apply to the latest revision in effect at the time of contract.

B. Manufacturer:
   1. The term "MANUFACTURER" shall mean the party that manufactures, fabricates, or produces materials or products.

      All 30-inch through 64-inch ductile iron pipe shall be the product of one manufacturer experienced in manufacturing pipe of the size, class, and quantity specified herein. The pipe manufacturer shall have manufactured 30-inch through 64-inch ductile iron pipe for a minimum of five (5) years. Prior to bid (or manufacture) the pipe manufacturer upon request shall submit to the OWNER or OWNER's ENGINEER a reference list for at least five (5) projects of comparable magnitude. This list shall include the following information: Location of Project; Quantity, Size, and Class; Owner, Address, Contact Name, and Phone.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards:
   1. ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
   2. ANSI/AWWA C105/A21.5 Polyethylene Encasement for Ductile-Iron Pipe Systems
   3. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids
   4. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   5. ANSI/AWWA C115/A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
   6. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe
   7. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast for Water
   8. ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service
   9. ANSI/AWWA C600 Installation of Ductile-Iron Water Mains and their Appurtenances
   10. ANSI/AWWA C606 Grooved and Shouldered Joints
   11. ANSI/AWS D11.2 Guide for Welding Iron Casting

   Note: Hereafter in this specification the specific referenced ANSI/AWWA standards are referred to either by their full description as in the first column of the above standards list, or only by their abbreviated AWWA "C" designation (e.g. AWWA C151 is meant to refer to ANSI/AWWA C151/A21.51, etc.).

1.3 CONTRACTOR SUBMITTALS

A. Shop Drawings/Lay Schedules: The CONTRACTOR upon request shall submit catalog cuts of pipe and fittings in accordance with the requirements of this Section.
   1. Certified dimensional drawings of all valves, fittings, and appurtenances.
   2. Certified dimensional drawings of joints, showing the manufacturer's allowable deflections.
   3. Copies of the manufacturer's approved installation instructions for the types of joints being used.

4. For pipe 42 inches in diameter and larger, lay schedules that indicate the type of pipe, fitting, or special, and the location and the direction of each of these components in the completed line shall be provided. In addition, the lay schedule shall include: the pipe stationing at all changes in grade or horizontal alignment; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained joints, or concrete encasement.

B. Certifications: Upon request the CONTRACTOR shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section, as specified in the referenced standards and as specified in Section 1.4 – Quality Assurance.

C. Sample Costs: All expenses incurred in making samples for certification of specified tests shall be borne by the MANUFACTURER.

1.4 QUALITY ASSURANCE

A. Inspection: All pipe shall be subject to inspection at the place of manufacture, in accordance with the provisions of the referenced standards, as supplemented by the requirements herein.

B. Plant Access: During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing and testing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

C. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with requirements as applicable.

D. Test Costs: The MANUFACTURER shall perform said material tests at no additional cost to the OWNER. The ENGINEER shall have the right to witness all testing conducted by the MANUFACTURER, provided that the MANUFACTURER's and CONTRACTOR's schedule is not delayed for the convenience of the ENGINEER.

E. ISO/Third Party Inspection:
1. All pipe material suppliers shall be ISO 9001:2000 registered or provide the services of an Independent Inspection Agency. ISO 9001:2000 registration shall have been certified by a qualified ISO registrar. Prior to the start of manufacturing any manufacturer not meeting the ISO registration requirements shall submit to the OWNER or OWNER's ENGINEER, for approval, a list of qualifications for a minimum of three (3) Independent inspection agencies. These qualifications shall include but are not limited to the following:
   a. List of project references for projects of similar type and size
   b. Resumes for inspection and testing personnel
   c. Capacities for chemical and mechanical testing of material specimens
   d. Frequencies for all instrument and testing equipment certifications
2. The independent testing agency will be responsible for observing, verifying, and documenting all quality assurance testing for the production of pipe material produced for this project. Independent inspection agency shall ensure that all pipe sections produced for this project have traceability such that each individual pipe section can be referenced to the following chemical, mechanical, and performance tests:
   a. Chemistry
      1) Ladle Number
      2) Ladle Chemistry
   b. Mold Number
      1) Mold Production History
   c. Bracketed Mechanical Testing
      1) Tensile Yield
      2) Elongation

3) Charpy Test

d. Hydrostatic Proof Test
   1) Chart Recorder Graph
   2) Proof Test Pressure

e. Annealing
   1) Annealing Furnace Number
   2) Horizontal Continuous Annealing Ovens, Record Pipe Flow Through Speeds
   3) Horizontal Annealing Ovens, Record Pipe Rotation Speeds
   4) Vertical Stationary Annealing Ovens, Record Position of Pipe in Oven
   5) Chart Recorder Graph of Time and Temperatures During Annealing Process

f. Pipe Weight

g. Lining/Coating/Finishing
   1) Cement Analysis,
   2) Sand Cement Ratio
   3) Curing Temperature and Humidity Records

h. Prior to the start of pipe manufacture the independent testing agency shall review all calibration certifications for all measuring instruments (e.g., weight scales, tape measures, dial gage indicators, tensile tester load cells, etc.) used to ensure the quality of the pipe and if necessary perform certification tests in accordance with the National Institute of Standards and Technology. The independent testing agency shall verify that written procedures and job training records are available for operations personnel for each production operation, including but not limited to raw material processing, melting, pipe casting, annealing, testing and inspection, lining, coating, etc. At all times the independent inspection agency shall verify compliance with these written procedures and these specifications.

i. During pipe manufacture the independent inspection agency shall provide adequate qualified personnel to facilitate a thorough and complete observation of the pipe's production from raw materials through final shipment. The independent inspection agency shall observe, review, document all tests required by AWWA/ANSI C151/A21.51 and these specification performed by the manufacturer. The independent inspection agency shall also be responsible for performing verification tests on materials and samples to support the results of manufacturer performed testing. The table below indicates the required tests to be performed by the manufacturer and frequency of observations and re-testing for the independent testing agency.

Table No. 1

Operation Area	Required Tests	Frequency
Raw Materials	Analysis of chemical content of metallics, coke, fluxes, silicon.	Review daily
Cupola	Analysis of chemical content of molten stream.	Observed tests: every 30 minutes. Verification tests: retest one (1) each day
	Analysis of chemical content after inoculation.	Observed tests: every ladle Verification tests: retest one (1) sample out of every five (5).
Post Annealing	Visual inspection.	Observed tests: every pipe.
	Dimensional verification.	Observed tests: every pipe. Verification tests: retest one (1) pipe out of every ten (10)
	Mechanical properties verification (tensile, impact, hardness)	Observed tests: each test Verification tests: retest one (1) sample out of every ten (10).
	Microstructure	Observed tests: each test
Hydrotesting	Hydrostatic proof test	Observed tests: each pipe
Lining	Visual inspection Lining thickness testing	Observed tests: each pipe

Operation Area	Required Tests	Frequency
Final Inspection	Visual inspection	Verification Tests: each pipe shall be visually inspected and stamped with the inspector stamp.

j. The independent inspection agency shall verify that all test results of the manufacturer and those re-tests performed by the independent testing agency are referenced to each individual pipe section for traceability in the future. This information shall be in a suitable format that, at the request of the owner or owner's engineer, may be downloaded into a spreadsheet format.

F. Factory Hydrostatic Test: All pipe shall be subject to a factory hydrostatic test of at least 500 psi for a period of not less than 10 seconds, for 30-inches and larger the pressure will then be elevated to a peak pressure that induces a stress in the pipe wall equivalent to 75% of the minimum specified yield strength of ductile iron (42,000 psi) as calculated by the following formula:

$$p = \frac{2 f_s t}{D}$$

Where: p = peak hydrostatic pressure

f_s = 31,500 psi, stress in pipe wall during hydrostatic test, which shall be 0.75 times the minimum yield strength of the ductile iron in tension (42,000 psi)

t = nominal wall thickness, in.

D = outside diameter, in.

Table No. 2

Factory Hydrostatic Test Pressures for Ductile Iron Pipe
(30 in and Larger)

Pressure Class	150		200		250		300		350	
Pipe Size/ Outside Diameter	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)
30" / 32.00	0.34	669	0.38	748	0.42	827	0.45	886	0.49	965
36" / 38.30	0.38	625	0.42	691	0.47	773	0.51	839	0.56	921
42" / 44.50	0.41	580	0.47	665	0.52	736	0.57	807	0.63	892
48" / 50.80	0.46	570	0.52	645	0.58	719	0.64	794	0.70	868
54" / 57.60	0.51	558	0.58	635	0.65	711	0.72	788	0.79	865
60" / 61.60	0.54	552	0.61	624	0.68	695	0.76	777	0.83	849
64" / 65.70	0.56	537	0.64	614	0.72	691	0.80	767	0.87	835

G. Affidavits: Upon request the CONTRACTOR shall submit affidavits of compliance from the MANUFACTURER for the following:
1. Ductile iron pipe in accordance with the requirements of AWWA C151 and these specifications.
2. Cement mortar lining of ductile iron pipe, specials and fittings in accordance with the requirements of AWWA C104 and these specifications.
3. Polyethylene encasement for ductile iron piping in accordance with AWWA C105 (if specified).
4. Rubber gasket joints for ductile iron pressure pipe and fittings in accordance with the requirements of AWWA C111 and these specifications.
5. Charpy impact testing of ductile iron used in the manufacture of pipe shall be performed in accordance with AWWA C151.
The minimum corrected absorbed energy (ft.-lb.) shall be as follows:

7 ft.-lb. at 70° F ± 10° F

6. Low-temperature impact tests shall be made from at least 10% of the test pipe to assure compliance. The minimum corrected absorbed energy (ft.-lb.) shall be as follows:

3 ft-lb at –40°F(°C)

7. The affidavits of compliance shall be certified by a registered professional engineer.

H. Domestic Manufactures

1. Ductile iron pipe shall be designed and manufactured in accordance with ANSI/AWWA C 150/A21.50 and ANSI/AWWA C 151/A21.51, latest revisions. All pipe must be new and shall be manufactured in the United States of America (USA); all ductile iron pipe shall be cast, cleaned, lined, coated, tested, and certified at a single manufacturing facility located in the USA - with all manufacturing units contiguous to one another. Approved USA manufacturers are American, U.S. Pipe, Tyler or equivalent.
2. All pressure pipe for water service shall be SMaRT certified by the institute for Market Transformation to Sustainability.

PART 2 - PRODUCTS

2.1 GENERAL

A. Standards: Ductile iron pipe shall conform to AWWA C151, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents. The ductile iron pipe, specials, and fittings shall be manufactured or supplied by American Ductile Iron Pipe (a division of American Cast Iron Pipe Company, Birmingham, Alabama) or pre-approved equal.

B. Markings: Upon request the CONTRACTOR shall require the MANUFACTURER to legibly mark specials in accordance with the laying schedule and marking diagram.

C. Laying Lengths: Pipe laying lengths shall be provided in 20 feet nominal lengths with allowable trim pipe lengths in accordance with AWWA C151 and special shorter lengths provided as required by the Drawings.

2.2 PIPE DESIGN

A. Design Parameters: All ductile iron pipe shall be designed and manufactured in accordance with AWWA C150 and AWWA C151, respectively, for the following minimum operating conditions:
1. The minimum internal design pressure shall be 150 psi with a 100-psi surge allowance, with a safety factor of 2, for a total internal design pressure of 500 psi. No reduction of safety factor for transient pressures shall be allowed.
2. The external loads design criteria shall be a minimum of 4 feet depth of cover at 120 lbs. per cubic feet soil weight and live load based on one AASHTO H-20 truck load. The thickness design of ductile iron pipe shall be in accordance with AWWA C150.
3. The horizontal deflection of cement mortar lined ductile iron pipe resulting from external load conditions shall not exceed three percent of the pipe diameter.
4. The pipe trench, per AWWA C150, for design purposes shall be:
   a. Laying condition Type 4 – Pipe bedded in sand, gravel or crushed stone to depth of ⅛ pipe diameter, 4” minimum. Backfill compacted to top of pipe. (Approximately 80% Standard Proctor, AASHTO T-99.)
5. For purposes of restrained joint calculations per the Ductile Iron Pipe Research Association (DIPRA) method, the soil classification* for both the native trench soil and also the backfill soil to surround the pipe shall be defined with one or more of the following options:

Option A	Option B	Option C	Option D	Option E	Option F	Option G
Clay 1	Silt 1	Clay 2	Silt 2	Coh-gran	Sand Silt	Good Sand

* As described in DIPRA's "Thrust Restraint Design for Ductile Iron Pipe," latest edition.

B. Minimum Pipe Class: Ductile iron pipe shall conform to AWWA C151. All pipe shall have a minimum pressure rating as indicated below, or higher ratings as indicated in the contract documents:

Table No. 3

Pipe Sizes (inch)	Pressure Class (psi)
4-12	350
14-20	250
24	200
30-64	150

2.3 JOINT DESIGN

A. General: Ductile Iron Pipe and fittings shall be furnished with push-on joints, push-on restrained joints, mechanical joints, flanged joints, and grooved joints as required.

B. Push-on Joints: Push-on joints shall conform to AWWA C111. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR.) Push-on joints shall be Fastite, as manufactured by American Ductile Iron Pipe, or pre-approved equal. The pressure rating for push-on joints shall be a minimum of 350 psi or the specified pressure rating of the pipe, whichever is less. Standard allowable joint deflection for 4" – 30" Fastite pipe shall be five degrees, for 36" Fastite pipe shall be four degrees, and for 42" – 64" Fastite pipe shall be three degrees. Allowable deflection of American's Fastite joint "Special Deflection Bells" for 36" – 42" shall be five degrees and for 48" – 64" shall be four degrees.

C. Restrained Joints: Restrained joints shall be "Flex-Ring" or "Lok-Ring" restrained joints as manufactured by American Ductile Iron Pipe or pre-approved equal. Field-adaptable restraint shall be provided through the use of "Fast-Grip" or "Field Flex-Ring" as manufactured by American Ductile Iron Pipe, or other pre-approved and bolt-less, push-on restrained devices. When restrained joints require factory welding, the MANUFACTURER shall qualify all welding procedures and welders used to produce the product per the requirements of a documented quality assurance system based on ANSI/AWS D11.2. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR.) Restrained joints and restrained joint pipe shall be rated for the minimum pressure shown in Table No. 4 or the specified pressure rating of the pipe, whichever is less. The MANUFACTURER shall furnish test results showing that restrained joints in the sizes specified have been successfully tested to at least twice the specified pressure rating of the joint without leakage or failure. Tests shall be performed on pipe with nominal metal thickness less than or equal to that specified for the project. Torque-activated restrained joint devices that rely on threaded bolts or set-screws for joint restraint shall not be used.

Table No. 4

RESTRAINED JOINT PRESSURE RATINGS, (psi) & ALLOWABLE JOINT DEFLECTIONS (Limited to the pressure rating of the pipe)				
JOINT SIZE	FASTGRIP	FIELD FLEXRING	FLEXRING	LOKRING
4"	350 / 5°		350 / 5°	
6"	350 / 5°		350 / 5°	

8”	350 / 5º		350 / 5º	
10”	350 / 5º		350 / 5º	
12”	350 / 5º		350 / 5º	
14”	250 / 4º	350 / 4º	350 / 4º	
16”	250 / 3º	350 / 3.75º	350 / 3.75º	
18”	250 / 3º	350 / 3.75º	350 / 3.75º	
20”	250 / 3º	350 / 3.5º	350 / 3.5º	
24”	250 / 3º	350 / 3º	350 / 3º	
30”	150/2.5 º	250 / 2.5º	250 / 2.5º	
36”		250 / 2º	250 / 2º	
42”				250 / 0.5º
48”				250 / 0.5º
54”				250 / 0.5º
60”				250 / 0.5º
64”				250 / 0.5º

D. Flanged Joints – Pipe: Candidate pipe for 4”- 54” flanged pipe thread-fabrication shall be Special Thickness Class 53 and for 60” – 64” flanged thread-fabrication shall be Pressure Class 350 ductile iron pipes, all in accordance with AWWA C115. Threaded companion flanges for ductile iron pipe shall be ductile iron in accordance with AWWA C115, not ANSI B16.1. Bolt circle and bolt holes match those of ANSI B16.1 class 125 and ANSE B16.5 class 150 flanges. The flanges shall be rated for at least 250 psi working pressure. The threaded flanges shall be individually fitted and machine tightened on the pipe ends. Bolts, gaskets and installation shall be in accordance with AWWA C115, Appendix A requirements, and flanged gaskets shall be Toruseal gaskets as manufactured by American Ductile Iron Pipe, with a special seal design. Toruseal gaskets must be used for all 54” – 64” flanged piping, for all glasslined piping, and for all buried flanged joints. Gaskets shall be full face Toruseal design for all service installations. Gaskets for flanged ductile iron pipe must not have the larger inside diameters provided by the requirements of ANSI B16.21. Flange facing shall be smooth or with shallow serrations per AWWA C115.

1 To insure accountability, all flanged pipe shall be fabricated at the factory by the pipe manufacturer.

E. Flanged Joints – Fittings: Flange fittings shall be ductile iron in accordance with AWWA C110 or AWWA C153, not ANSI B16.1. Bolt circle and bolt holes match those of ANSI B16.1 class 125 and ANSI B16.5 class 150 flanges. The flanges shall be rated for at least 250 psi working pressure. Bolts, gaskets and installation shall be in accordance with AWWA C110 or AWWA C115, Appendix A requirements, and flanged gaskets shall be Toruseal gaskets as manufactured by American Ductile Iron Pipe, with a special seal design. Toruseal gaskets must be used for all 54” – 64” flanged piping, for all glasslined piping, and for all buried flanged joints. Gaskets shall be full face Toruseal design for all service installations. Gaskets for flanged ductile iron pipe must *not* have the larger inside diameters provided by the requirements of ANSI B16.21. Flange facing shall be smooth or with shallow serrations per AWWA C110 or AWWA C153.

F. Welded-on Thrust Collars: Welded-on thrust collars, for wall pipe and pipe thrust restraint, shall be welded steel collars designed for the thrust generated by 250 psi working pressure with a safety factor of at least two (2.0) against failure. Welded-on thrust collars shall be as manufactured by American Ductile Iron Pipe or pre-approved equal. The manufacturer shall qualify all welding procedures and welders per the requirements of a documented quality assurance system based on ANSI/AWS D11.2.

G. Mechanical Joints: Mechanical joints shall conform to AWWA C111. Bolts shall be high strength low alloy steel per AWWA C111. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR) per this standard.

H. Grooved Joints: Unless specifically otherwise called for on the contract drawings, grooved joints shall be an approved substitute for flanged joints. Grooved pipe and groove joints shall be in accordance with AWWA C606. Rigid radius groove dimensions shall be utilized. Flexible grooves shall be provided as necessary for settlement or expansion as determined and approved by the ENGINEER and as specifically shown on the contract drawings. Gasket material shall be Grade "M" halogenated butyl. Bolts shall be heat treated plated carbon steel, track head, conforming to the mechanical properties of ASTM A-183, minimum tensile strength 110,000 psi. Grooved ductile iron pipe shall be Special Thickness Class 53 for 4" – 16", Class 54 for 18", Class 55 for 20", and Class 56 for 24" – 36".

Commentary – The following table of available push-on and mechanical joint gaskets and services is to be used for selecting various gasket compounds for push-on and mechanical joints. The maximum service temperatures are based on lowest temperature rated mechanical joint applications, but shall also be suitable for push-on joint applications. The manufacturer should be consulted for higher temperature rating requirements that will generally be met by superior performance of push-on joint design.

Common Name Or Trade Name	Chemical Name	Temperature Capability	Common Uses
Plain Rubber	Styrene Butadiene (SBR)	120°F	Fresh Water, Salt Water, Sanitary Sewage
Neoprene	Polychloroprene (CR)	200°F	Fresh Water, Sewage, Outdoor Exposure
Fluoroelastomer Fluorel Viton	FKM	225°F	Aromatic Hydrocarbons, Gasoline, Refined Petroleum Products, most Chemicals and Solvents, High Temperature, Air
Buna-N Nitrile	Acrylonitrile Butadiene	120°F	Non-Aromatic Hydrocarbons, Petroleum Oil, Hydraulic Fluids, Fuel Oil, Fats, Oil, Grease, Digester Gas
EPDM	Ethylene Propylene Diene Monomer	225°F	Water, Sewage, Ketones, Dilute Acids and Alkalies, Vegetable Oil, Alcohols, Outdoor Exposures, Air

2.4 FITTINGS

A. General: Fittings shall be ductile iron in accordance with AWWA C110, AWWA C153, or AWWA C606, latest revisions.

B. Cement Lining: Fittings shall be internally lined with cement mortar in accordance with AWWA C104. The lining thicknesses shall be equal to or greater than those for comparable size pipe.

C. Buried Service Fittings: Fittings, sizes 4" – 24", with push-on, restrained push-on, or mechanical joints shall be rated for 350 psi working pressure. Fittings, sizes 30" – 64", with push-on, restrained push-on, or mechanical joints shall be rated for 250 psi working pressure.

D. Aboveground Service Fittings: Fittings, sizes 4" – 64", with flanged joints shall be rated for 250 psi

working pressure. Fittings, sizes 4" – 36", with grooved joints shall be rated for 250 psi working pressure. Grooved couplings shall be rated for 250 psi working pressure for 4" – 18" and 150 psi working pressure for 20" – 36".

2.5 WELDED-ON OUTLETS

A. Outlet Size and Parent Pipe Size: Welded-on outlets shall be limited to branch outlets having a nominal diameter not greater than 70% of the nominal diameter of the main line pipe or 36-inch whichever is smaller (see Table No. 1), with all fabrications subject to further requirements of the following specification with regard to design and manufacture. The MANUFACTURER shall have the capability to furnish welded-on outlets as a radial (tee) outlet, tangential outlet, or lateral outlet fabricated at a specific angle to the main line pipe (in 15° increments between 45° and 90° from the axis of the main line pipe), as indicated on the drawings. Welded-on outlets shall be fabricated by the pipe manufacture at the same facility where the pipe is produced. The pipe manufacturer shall have a minimum of 5 years experience in the fabrication and testing of outlets of similar size and configuration.

Table No. 5

Main Line Nominal Diameter
Versus
Maximum Nominal Branch Outlet Diameter

Main Line Nominal Dia.	Branch Outlet Nominal Dia.	Main Line Nominal Dia.	Branch Outlet Nominal Dia.
10"	6"	30"	20"
12"	8"	36"	24"
14"	8"	42"	30"
16"	10"	48"	30"
18"	12"	54"	*30"
20"	14"	60"	*30"
24"	16"	64"	*30"

B. Outlet Joint Types: The joints on welded-on branch outlets shall meet, where applicable, the requirements of AWWA C111 and/or AWWA C115.

C. Design:

1 The pipe wall thickness and weld reinforcement design for welded-on outlet fabrications shall be based on a method similar to that which is described in Section 13 of AWWA Manual M11 for similar welded outlets on steel pipe (which in turn refers to Section VIII of the ASME Unfired Pressure Vessel Code for design method details). Reinforcing welds shall be placed using Ni-Rod FC 55^{Ò} cored wire, Stoody Castweld Ni 55-0 cored wire, or Ni-Rod 55^{Ò} electrodes manufactured by INCO Alloys (or an electrode with equivalent performance properties). Carbon steel electrodes are not acceptable. Upon request, the MANUFACTURER shall provide test results indicating typical mechanical properties of the utilized weld material (an all-weld sample), as well as typical mechanical properties from transverse tensile and impact specimens machined from butt-weld joined ductile iron pipe coupons to show the suitability or equivalence of the electrodes used.

2 Parent pipe and branch outlet candidate pipe shall be centrifugally cast ductile iron pipe designed in accordance with AWWA C150 and manufactured in accordance with AWWA C151. Minimum classes for parent and outlet pipe shall be: for sizes 4-inch through 54-inch, Special Thickness Class 53; for sizes 60-inch through 64-inch, Pressure Class 350.

3 All welded-on outlets 6-inch through 30-inch shall be rated for a working pressure of 250 psi. Welded-on outlets 36-inch and larger shall be rated for 200 psi. Welded-on outlets of all diameters and configurations must have a minimum safety factor of 2.5 based on proof of design hydrostatic test results. The MANUFACTURER shall, at the request of the OWNER or OWNER's ENGINEER, provide representative proof test data confirming the design, hydrostatic test results, and safety factors.

4 Prior to the application of any coating or lining in the outlet area all weldments for branch outlets

to be supplied on this project shall be subjected to an air pressure test of at least 15 psi. Air leakage is not acceptable. Any leakage shall be detected by applying an appropriate foaming solution to the entire exterior surface of the weldment and adjoining pipe edges or by immersing the entire area in a vessel of water and visually inspecting the weld surface for the presence of air bubbles. Any weldment that shows any signs of leakage shall be repaired and re-tested in accordance with the manufacturers' written procedures.

D. **Quality Assurance**

1 The manufacturer shall have a fully documented welding quality assurance system and maintain resident quality assurance records based on ANSI/AWS D11.2, the *Guide for Welding Iron Castings*. The manufacturer shall maintain appropriate welding procedure specification (WPS), procedure qualification (PQR), and welder performance qualification test (WPQR) records as well as appropriate air test logs documenting air leakage tests on all welded on outlet pipes furnished to the project. The manufacturer shall have ISO 9001:2000 registration.

2 Prior to the start of manufacturing any proposed manufacturer not meeting ISO 9001:2000 registration requirements shall submit to the OWNER or OWNER's ENGINEER the name of an Independent Inspection Agency and the agency's qualifications. Submitted qualifications shall include but are not limited to the following:

a. List of project references for projects of similar type and size
b. Resumes for inspection and testing personnel
c. Capacities for chemical and mechanical testing of material specimens
d. Frequencies for all instrument and testing equipment certifications

3 The independent inspection agency shall be responsible for all of the following:

a. Verify compliance to written welding procedures, specification (WPS), and procedure qualification (PQR).
b. Verify qualification of all welders (WPQR) per ANSI/AWS D11.2 criteria
c. Document use of Ni-Rod FC 55® cored wire or Ni-Rod 55® electrodes manufactured by INCO Alloys, Stoody Cast-Weld 55-0 cored wire, or an electrode with equivalent performance properties. The independent testing agency shall provide test results indicating typical mechanical properties of the utilized weld material (an all-weld sample), as well as typical mechanical properties from transverse tensile and impact specimens machined from butt-weld joined ductile iron pipe coupons to show the suitability or equivalence of the electrodes used.
d. Witness and document all air testing of outlet welds

2.6 *CEMENT-MORTAR LINING*

A. Cement-Mortar Lining for Shop Application: Except otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined in the shop with a standard thickness cement-mortar lining applied in conformity with AWWA C104. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be repaired or replaced with lining conforming to these Specifications.

B. Lining Thickness: The minimum lining thickness shall be as follows:

Table No. 6

Nominal Pipe Diameter (in)	Minimum Lining Thickness (in)
3-12	1/16
14-24	3/32
30-64	⅛

C. Seal Coat or Non-Seal Coat Cement-Mortar Lining:

1 General: Ductile iron pipe shall be internally lined with cement mortar lining in accordance with AWWA C104, by a high speed, centrifugal process. The quality system of the manufacturer shall be registered to an ISO 9000 quality standard by an accredited registrar. Grinding of linings shall

not be allowed. The finished cement lining shall be uniformly smooth. In addition to complying with AWWA C104, the linings shall also comply with the following additional requirements.

2 Material: The cement used shall be in conformity with AWWA C104. Sand shall consist of inert, hard, strong, and durable silica grains. The water used in the cement mortar shall be potable, and free from injurious quantities of organic matter, alkali, salt or other impurities that might reduce the strength, durability, or other desirable qualities of the lining. All material in contact with water shall be certified to meet the requirements of ANSI/NSF Standard 61. The cement mortar shall contain not less than one part of cement to two parts of sand, by volume.

3 Lining Thickness: Cement lining thicknesses shall be per AWWA C104 either single or double thickness and as shown in the Table No. 6.

4 Surface Preparation: All surfaces to be mortar lined shall be cleaned as necessary to remove foreign matter that could interfere with the adherence of the cement mortar or protrude through the lining.

5 Lining Equipment and Process: Linings shall be manufactured using centrifugal pipe rotational equipment capable of sufficient rotation speed to sustain 60 G to 100 G of compaction force. Simultaneous controlled vibration shall be applied to the pipe during high-speed rotation to produce a lining of such high density and firm compaction that the laitance can be washed from the surface of the lining immediately after consolidation. Upon request, the MANUFACTURER shall submit an affidavit of compliance certified by a registered professional engineer that the linings have been applied according to these specifications. The mortar shall be mixed in batches. The amount of cement and sand entering into each batch shall be measured by weight. The quantity of mixing water entering into each batch shall be measured automatically by an adjustable device, or it shall be otherwise measured to ensure that the correct quantity of water is being added.

6 Washing and Finish: After the mortar has been distributed, the rotational speed and vibration shall be increased to produce a mortar lining with a uniformly smooth, firm surface. Immediately after lining, the surface of the lining shall be flushed with a large volume of water to remove excess laitance.

7 Water Cement Ratio: The lining process, as described above, shall remove approximately 33% of the water, and after centrifugation the uncured cement mortar lining shall have a water to cement ratio of no greater than 0.3.

8 Curing: Cement mortar linings shall be lined and stored in a building with controlled atmosphere for a minimum of 18 hours. Linings shall be furnished standard without seal coat.

9 All repairs of handling or other damage shall be made in accordance with the recommendations of the MANUFACTURER and shall be reasonably smooth and may not project into the waterway.

2.7 OPTIONAL INTERIOR LINING - SEWER

A. Lining and Coatings for Ductile Iron Pipe

1 Option 1

a. The interior of the pipe shall be blasted and cleaned to remove all loose oxides and rust. After cleaning, the lining material shall be applied to yield 40 mils for the complete system.

2 The lining material shall be a two component epoxy with the following requirements:

a. A permeability rating of 0.0 perms when measured by ASTM E96-66, Procedure A. Duration of test - 6 weeks.

b. A direct impact resistance of 125 inches-pounds with no cracking when measured by ASTM D-2794.

c. The ability to build at least 50 mils dry in one coat. The material shall be recoatable with itself for at least seven days with no additional surface preparation when exposed to direct summer sun and a temperature of 90 degrees F.

d. The material shall contain at least 20% by volume of ceramic quartz pigment.

e. A test and service history demonstrating the ability of the material to withstand the service expected.

f. Lining shall be Protecto 401

3 Option 2

a. Lining Material

The standard of quality for interior liquid epoxy lining shall be a two component, amine cured

novolac epoxy containing a minimum of 20% by volume ceramic pigmentation. Due to health and environmental concerns, the lining must be both coal tar free (polycyclic aromatic hydrocarbons) and HAPS free (hazardous air polluting solvents), and no less than 97% solids by volume. Permox-CTF™ by Permite Corp., Stone Mountain, GA, meets both composition and performance standards of this specification. The following properties are minimum performance test requirements and must be obtained from 40 mil DFT films of lining material applied to the specified substrate and certified by the lining manufacturer.

b. In the event a formulary change is made by the manufacturer subsequent to the performance testing and certification of the lining material, the new formulation must be re-qualified. The new project, a related to the formulary change, is subject to meeting the same composition and performance standard and must be re-certified by the lining manufacturer.

(1) Testing-Physical Properties

a) ASTM G-95 Cathodic Disbondment shall be not greater than .05mm disbandment, 30 days duration.

b) ASTM D-4060 Abrasion Resistance shall not exceed a weight loss of more than 0.30 grams (CS17 Wheel, 1000-gram load, 1000 cycles).

c) ASTM D-4541 Adhesion 700 psi minimum.

d) ASTM D-1653 Permeability, Method A 40-mils free cast film 30-day duration. 0.00 perms.

e) ASTM G-53-77 MoistureULTRAVIOLET Light. UVB-313 Bulb. Cycle-8 hrs. UV @ 60° C followed by 100% Humidity @ 40° C. 1 year - pass, no crazing, cracking, or loss of adhesion.

f) ASTM D-2794-92 Direct Impact Resistance 140 in./lbs. minimum.

(2) Testing-Chemical Resistance by Immersion

a) ASTM D-1308 evaluated by ASTM D-714
20% Sulfuric Acid @ 77°F 2 years, no effect
25% Sodium Hydroxide @ 140°F 2 years, no effect
5% Sodium Chloride Solution @ 77°F 2 years, no effect
Distilled Water @ 160°F 2 years, no effect

(3) Surface Preparation

a) All pipe and fittings shall be delivered to the application facility without cement or asphalt lining or any other lining on the interior surface. Because total removal of old linings is generally not possible nor cost effective, the intent of this specification is that the entire interior of the DIP and fittings shall be as cast without any lining material prior to application of the specified lining. Upon completion of inspection as outlined above, all surface preparation shall be in strict accordance with NAPF 500-03 revision dated 2/14/2006 as published by: National Association of Pipe Fabricators, Inc.
1901 N. W. 161st Street
Edmond, OK 73013
A copy of this specification may be obtained at http://www.napf.com/
* Pre-blast Cleaning consult NAPF 500-03-01
** Blast Cleaning specification is per NAPF 500-03-04

(4) Application of Lining

a) Application of the lining material may only be performed by approved firms as designated by the manufacturer or its authorized representative. No deviations are allowed from this specification included but not limited to accompanying procedures that may be provided by the manufacturer for the job inherent to this specification.

b) Upon completion of the blast cleaning operation, the lining material should be applied to the interior of the pipe within 12 hours in order to avoid any possible post blast surface contamination. Any area found to have rust bloom prior to application must be reblasted.

c) The barrel of the pipe from the inside shoulder of the gasket groove to the end of the interior spigot shall receive a nominal coating of 40 mils dry film thickness of the protective lining. If flange fittings or pipe are included, the lining must not be used on the face of the flange. All fittings shall be lined with 40 mils nominal of the

protective lining.

d) Due to the tolerances involved, the gasket groove and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum wet film thickness of un-reduced Permox-CTF™ Joint Compound. Application shall be by brush with care taken to insure the coating is smooth and without excess buildup in the gasket groove or on the spigot end. No coating application to the gasket groove and spigot shall take place prior to lining of the pipe barrel

(5) Inspection

a) Each pipe joint and fitting shall be marked in accordance with the application date of the lining system including its numerical sequence of application for that date. Applicator may be required to maintain such records for a reasonable period of time.

b) Dry film thickness determination for all DIP and Fittings must be checked and verified using a properly calibrated magnetic film thickness gauge and testing shall be accomplished using the method outlined in SSPC-PA-2 Film Thickness Rating.

c) The barrel of all pipe and fittings shall undergo a non-destructive 2,500-volt pinhole test. Any pinholes detected must be repaired based upon lining manufacturer's written recommendations.

(6) Certification

a) The pipe or fitting MANUFACTURER must supply a written certificate attesting to the fact that the APPLICATOR met the requirements of this specification, that the material used was as specified, and that the material was applied as required by the specification.

4 Option 3

a. Basis of Design

(1) Tnemec Series 431 Perma-Shield PL modified polyamine ceramic epoxy lining

(2) Generic Type: Polyamine Ceramic Epoxy

b. Properties:

(1) Solids by Volume: 100 percent

(2) Hazardous Air Pollutants: Zero

(3) Ceramic Hollow Microspheres: 20 percent by volume (no silica fume, fly ash, or alumina dust)

(4) Pigment Volume Concentration: Less than 22 percent

(5) Coal-Tar Content: Zero

(6) Dry Film Thickness: 40 mils nominal

(7) High Voltage Holiday Testing Requirements: 4,000 volts (100 volts per mil)

(8) High Velocity Sewer Jet Cleaning (Hydrocleaning): Lining material shall be able to withstand high velocity sewer jet cleaning with the following parameters.

— 2,500 psi operating pressure utilizing 0º Nozzles.

— Cleaning jet nozzles (fixed) shall be no greater than a 30 degree angle of incidence to the pipe wall and up to 90 degree angle of incidence for rotational or spinner nozzles.

— Lining shall be able to withstand a stationary hold time of 60 seconds for up to 30 degree nozzles in accordance with NASSCO Jetter Code of Practice.

(9) Above Ground Storage Life: 3 Years

c. Performance Criteria:

All testing shall be in accordance with current ASTM appropriate standards

(1) Abrasion: (ASTM D4060-07, CS-17 wheel, 1,000 grams) – 41 mg loss.

(2) Abrasion: (BS EN 598:2007+A1:2009, 50,000 cycles) – 0.6 mils loss

(3) Adhesion: (ASTM D 4541 – Substrate: DIP) – Not less than 3,000 psi.

(4) Severe Wastewater Analysis Test (ASTM G 210-13): (150°F, 500 ppm H2S, 4000 ppm NaCl, 10% H2S04, EIS Permeation Analysis) – Initial impedance of 11.2 (log-z). No blistering, cracking, checking or loss of adhesion. Reduction in electrical impedance of 0.5 after 28 days exposure.

(5) Cathodic Disbondment: ASTM G 8 (1.5 V) Classification Group A. No more than 0.000 inch (0.00 mm) disbonded equivalent circle diameter.

(6) Chemical Resistance: (ASTM C 868-02, 25 percent sulfuric acid, 100 degrees F, 100 days – (NACE TM0174-2002, 6 months continuous immersion, 50 percent

sulfuric acid, 13 percent sodium hypochlorite, 5 percent sodium hydroxide, 75 degrees F – No effect.

(7) Dielectric Strength: (ASTM D 149-09) – greater than 600 volts per mil
(8) Hardness: (ASTM D 2240): Shore D hardness of 79. (ASTM D 3363).
(9) Immersion: 140°F (60°C) De-ionized Water Immersion. No blistering, cracking or delamination of film after 5,000 hours continuous immersion.
(10) Impact: (ASTM D 2794-04) – No visible cracking or delamination after 160 inch-pounds (18.0 J) direct impact.
(11) Salt Spray (ASTM B 117-09): No blistering, cracking, rusting or delamination of film after 10,000 hrs.
(12) Water Absorption (ASTM C413-01(2006) – 0.0 percent water absorption
(13) Water Vapor Transmission (ASTM D 1653-03(2008) Method B, Wet Cup, Condition C) – 1.25 g/m2 per 24 h water vapor transmission and 0.09 perms water vapor permeance.

d. Surface Preparation:
(1) All ductile iron pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. All oils, small deposits of asphalt paint, grease, and soluble deposits shall be removed in accordance with NAPF 500-03-01 Solvent Cleaning prior to abrasive blasting.
(2) Ductile Iron Pipe: Uniformly rotary-abrasive blast the entire interior surface using angular abrasive to an NAPF 500-03-04: “Internal Pipe Surface Condition, with full removal of annealing oxide layer”. When viewed without magnification, the interior surfaces shall be free of all visible dirt, dust, annealing oxide, rust, mold coating and other foreign matter. Any area where rust reappears before application shall be re-blasted. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns) (Reference NACE RP0287 or ASTM D 4417, Method C).
(3) Ductile Iron Fittings: Uniformly abrasive blast to a NAPF 500-03-05: “Fitting Blast Clean #1 Condition, No Staining”. When viewed without magnification, the interior surfaces of cast iron fittings shall be free of all visible dirt, dust, annealing oxide, rust, mold coating and other foreign mater. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns).
(4) Surface shall be coated within eight hours of surface preparation.

e. Application
(1) The lining shall be applied by an approved applicator with successful history of applying ceramic epoxy linings to the interior of ductile iron pipe and fittings.
(2) Within 8 hours of surface preparation, the interior shall be coated with the following dry film thicknesses (DFT).
a) Pipe Interior: 40 mils
b) Fittings Interior: 40 mils
c) Push-on Joints: 6-10 mils
d) Mechanical Joints: Extend lining from spigot end to edge of gauging ring.

f. Inspection
(1) Each pipe joint and fitting shall be marked in accordance with the application date of the lining system including its numerical sequence of application for that date. Applicator may be required to maintain such records for a reasonable period of time.
(2) Dry film thickness determination for all DIP and Fittings must be checked and verified using a properly calibrated magnetic film thickness gauge and testing shall be accomplished using the method outlined in SSPC-PA-2 Film Thickness Rating.
(3) The barrel of all pipe and fittings shall undergo a non-destructive 2,500-volt pinhole test. Any pinholes detected must be repaired based upon lining manufacturer=s written recommendations.

2.8 EXTERIOR LINING - SEWER

A. Buried Ductile Iron Pipe: The exterior of ductile iron pipe, special, and fittings shall be coated with a 1 mil asphaltic coating in accordance with AWWA C151, Section 51-9. When specified, loose polyethylene encasement shall be supplied in accordance with AWWA C105.

B. Aboveground Ductile Iron Pipe: The exterior of ductile iron pipe, specials, and fittings shall be coated with one of the following coatings or primers:

Above Grade - Exterior (Mild Exposure)
Tnemec Series N140-1211 Pota-Pox Plus Primer at 6.0 – 8.0 mils DFT.
Above Grade - Interior/Exterior Immersion/Non-immersion (Mild to Aggressive Exposure). Tnemec Series N140—1211 Pota-Pox Plus Primer applied at 6.0- 8.0 mils DFT

C. Below Grade Ductile Iron Pipe: The exterior of the ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes - External zinc-based coating - Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01."

D. Below Grade Ductile Iron Fittings: The exterior surfaces of ductile iron fittings shall be coated as noted in Section C above or they shall be coated with Tnemec Series 90-98 Tneme-Zinc applied at a rate to achieve 2.0 – 3.0 mils DFT. The coating shall conform to ISO 8179 – Part 2 "Liquid Zinc Coatings for Ductile Iron Pipe".

2.9 PIPE AND FITTINGS JOINTS

A. JOINTS:
1 Ductile iron pipe and fittings to have rubber gasket joints in accordance with the latest revision of ANSI/AWWA C111/A21.11. Buried piping and fittings shall be either push-on joint (pipe), push-on restrained joint, or mechanical joint (fittings-only, where specified; see ** below).
2 Piping and fittings above ground shall be flanged.
3 Where buried restrained pipe joints are required to resist thrust due to internal pressure, restrained gasket [AMERICAN Amarillo Fast-Grip or equal, colored (yellow, orange, etc.) restrained joint gasket] - or fabricated, push-on restrained joints (AMERICAN Flex-Ring or AMERICAN Lok-Ring joints - or equal) shall be utilized at the specified locations.
4 Where buried restrained fitting joints are required to resist thrust due to internal pressure, restrained mechanical joints (MJ) [in limited situations; see ** below] utilizing torque-activated MJ restraints (MegaLugs, One-Loks, or equal), restrained gasket [AMERICAN Amarillo Fast-Grip or equal, colored (yellow, orange, etc.) restrained joint gasket] - or fabricated, push-on restrained joints (AMERICAN Flex-Ring or AMERICAN Lok-Ring joints - or equal) shall be utilized at the specified locations.
5 Restrained joints shall be rated for a working pressure of 350 psi minimum (4@-18@) and 250 psi minimum (20@-64@).
** Restrained joints (for items other than fittings less than or equal to 14@ and MJ sleeves and MJ valves) using set screws such as retainer glands, Mega-Lugs, or other torque-activated means of restraint shall be permitted only following specific approval by the owner / engineer.

2.10 AMARILLO FAST-GRIP GASKETS FOR DUCTILE IRON PIPE

A. Four-inch through 30-inch restrained joints shall be AMERICAN Amarillo Fast-Grip gasket and joint restraining system.

B. Pressure ratings shall be 350 psi for 4-inch through 18-inch; 250 psi for 20-inch through 24-inch; and

150 psi for 30-inch, but in no case shall the joint be considered rated at a higher pressure than the pipe of which it is a part.

C. Joint deflection shall be 5 degrees for 4-inch through 12-inch; 4 degrees for 14-inch; 3 degrees for 16-inch through 24-inch; and 2.5 degrees for 30-inch.

D. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, shall be styrene butadiene rubber (SBR), and shall be ANSI/NSF Standard 61 certified for contact with potable water.

E. Gaskets shall be yellow in color, and the yellow color shall be consistent throughout the entire cross section of the gasket. The yellow color shall not be attained by surface coating; it shall be inherent within the rubber.

F. Restraining gaskets shall be manufactured in the United States.

2.11 V-BIO ENHANCED POLYETHYLENE ENCASEMENT FOR DUCTILE IRON PIPE

A. Polyethylene encasement for use with ductile iron pipe shall meet all the requirements of ANSI/AWWA C105/A21.5, *Polyethylene Encasement for Ductile Iron Pipe Systems*.

B. In addition, polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight mils.

C. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

D. Ductile iron pipe and the polyethylene encasement used to protect it shall be installed in accordance with AWWA C600 and ANSI/AWWA C105/A21.5 and also in accordance with all recommendations and practices of the AWWA M41, *Manual of Water Supply Practices – Ductile Iron Pipe and Fittings*. Specifically, the wrap shall be overlapped one foot in each direction at joints and secured in place around the pipe, and any wrap at tap locations shall be taped tightly prior to tapping and inspected for any needed repairs following the tap.

E. All installations shall be carried out by personnel trained and equipped to meet these various requirements.

F. The installing contractor shall submit an affidavit stating compliance with the requirements and practices of ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51, ANSI/AWWA C105/A21.5, AWWA C600 and M41.

SECTION 15062

FABRICATED PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and shop application of Series 431 Perma-Shield PL, a high-performance polyamine ceramic epoxy lining for use in the interior and on the exterior of fabricated ductile iron pipe and fittings exposed to severe wastewater environments.

B. The ceramic epoxy lining material shall be an amine-cured epoxy containing at least 20% by volume of ceramic hollow microspheres.

1.2 REFERENCES

A. ASTM International, (ASTM)
   1. ASTM B 117-99(2007) – Standard Practice for Operating Salt Spray (Fog) Apparatus
   2. ASTM C 413-01(2006) – Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
   3. ASTM C 868-02(2008) – Standard Test Method for Chemical Resistance of Protective Linings
   4. ASTM D 149-09 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
   5. ASTM D 870-09 – Standard Practice for Testing Water Resistance of Coatings Using Water Immersion
   6. ASTM D 1653-03(2008) – Standard Test Methods for Water Vapor Transmission of Organic Coating Films
   7. ASTM D 2370-98(2002) – Standard Test Method for Tensile Properties of Organic Coatings
   8. ASTM D 2240-05 – Standard Test Method for Rubber Property—Durometer Hardness
   9. ASTM D2583-07 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
   10. ASTM D 2794-93(2004) – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
   11. ASTM D 4400-99(2007) – Standard Test Method for Sag Resistance of Paints Using a Multinotch Applicator
   12. ASTM D 4060-07 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
   13. ASTM D 4541-09 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
   14. ASTM G 8-96(2003)e1 – Standard Test Methods for Cathodic Disbonding of Pipeline Coatings
   15. ASTM G 210-13 – Standard Practice for Operating the Severe Wastewater Analysis Testing Apparatus (S.W.A.T.)

B. British Standard, (BS)
   1. BS EN 598:2007+A1:2009 – Ductile Iron Pipes, Fittings, Accessories and Their Joints for Sewerage Applications – Requirements and Test Methods

C. NACE International, (NACE)
   1. NACE SP0188-2006 – Standard Practice for Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

2. NACE TM0174-2002 – Laboratory Methods for the Evaluation of Protective Coatings and Lining Materials in Immersion Service

D. SSPC: The Society for Protective Coatings, (SSPC)

1. SSPC-PA2 – Paint Application Specification No. 2: Measurement of Dry Coating Thickness with Magnetic Gages

E. Unless otherwise specified, references to documents shall mean the documents in effect at the time of receipt of Bids. If referenced documents have been discontinued by the issuing organization references to those documents shall mean the replacement documents or the last version of the document before it was discontinued.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide products from a company specializing in manufacture of high-performance epoxy coatings with a minimum 10 years experience.

1. Materials shall be products of a single manufacturer or items standard with manufacture of specified coating materials.

2. Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.

B. Applicator's Qualifications: Engage a single installer approved by the manufacturer with a minimum of three years experience performing this type of lining installation and with documented skill and successful experience in the installation of ceramic epoxy lining to interior of ductile iron pipe and fittings.

1. Submit name and qualifications to Engineer.

2. Submit proof of acceptability of applicator by manufacturer to Engineer.

1.4 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01200 entitled "Submittals", the applicator shall submit all required information as specified herein.

B. Shop Drawings: Submit for approval prior to commencing any Work:

1. Product Data Sheet

2. Material Safety Data Sheet

3. Performance Testing Reports: Copies of test data for the entire physical, chemical, and permeation properties listed herein and as outlined within this Section.

4. Instillation Instructions: Manufacturer's written installation instructions for the materials specified in this Section.

5. Copies of specifications, technical information, and general recommendations from the coating manufacturer for the specified material.

6. Qualifications Data: Submit qualifications in accordance with Article 1.3, above:

a. Manufacturer

b. Applicator

C. Application Reports: Submit at the completion of Work

Daily Reports: Include surface preparation, substrate conditions, ambient conditions application procedures, lining materials applied, material quantities, and material batch number(s).

1.5 PRODUCT STORAGE, HANDLING AND APPLICATION

Coating materials shall be handled, stored and applied in accordance with the manufacturer's recommendations.

1.6 WARRANTY

A. Protective Lining Manufacturer shall warranty its products as free from material defects for a minimum period of three (3) years. Provide associated Warranty Certificate.

PART 2 - PRODUCTS

2.1 MATERIALS

A. To define requirements for materials, size, and design, this specification lists specific products manufactured by Tnemec Company, Inc. of Kansas City, Missouri. Materials specified herein are cited as the minimum standard of quality which will be acceptable.

B. Interior Pipe Lining:

1. Tnemec Series 431 Perma-Shield PL polyamine ceramic epoxy lining
    a. Dry Film Thickness: 40 mils (nominal)
2. Generic Type: Polyamine Ceramic Epoxy
3. Properties:
    a. Solids by Volume: 100 percent
    b. Hazardous Air Pollutants: Zero
    c. Ceramic Hollow Microspheres: 20 percent by volume (no silica fume, fly ash, or alumina dust)
    d. Pigment Volume Concentration: Less than 22 percent
    e. Coal-Tar Content: Zero
4. Performance Criteria:
    a. Abrasion: (ASTM D4060-07, CS-17 wheel, 1,000 grams) – 76 mg loss. (BS EN 598:2007+A1:2009, 50,000 cycles) – 0.6 mils loss
    b. Adhesion: (ASTM D 4541) – Not less than 2,866 psi, DIP.
    c. Severe Wastewater Analysis Test (S.W.A.T.): (ASTM G 210-13) Initial electrochemical impedance of 10.3 (log-z). No cracking, checking or loss of adhesion. Not less than 85% retained impedance and no more than 1.6 ohms●cm^2 reduction in log-z following 28 days exposure.
    d. Cathodic Disbondment: ASTM G 8 (1.5 V) Classification Group A. No more than 0.00 inch (0.00 mm) disbonded equivalent circle diameter.
    e. Chemical Resistance: (ASTM C 868-02, 25 percent sulfuric acid, 100 degrees F, 100 days – (NACE TM0174-2002, 6 months continuous immersion, 50 percent sulfuric acid, 13 percent sodium hypochlorite, 5 percent sodium hydroxide, 75 degrees F – No effect.

f. Dielectric Strength: (ASTM D 149-09) – greater than 600 volts per mil

g. Hardness: (ASTM D 2240): Shore D hardness of 79.

h. Immersion: 140°F (60°C) De-ionized Water Immersion. No blistering, cracking or delamination of film after 5,000 hours continuous immersion.

i. Impact: (ASTM D 2794-04) – No visible cracking or delamination after 160 inch-pounds (18.0 J) direct impact.

j. Salt Spray (ASTM B 117-09): No blistering, cracking, rusting or delamination of film. No rust creepage at scribe after 1,000 hrs.

k. Water Absorption (ASTM C 413-01(2006) – 0.0 percent water absorption

l. Water Vapor Transmission (ASTM D 1653-03(2008) Method B, Wet Cup, Condition C) – 1.25 g/m2 per 24 h water vapor transmission and 0.09 perms water vapor permeance

C. Exterior Pipe Coating:
   1. Tnemec Series 140 Pota-Pox Plus epoxy primer
      a. Dry Film Thickness: 4.0 – 6.0 mils
   2. Tnemec Series 431 Perma-Shield PL polyamine ceramic epoxy exterior lining
      a. Dry Film Thickness: 30.0 – 40.0 mils

D. No substitutions allowed

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. All ductile iron pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior or exterior surface. All oils, small deposits of asphalt paint, grease, and soluble deposits shall be removed in accordance with NAPF 500-03-01 Solvent Cleaning prior to abrasive blasting

B. Ductile Iron Pipe Interior Preparation: Uniformly rotary-abrasive blast the entire interior surface using angular abrasive to an NAPF 500-03-04: "Internal Pipe Surface Condition, with full removal of annealing oxide layer". When viewed without magnification, the interior surfaces shall be free of all visible dirt, dust, annealing oxide, rust, mold coating and other foreign matter. Any area where rust reappears before application shall be re-blasted. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns) (Reference NACE RP0287 or ASTM D 4417, Method C).

C. Ductile Iron Pipe Exterior Preparation: Uniformly abrasive blast the entire exterior surface using angular abrasive to an NAPF 500-03-04: "External Pipe Surface Condition". When viewed without magnification, the exterior surfaces shall be free of all visible dirt, dust, loose annealing oxide, loose mold coating, rust and other foreign matter. Tightly adherent annealing oxide, mold coating and rust staining may remain on the surface provided they cannot be removed by lifting with a dull putty knife. Any area where rust reappears before application shall be re-blasted. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns) (Reference NACE RP0287 or ASTM D 4417, Method C).

D. Ductile Iron Fittings: Uniformly abrasive blast the interior and exterior surfaces to a NAPF 500-03-05: "Fitting Blast Clean #1 Condition, No Staining". When viewed without magnification, the interior surfaces of cast iron fittings shall be free of all visible dirt, dust, annealing oxide, rust, mold coating and other foreign mater. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns).

E. Surface shall be coated within a maximum of eight hours of surface preparation.

3.2 APPLICATION

A. The lining shall be applied by an approved applicator with successful history of applying ceramic epoxy linings to the interior of ductile iron pipe and fittings.

B. Within 8 hours of surface preparation, the interior shall be ceramic epoxy coated with the following dry film thicknesses (DFT).

1. Pipe Interior: 40 mils
2. Fittings Interior: 40 mils
3. Push-on Joints: 6–10 mils
4. Mechanical Joints: Extend lining from spigot end to edge of gauging ring.

C. The exterior shall be coated with the following dry film thickness (DFT):
1. Pipe Exterior: 4.0 – 6.0 mils of epoxy primer
2. Pipe Exterior: 30.0 – 40.0 mils ceramic epoxy liner

3.3 CUTTING PIPE

Cutting shall be done in a neat manner, without damage to the pipe or the lining. Use wheel cutters when practicable. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the ends of the pipe shall be dressed with a power grinder to remove all sharp edges. The cut ends of push on joint pipe shall be suitably beveled.

3.4 HANDLING

Series 431 Perma-Shield PL lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, cables or other devices shall be placed inside the pie and fittings for lifting, positioning, or laying. The pipe shall not be dropped or unloaded by rolling. Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers. Only nylon straps or similar lifting devices are to be used.

3.5 INSPECTION

A. Inspection

1. All ceramic epoxy lined pipe and fittings visual examined for film defects, including any runs, sags, and debris in the film. Repairs shall be made in accordance with the manufacturer's instructions.
2. All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic dry film thickness gauge. The thickness testing shall be in according with SSPC-PA2 film thickness rating.
3. The interior and exterior lining of all pipe and fittings shall be tested for holidays, pinholes, and

discontinuities in accordance with NACE SP0188. All holidays shall be properly repaired in accordance with the manufacturer's instructions and retested at no additional cost to the Owner.

4. Each pipe joint and fitting shall be marked with the date of application of the ceramic epoxy lining system and with its numerical sequent of application on that date.

B. Certification: The pipe or fitting manufacturer shall supply a certificate attesting to the fact that the applicator met the requirements of this Specification, and that the material was applied as required by the Specification.

3.6 COATING REPAIR

A. Repairs and touch-up shall be performed in accordance with the manufacturer's recommended repair and touch-up procedures.

B. All field cut ends shall be repaired and sealed prior to the installation.

SECTION 15100

VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install valves, operators and appurtenances necessary to complete work as shown on the Drawings or as specified.

B. Codes, specifications, and standards referred to by title or number shall form a part of this specification to the extent required by the references thereto. Latest revisions as of the date of bid opening shall apply, unless otherwise specified.

1.2 QUALITY ASSURANCE

A. Mark gates, operators, and appurtenances. Marking shall meet the requirements of the applicable specification or standard.

B. Testing
   1. Perform factory tests in accordance with the applicable specification or standard.
   2. Perform field tests specified in this section.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Submit the following:
   1. Manufacturer's Certificate of Compliance certifying compliance with the applicable specifications and standards.
   2. Certified copies of test reports of concrete mixes required by applicable standards.
   3. Shop drawings with performance data, physical characteristics and with dimensioned layouts of gates.
   4. Manufacturer's written installation instructions.
   5. Manufacturer's operation and maintenance material and manuals.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products.

B. Load and unload all gates, and appurtenances by hoists or skidding. Do not drop products. Do not skid or roll products on or against other products. Use sling, hooks, and pipe tongs in such a manner to prevent damage to products. No inward projecting lifting device shall be allowed.

C. Keep stored products safe from damage or deterioration. Keep the interior of gates, operators, and appurtenances free from dirt or foreign matter. Store gates in a manner that will protect gates from damage.

D. Store gates, operators and appurtenances in accordance with manufacturer's recommendations.

E. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

PART 2 - PRODUCTS

2.1 BUTTERFLY VALVES

A. General
1. Butterfly valves and operators shall meet the requirements of AWWA Standard C504, except buried valves shall have mechanical joint type ends. Valves and operators shall be Class 150B.
2. Buried butterfly valves shall mechanical joints. Mechanical joints shall meet the requirements of ANSI/AWWA C110. Butterfly valves installed above ground or in structure shall have flanged joints as specified in AWWA C504. Nuts, bolts, and gaskets for flange joints shall meet the requirements of ANSI/AWWA C110. Nuts and bolts shall be cadmium plated. Gaskets shall be full face and velumoid or equal.
3. Each buried butterfly valve shall have a manual operator and a 2-inch operating nut. Valve opening direction shall be consistent with operation of existing valves in the facilities in which the valves are installed, unless otherwise directed by the Engineer.
4. Each butterfly valve installed above ground or in a structure shall have a manual operator and handwheel or chainwheel and chain, unless otherwise specified.
5. Valves shall be as manufactured by DeZurik, Henry Pratt, M&H Valve or Mueller.

B. Class 150 B Butterfly Valves
1. Valve seating shall be 360° continuous with the seat offset.
2. The body shall be cast iron ASTM A126 Grade B with 125 lb. flanged ends per ANSI B16.1 standard for cast iron flanges.
3. The disc shall be cast iron per ASTM A-48, Class 40C, with a disc seating edge of solid 316 stainless steel.
4. The seat shall be of Buna-N for water, and shall be molded in and vulcanized to the valve body. The seat shall contain an integral shaft seal protecting the valve bearings and packing form any line debris.
5. The valve shaft shall be type 304 stainless steel and shall have self-compensating V-type packing seals with a minimum of 4 sealing rings.
6. The disc shall be securely attached to the valve utilizing a field removable/replaceable 304 stainless steel torque screw on sizes 3"-12" or a tangential pin locked in place with a set screw on sizes larger than 12".
7. Valves with the seat mechanically retained to the disc shall be unacceptable.

C. Class 250 Butterfly Valves
1. alves shall be designed for compliance with AWWA C504 with the following additional features necessary for 250 psig rated working pressure.
2. The body shall be of cast iron per ASTM A126 Class B. Flanged end valves shall be of the short body design with 250 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges. Mechanical Joint end valve bodies shall be of ductile iron per ASTM A536 (65-45-12) and shall meet the requirements of AWWA C11/ANSI 21.11.
3. The disc shall be offset to provide an uninterrupted 360 degree seating edge and shall be ductile iron per ASTM A 536 (65-45-12).
4. The valve shaft shall be of ASTM A564 Type 630 stainless steel.

D. Butterfly Valve Operators
1. Valve operators shall be of the traveling nut type of a self locking design to prevent disc creep in any position. Operators shall be provided with input stops which are field adjustable to any disc position and which will accept a minimum of 450 ft/lbs of input torque without failure.

2. Valve operators shall be sized for the torques provided in Table 1 of ANSI/AWWA C504 for size and class of valve specified.
3. 250 valve operators shall be sized for pressure and dynamic conditions listed in Appendix "A" of ANSI/AWWA C504. Based on 250 psi pressure differential and 16 fps flow unless other flow rates are specified by the engineer.
4. Each valve shall be operated through three open/close cycles to insure free operation at all positions. Each valve shall be hydrostatically tested at twice rated pressure with the disc open, and a rated pressure in each direction with the disc closed. No permanent deformation or visible leakage shall be allowed on either hydrostatic test.

E. Air Line Butterfly Valves
1. An offset disc shall allow full 360° seating.
2. Valve shall have lug bodies made of cast iron.
3. Shaft seal shall be EPDM with an EPDM resilient seat.
4. Disc and shaft shall be 316 stainless steel with TFE-coated stainless steel bearings.
5. Actuator shall be adjustable memory stop, infinite position lever.

2.2 GATE VALVES

A. Resilient Seat Gate Valves
1. Valves shall meet the requirements of AWWA C509, latest revision.
2. Valves shall be seat tested at 200 psi water pressure for zero leakage and 400 psi for no leakage through the metal, flanged joints, or stem seals.
3. Gate valves shall be furnished with flanged ends, mechanical joints or push-on as detailed on the drawings or as noted in the valve schedule.
4. Stem shall be manganese bronze having a minimum tensile strength of 60,000 psi.
5. The gate, body, bonnet, bonnet cover and wrench nut shall be cast iron (ASTM A126 Class B).
6. Valves shall be of the non-rising stem type. Two O-rings shall seal the stem above the stem collar.
7. The interior and exterior ferrous surfaces shall be coated with a minimum 8 mils of epoxy.
8. The bolts and nuts shall be electro-zinc plated steel (ASTM A307) unless underground where all nuts and bolts shall be stainless steel.

B. Double Disc Gate Valve
1. Valves shall be of the double revolving disc, parallel seat design with independent wedging action to spread the two discs against the seat.
2. Valves shall be seat tested at 200 psi water pressure for zero leakage and 400 psi for no leakage through the metal, flanged joints, or stem seals.
3. Gate valves shall be furnished with flanged ends, mechanical joints or push-on as detailed on the drawings or as noted in the valve schedule.
4. Stems shall be manganese bronze with a minimum tensile strength of 60,000 psi for valves sizes up to 24" and a minimum tensile strength of 80,000 psi for valve sizes 30" and larger.
5. Gate valves shall be of the non-rising stem type for valves sizes less than 12".
6. Valves 14" and larger shall be installed with stem in horizontal position and equipped with tracks and scrappers.
7. Valves 16" and larger that operate on line with pressure greater than 60 psi shall have a bypass valve furnished with the same type materials as main valve.
8. The interior and exterior ferrous surfaces shall be coated with a minimum 8 mils of epoxy.
9. The bolts and nuts shall be electro-zinc plated steel (ASTM A307) unless underground where all nuts and bolts shall be stainless steel.
10. Valves mounted in vertical pipes shall be square bottom valves with shoes and tracks on both disc.
11. Valves on raw sewage or sludge lines shall have double clean-out pockets.

C. Gate valve locations
   1. Gate valves 6" and smaller shall be resilient seat gate valves.
   2. Gate valves 8" and larger shall be double disc gate valves.
   3. Valves shall be as manufactured by American Flow Control, M&H Valve, American R&D, Mueller or Kennedy.

2.3 GATE VALVES SMALLER THAN 3"

Gate valves smaller than 3-inch installed above ground or in structures shall be bronze, 125 lb. S.W.P. double disc, screwed-in bonnet, rising stem, inside screw gate valves with screwed ends and malleable iron handwheels. Valves shall meet the requirements of Federal Specification WW-V-54d for Class A, Type III valves.

2.4 STAINLESS STEEL ANGLE VALVES AND GLOBE VALVES, 4" AND LARGER

Stainless steel angle valves and globe valves, 4-inch and larger, installed above ground or in structures shall be 304 stainless steel construction, 150 psi W.P., bolted flange yoke-bonnet, outside screw rising stem with flanged ends and handwheels. Flanged ends shall be faced and drilled to meet the requirements of ANSI B16.5 for 150 lb. standard flanges.

2.5 BRONZE GLOBE VALVES, 3" AND SMALLER

Bronze globe valves, 3-inch and smaller, installed above ground or in structures shall be 150 pound, union bonnet type with ASTM B62 bronze body and bonnet, 500 Brinnel plug type disc, 500 Brinnel screwed-in seat, screwed ends, and handwheels.

2.6 PLUG VALVES

A. Plug Valves
   1. All plug valves shall be eccentric plug valves unless otherwise specified.
      a. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valve shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall be to the AWWA Standard C111-64, grooved ends per AWWA C-606-87. Screwed ends shall be to the NPT standard.
      b. Valves bodies shall be of ASTM A126 Class B cast iron. Bodies in 4" and larger valves shall be furnished with a 1/8" welded overlay seat of not less than 90% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.
      c. Plugs shall be of ASTM A126 Class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be resilient faced with neoprene or hycar, suitable for use with sewage.
      d. Valves shall have sleeve type metal bearings and shall be of sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CF-8M in 1/2"-36" sizes. In valves large than 36", the upper and lower plug journals shall be fitted with ASTM A-240 type 316 stainless sleeves with bearings of SATM B30, Alloy C95400 aluminum bronze. Non-metallic bearings shall not be acceptable.
      e. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable with out removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.

f. Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 72". Each valve shall be given a hydrostatic and seat test with test results being certified when required by the specifications.

g. Manual valves shall have lever (valves smaller than 6") or gear actuators (all valves 6" and larger) and tee wrenches, extension stems, floorstand, extended bonnets etc., as indicated on the plans. All extended bonnets must have gear located at the operator - stem extensions with handwheel operators and gearing at valve are not an acceptable equivalent. All floorstands shall be of the geared type with a handwheel operator. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts and washers shall be zinc plated.

h. Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. Extension stems are required on all valves with the centerline greater than 4' below grade. All exposed nuts, bolts, springs and washers shall be stainless steel.

1) All valves and actuators shall be as manufactured by DeZurik, ValMatic, Milliken, American R&D, Rotork or AUMA.

B. For valves located in digester gas service, the plug shall be completely coated with a chloro-isobutene-isoprene compound of a minimum of 70 durometer hardness bonded to the plug and rated for temperatures of 250°F.

2.7 MUD VALVES

A. Mud valves shall be of the heavy duty flange type with non-rising stems.

B. Frame, plug, yoke, and extension stem connection shall be cast iron (CASTM 126B). Valve operating stem and lift nut shall be ASTM B421 bronze. Seating shall be heavy wear resistant rubber seat.

C. Seating surfaces shall be ASTM B62 bronze with tapered, accurately machined, seating face.

D. Extension stems, pedestal lifts, stem guides and wall brackets will be furnished by valve manufacturer for a complete unit.

2.8 STAINLESS STEEL BALL VALVES

Stainless steel ball valves, ¼ inch through inch, shall be Class 600, three-piece valves with TFE seats, reinforced teflon stem seals, screwed ends, 316 stainless steel bodies, end pieces, balls and stems, and lever operators. Valves shall be manufactured by Contromatics, or equal.

2.9 BRONZE BALL VALVES

Bronze ball valves, ¼ inch through 3 inch, shall be Class 600, three-piece valves with TFE seats, reinforced teflon stem seals, screwed ends, bronze bodies and end pieces, stainless steel balls and stems, and lever operators. Valves shall be manufactured by Contromatics, or equal.

2.10 PVC BALL VALVES

PVC ball valves shall be manufactured of Type 1, Grade 1, polyvinyl chloride and shall have teflon seats and viton seals. Valves shall be 150 pound working pressure and shall have double union screwed ends. Valves shall have polyvinyl chloride handles.

2.11 SILLCOCKS

Sillcocks shall be ¾ inch with ¾ inch hose end, wall flange, antifreeze type.

2.12 NEEDLE VALVES

Needle valves shall be designed to accurately regulate the flow of water through a pipe. The valves shall be constructed for a non-shock cold water pressure of 200 psi. Valves shall be globe type with cast bronze, ASTM B62, bodies and bonnets; bronze stems; and indicator handwheel.

2.13 CURB STOPS

Buried valves 2 inch and smaller in water lines shall be curb stops. Curb stops shall meet the applicable requirements of AWWA C800, ASTM B-62 for 85-5-5-5 composition bronze, and USAS B2.1. Curb stops shall be Mueller H-10283, Mark II Oriseal Valve or equal.

2.14 MANUAL OPERATORS

Manual operators shall be specified in this section. Gate, plug, and butterfly valves with the valve centerline less than six feet above the floor or platform shall be provided with handwheels. Gate, plug, and butterfly valves with the valve centerline six feet or more above the floor or platform shall be provided with chainwheels and chains. Chains shall terminate four feet above operating floor or platform.

2.15 VALVE STANDS

Valve stands shall be cast iron with indicators and shall be compatible with the valve being served.

2.16 VALVE BOXES

A. Valve boxes shall be cast iron. Valve boxes shall be of two piece or three piece type. Each two piece box shall be complete with bottom section, top section, and cover. Valve boxes shall be extension type with slide or screw type adjustment. Each base and bottom section shall be the proper size for the valve served. Each valve box assembly shall be the proper length for the valve served. The minimum thickness of metal shall be 3/16 inch. Cast the work "WATER" in each valve box cover used on valves in potable water piping.

B. Underground valves, 3 inch and larger, provided with valve boxes shall also be provided with compatible extension stems of sufficient length to place operating nut within approximately nine inches of the finished ground surface. Extension stem shall be furnished by the valve manufacturer.

C. Valve boxes for curb stops shall be cast iron. Curb boxes shall be extension type. Each curb box shall be complete with foot piece, curb box, and lid.

2.17 AIR & VACUUM VALVES

Air valve shall consist of a body, cover, baffle, float and seat. The baffle design shall protect the float from direct contract of the rushing air and water to prevent the float from closing prematurely. Valve to be equal to APCO Air and Vacuum Valve.

2.18 VALVE ACTUATORS

A. Valve actuators and appurtenances shall be sized and furnished by the valve manufacturer for the service shown or specified.

B. Cylinder valve operators shall be swivel cylinder type operators using water as the source of hydraulic power. The operators shall also include limit switches for remote indication of open valve position, speed control valves to limit valve opening and closing speed, 4-way solenoid valve for remote control of valve and an adjustable cylinder stop. The speed control valves shall consist of a check valve and throttle valve installed in one or more of the cylinder lines.

C. Large electric actuators (for butterfly valves 8- inches and larger, gate valves 4-inches and larger, globe valves 4-inches and larger, eccentric plug valve 4-inches and larger, ball valves 4-inches and larger).
   1. Electric motor actuators shall be as manufactured by Limitorque,E.I.M., Rotork or AUMA. Electric actuator shall include the motor power gearing, limit switches, built-in controls, declutch and auxiliary handwheel for manual operation in a grease-tight, NEMA rated, weatherproof housing. Actuator shall be sized to operate the valve from fully open to fully closed in not less than two seconds per inch of valve diameter, plus or minus 50% through 20- inch, and plus or minus 30% for valves 24-inches and larger.
   2. Actuator shall be sized to deliver not less than one and one-half (1.5) times the required torque based upon maximum dynamic flow conditions.
   3. Power gearing shall consist of helical or spur type gears of alloy heat treated steel. Worm gears shall be carburized and hardened alloy steel and ground after heat treatment. The worm gear pinion shall be alloy bronze. The gearing shall be designed to allow field repair and change in gear ratio. All gearing shall be designed for 100% overload. Ball or roller bearing shall be used where necessary.
   4. A handwheel shall be provided for manual operation of the valve. The handwheel shall not rotate during electric operation, and the motor shall not rotate during hand operation. To place the operator in manual operation, a declutching lever shall mechanically (not electrically) disconnect the motor drive from the gear train. Failure of the motor gearing or a fused motor shall not prevent hand operation. Hand operation shall not require more than 80 pound pull on the rim of the handwheel. The handwheel shall rotate counter-clockwise to open, and an arrow with the work "open" shall be cast on the handwheel. Operation shall automatically return to electric drive position when the motor is energized.
   5. A mechanical type valve position indicator shall be furnished to show valve position at all times. The indicator shall be part of an intermediate gear head of the electric motor actuator.
   6. Two adjustable torque switches of the quick breaktype shall be furnished. Torque switches shall be responsible to an excessive load encountered in either the opening or closing direction. Four fully adjustable, double pole, double throw limit switches shall be furnished in addition to the switches required for built-in control. Torque and limit switches shall be rated 10 amp at VAC. Switch compartments shall be furnished with a case heater. Auxiliary position potentiometer rated 0-10 K ohm shall be furnished when specified in the valve list.
   7. Built-in control for non-modulating service shall consist of an integrally mounted reversing starter equipped with thermal overloads or motor thermostat, local pushbuttons, selector switches, and indicating lights as specified in the valve list, and a 120 VAC control power transformer.
   8. Built in control for modulating shall be of the electronic solid state type with time proportional motor energization to control the average speed of the motor. Local pushbuttons, selector switches, and indicating lights shall be furnished as specified in the valve list. The control system shall be mounted within the valve actuator limit switch housing and shall consist of a comparator circuit powered by a closely regulated D.C. power supply, controls to determine zero, span, deadband and gain, and a thyristor-type solid state reversing starter section. The solid state control system shall be capable of accepting a 4-20 MADC current signal. The comparator section shall

compare the input signal to the feedback signal, and if a difference is detected, it shall cause the motor to move the valve to the appropriate position, thus correcting the error. Control voltage shall be 120 volts A.C. supplied by an integrally mounted control volt transformer. The solid state reversing starter shall be capable of controlling three phase 480 volts A.C. by switching two of the three phases. The thyristors shall be protected by three line fuses and by properly sized inrush resistors. Rotation direction shall be shown by two neon indicating lights.

9. The actuator motor shall be totally enclosed and designed for the electric service specified in the valve list.
10. Motor for non-modulating service shall be provided with Class B insulation, and the observed temperature rises by the thermometer shall not exceed 75°C above ambient 40°C when operating continuously for 15 minutes under the full rated load. Motor for modulating service shall be designed for continuous full load duty.

D. Small electric actuators (for butterfly valves 6-inches and smaller, and all other quarter turn valves 3-inches and smaller).
   1. Electric motor actuator shall be as manufactured by RCS, Hills-McLanna, or Worchester. The actuator shall consist of a high-torque, reversible electric motor, reduction gearbox, and output shaft "open" and "close" end travel limit switches, all contained in a NEMA 4 watertight enclosure. Actuator shall be sized to operate the valve from fully open to fully closed in not less than 8 seconds and not greater than 30 seconds and non-modulating service and not less than 30 seconds and not greater than 60 seconds for modulating service.
   2. Actuator shall be sized to deliver not less than two (2) times the required torque based upon maximum dynamic flow conditions.
   3. The actuator shall be suitable for operation in ambient temperature ranging from -40° to +150°F. For temperatures below 32°F and where actuators are exposed to temperature variations of 35° or more, a space heater and thermostat is required.
   4. Actuator shall be complete with disengageable manual override to permit operation of the valve in the event of electrical power failure, or system malfunction. Actuators shall be furnished with a disengageable shaft as manual override with top of shaft indicating direction of travel. The valve shall not be capable of being operated electrically when manual override is engaged.
   5. A mechanical type valve position indicator shall be furnished to show valve position at all times. The indicator shall be part of an intermediate gear head of the electric motor actuator.
   6. A cam actuated end travel limit switch shall be provided for each direction of travel. Each switch shall be independently adjustable and capable of being set to operate at any point. Travel limit and auxiliary switches shall be single pole, double throw snap acting, totally enclosed and rated 15 apms at 250 VAC. Clearly marked terminal strips shall be provided in actuator housings for ease of field installations. Auxiliary NO/NC independently adjustable contacts shall be furnished at the open and closed limits for remote monitoring when specified in the valve list.
      a. Auxiliary position potentiometer rated O-10K ohm shall be furnished when specified in the valve list.
   7. Provision shall be made for an electromechanical brake to minimize overrun and prevent back driving of valve disc or plug.
   8. The motor shall be permanent split capacitor type designed for operation on a 120 VAC-1 phase - 60 Hz supply. The motor winding insulation shall be Class B. A self-resetting thermal overload switch shall be provided to prevent motor overheating. The motor shall be rated for 25% out-cycle at maximum rated output for non-modulating service. Extended duty motors shall be furnished for modulating service and shall be designed for 20 starts/minute maximum.
   9. Built-in control shall consist of local pushbuttons, selector switches and indicating lights as specified in the valve list.
   10. Actuators for modulating service shall be furnished with a solid state positioning controller capable for receiving a 4-20 millamp control signal. Positioner shall consist of an error detection circuit, amplifier, either solid state or electro-mechanical relays. By means of a solid state approach module, it shall provide proportional speed action to the motor actuator with adjustments

for 5:1 turn down ratio to an error signal of 10% to 1.0%. The main printed circuit board shall have adjustments for zero, span, sensitivity, and input trim. Enclosure shall be of NEMA 4 (weatherproof) construction, suitable for surface mounting, or mounting to the actuator.

E. Pneumatic actuators shall be double acting type, permanently lubricated and sealed for watertightness with self-lubricating bronze or stainless steel sleeve bearings, thrust bearings, and built-in adjustable opening and closing stops. Each actuator shall include limit switches to indicate full open and full close valve position, one four-way solenoid valve, needle valves to reduce air pressure, air supply strainer, and supply pressure shutoff valve.

F. Provide piping and wiring necessary to complete actuators. Power and control wiring shall be as specified in Section 16100.

G. Valves shall be as manufactured by APCO, American Flow Control, ValMatic, American R&D, M&H Valve or Milliken.

2.19 RUBBER FLAPPER SWING CHECK VALVE

A. The check valve shall be cast iron body, long pattern design, with integrally cast-on end flanges.

B. The flapper shall be Buna-N having an internally molded elastic spring and o-ring seating edge.

C. Valve shall be designed for 175 psi working pressure.

D. Flapper shall be easily removed from valve without need to remove valve from line.

E. Valve shall have stainless steel cover bolts.

F. Valve exterior to be painted with red phenolic prime paint as accepted by the FDS for use in contact with potable water.

G. Valve to be APCO series 100 rubber flapper swing check valve or valmatic.

2.20 3-WAY PLUG VALVES

A. Valves shall be of the non-lubricated tapered plug type with resilient faced plugs for drip tight shutoff. End connections shall be flanged and shall be drilled to ANSI 125/150 pound standard. Valves shall be available in cast iron, ni-resist, aluminum, carbon steel, soft rubber lined, hard rubber lined, stainless steel and other alloys on special order. All cast iron, aluminum, ni-resist, carbon steel and stainless steel valves shall have stainless steel bearings in the upper and lower journal areas. All three-way valves shall be furnished as standard with a plug to shut off one port at a time.

B. Manual valves for drip tight shut off shall be furnished with a resilient facing bonded to the plug sealing surface and shall be provided with double handwheel actuators. These actuators shall be of the worm and gear type and shall have one handwheel to lift and reseat the plug and one handwheel to rotate the plug. Handwheel actuators shall be totally enclosed and shall have seals and gaskets to prevent entry of dirt, water on corrosive atmospheres. Actuators shall have corrosion resistant bearings on the gear sector. Manual actuators shall provide plug rotation up to 360 °.

PART 3 - EXECUTION

3.1 SETTING VALVES AND VALVE BOXES

A. Clean the interiors of valves of foreign matter before installation. Tighten stuffing boxes. Inspect valves in opened and closed positions to insure all parts are in working condition.

B. Set buried valves and valve boxes plumb. Center valve boxes on the valves or valve operators. Tamp backfill around each valve box to a distance of four feet on all sides of the box, or to the undisturbed trench face if less than four feet.

NOTES:

A. Ends
MJ - Mechanical Joint; Flg. - Flanged, F250 - Class 250 flange

B. Service

A	Air (backwash)
CD	Chemical Drain
CG	Chlorine Gas
CS	Chlorine Solution
FE	Filter Effluent
F1	Filter Influent
FTW	Filter To Water
FW	Finished Water
HF	Hydrofluosilicic Acid
SF	Sludge Filtrate
SL	Sludge
TS	Thickened Sludge
TW	Treated Water
WWS	Washwater Supply

C. Operator
1. Cylinder operated with solenoid valve, speed control valves, adjustable limit switches, and an adjustable cylinder stop screw.
2. Handwheel operator with chain.
3. Gear operator with extension stem, operating nut and valve box.
4. Handwheel operator.
5. Electric operator.
6. Lever operator.
7. Indicating floorstand with extension stem.

D. Valves associated with Membrane System and associated appurtenances to be furnished by membrane supplier.

E. Mark Legend

BFV	Butterfly Valve
CV	Check Valve
GV	Gate Valve
PV	Plug Valve

SECTION 15135

GAGES AND METERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pressure gages and pressure gage taps.

B. Static pressure gages.

1.2 REFERENCES

A. ASME - B40.0 - Gages - Pressure Indicating Dial Type - Elastic Element.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi.

C. ASTM D2458 - Method of Flow Measurement by the Venturi Motor Tube.

D. ASTM E1 - Specification for ASTM Thermometers.

E. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.

F. ISA RP 3.2 - Flange Mounted Sharp Edged Orifice Plates for Flow Measurement.

G. UL 393 - UL 393 - Indicating Pressure Gages for Fire and Protection Services.

H. UL 404 - Gages, Indicating Pressure, for Compressed Gas Service.

1.3 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Provide list which indicates use, operating range, total range and location for manufactured components.

1.4 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700, Contract Closeout – Section 01740, Warranties and Bonds – Procedures for submittals.

B. Project Record Documents: Record actual locations of components and instrumentation.

C. Operation and Maintenance Data: Section 01730 Operation and Maintenance Data.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Material and Equipment: Environmental conditions affecting products on site.

B. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

1.6 EXTRA MATERIALS

A. Section 01730 - Operation and Maintenance Data.

B. Provide two (2) bottles of red gage oil for static pressure gages.

C. Provide six (6) pressure gages with pulsation damper.

PART 2 - PRODUCTS

2.1 PRESSURE GAGES

A. Manufacturer: Ashcroft Type 1009 Grade 1A.

B. Other acceptable manufacturers offering equivalent products.
US gauge

C. Gage: ASME B40.1, stainless steel case, 316 stainless steel bourdon tube, rotary brass movement, 316 stainless steel socket, with front recalibration adjustment, black scale on white background.
1. Case: Stainless steel with 316 S.S. bourdon tube.
2. Size: 4 ½ inch diameter.
3. Mid-Scale Accuracy: ½ percent.
4. Scale: Psi.

D. Options: Stainless movement, safety glass, ½ % accuracy, silicone filled.

2.2 PRESSURE GAGE TAPPINGS

A. Ball Valve: Stainless Steel, ½ inch NPT for minimum 150 psig.

B. Pulsation Damper: Pressure snubber, stainless steel with ½ inch connections, as manufactured by Ashcroft, Model 50-1112S.

C. Diaphragm Seal: 316L stainless steel diaphragm, 316 L bottom housing, ½ inch NPT connection, silicone filled, with locking device for use with gauge and snubber.

D. Gauge assembly shall include one (1) gauge, one (1) ½ inch stainless steel cross, one (1) diaphragm seal, one (1) snubber, two (2) ½ inch stainless steel ball valves, and one (1) ½ inch stainless steel plug and three (3) ½ inch stainless steel nipples three inches in length.

2.3 STATIC PRESSURE GAGES

A. Manufacturer: Ashcroft

B. Other acceptable manufacturers offering equivalent products.
US Gauge

C. Three and one-half (3 ½) diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, two (2) percent of full scale accuracy.

D. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, three (3) percent of full scale accuracy.

E. Accessories: Static pressure tips with compression fittings for bulkhead mounting, one-fourth (¼) inch diameter tubing.

2.4 VENTURI FLOW METERS

A. Manufacturer:
   1. BFI
   2. PFS

B. The metering primary shall be a differential pressure producing type, utilizing pure static pressure sensed at the inlet and throat. The differential pressure shall indicate static pressure change only. Devices employing entire or partial Pitot effects, amplifying the differential by causing changes in the direction of the flow at the inlet and/or throat cross sections, or introducing unwanted noise are not acceptable.

C. The entrance section shall be a cylindrical section of similar diameter as the pipe in which the meter is being installed. The high pressure tap shall be installed in this entrance section. The inlet section shall incorporate a hydraulic shape employing at least two vena contractae to condition the flow pattern before it enters the throat section. The throat section shall be a cylindrical section with a length at least 0.50 times the throat diameter. The low pressure tap shall be installed in the throat section. The recovery section (outlet cone) shall be truncated having an included angle of 10 degrees. The metering element shall not have debris collecting cavities or annular chambers, but shall have a single pressure connection at the inlet and throat. Vent ports and drains shall be included on a 90 degree plane to the metering taps.

D. The flow meter body shall be constructed of cast iron, ASTM specification for gray iron castings for valves, flanges and pipe fittings, Designation A-126, Class B. The throat liner and pressure tap bushings shall be bronze, brass or 316 stainless steel. The flowmeter flanges shall be 125 lbs, or 250 lbs, rating. The flow meter shall be hydrostatically tested at twice working pressure for a period of not less than 15 minutes.
   1. The entire flowmeter except the throat liner and pressure tap bushings shall be coated with an epoxy paint which meets the requirements of the United States EPA for potable water applications.

E. The manufacturer shall furnish data substantiating meter proportions and performance which should include: Meter coefficient value and tolerance, proof that the coefficient is constant above a Reynolds Number of 75,000 and independent of beta ratio and line size. The value of the permanent head loss as a percent of the differential pressure produced, a flow versus differential curve for the specific application described, data showing the effects of typical installations of fittings immediately upstream of the meter; including increaser, decreaser, and elbow. All submitted data shall be certified by the manufacturer.
   1. The uncalibrated accuracy of the flowmeter installed per the manufacturers recommendation shall be ±0.50% of actual flow rate over a range of at least 10 to 1. This accuracy shall be substantiated by a two times standard deviation calculation of at least 30 calibrated flowmeters of different line sized and beta ratios. The manufacturer shall have manufactured primary flowmeters for a minimum of 10 years. The manufacturer shall warranty its primary flowmeter for a period of not less than 25 ears against defects in materials and workmanship.

F. Dynamic Pressure Pulse Effect
   1. To assure no dynamic pressure pulse effect, the maximum pulsation amplitude and frequency should not exceed the approximate values listed below. The influence of these pulses may be eliminated by increasing the low flow cut-in switch selection. The values are as follows:
   14 kPa (2 psi) peak-to-peak at 4 Hz and above
   35 kPa (5 psi) peak-to-peak at 2 Hz

70 kPa (10 psi) peak-to-peak at 1 Hz
700 kPa (100 psi) peak-to-peak at 0.1 Hz

G. Process Temperature Effect on K-Factor
The K-factor reference is factory-determined at reference conditions. When the actual process temperature is provided. Foxboro calculates the flowing K-factor to correct for temperature effects. Calculation procedures to manually change the flowing K-factor are contained in Foxboro Instruction Manual MI 019-189.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one (1) pressure gage per high service pump, installing taps on discharge of pump beyond check valve.

C. Install pressure gages with pulsation dampers. Provide ball valves to isolate each gage. Extend nipples to allow clearance from insulation.

D. Provide instruments with scale ranges selected according to service with largest appropriate scale.

E. Install gages in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

G. Venturi Meters are needed at two (2) locations. The 18" raw water supply line location and a 16" finished water meter.

SECTION 15140

SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and equipment hangers and supports.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

Section 03300 Cast-in-Place Concrete: Placement of inserts and sleeves in concrete form work.

1.3 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Equipment bases.

B. Section 07270 - Firestopping: Joint seals for piping and duct penetration of fire rated assemblies.

C. Section 09900 - Painting.

D. Section 15260 - Piping Insulation.

E. Section 15280 - Equipment Insulation.

F. Section 15410 - Plumbing Piping.

1.4 REFERENCES

A. ASME B31.1 - Power Piping.

B. ASME B31.2 - Fuel Gas Piping.

C. ASME B31.5 - Refrigeration Piping.

D. ASME B31.9 - Building Services Piping.

E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

G. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

I. NFPA 13 - Installation of Sprinkler Systems.

J. NFPA 14 - Installation of Standpipe and Hose Systems.

K. UL 203 - Pipe Hanger Equipment for Fire Protection Service.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

C. Product Data: Provide manufacturers catalog data including load capacity.

D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of plumbing piping.

B. Supports for Sprinkler Piping: In conformance with NFPA 13.

C. Supports for Standpipes: In conformance with NFPA 14.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Grinnell Supply Sales Co.

B. Plumbing Piping - DWV:
   1. Conform to ASTM F708.
   2. Hangers for Pipe Sizes ½ to 1-1/2 Inch: Carbon steel , adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:
   1. Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.
   2. Hangers for Pipe Sizes ½ to 1-1/2 Inch: Carbon steel , adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
   5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
   6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. **ACCESSORIES**

Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.2 INSERTS

A. Manufacturers:
1. Grinnell Supply Sales Company, Model Fig 28Z.

B. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.3 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Metal Counterflashing: 22 gage galvanized steel.

C. Lead Flashing:
1. Waterproofing: 5 lb/sq ft sheet lead
2. Soundproofing: 1 lb/sq ft sheet lead.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

PART 3 - EXECUTION

3.1 INSTALLATION

Install in accordance with manufacturer's instructions.

3.2 INSERTS

A. Provide inserts for placement in concrete form work.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

3.3 PIPE HANGERS AND SUPPORTS GENERAL

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping .

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Refer to Section 09900. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.4 PIPE SUPPORT SPACING

A. Supports
   1. The Contractor shall provide all supports necessary to hold the pipe and appurtenances in a firm, substantial manner at the lines and grades shown on drawings or as directed, and without strain upon the piping and connected equipment.
   2. Piping shall be supported from concrete slabs by suitable saddle stands or concrete piers. Piping along walls shall be supported by suitable wall brackets with attached roll or saddle, or by wall brackets with hanger rods. For piping supported from overhead, approved rod anchors of a type capable of screw adjustments after erection of the pipe and with suitable adjustable concrete inserts or beam clamps shall be used.
   3. Supports shall be located wherever necessary and in no case shall exceed the following:
      a. Ductile Iron Pipe and Steel Pipe.

Pipe Size	Maximum Support or Hanger Spacing
1-inch and smaller	4 feet
1-1/4 inch thru 2-inch	6 feet
3-inch and 4-inch	8 feet

6-inch and 8-inch	8 feet
10-inch and 12-inch	10 feet
14-inch thru 18-inch	10 feet
20-inch and larger	12 feet

4. Polyvinyl Chloride (PVC) Pipe
   Hanger spacing for PVC pipe shall be as recommended by the pipe manufacturer for the temperature of the material conveyed in the pipe.
   a. Copper Pipe

Pipe Size	**Maximum Support or Hanger Spacing**
1-inch and smaller	5 feet
1-1/4 inch thru 2-inch	6 feet
3-inch and 4-inch	8 feet

   Copper pipe shall be supported with plastic coated clamps, hangers, and supports.
   b. Stainless Steel Pipe

Pipe Size	**Maximum Support or Hanger Spacing**
1-inch and smaller	6 feet
1-1/4-inch thru 2-inch	8 feet
3-inch thru 6-inch	10 feet
8-inch thru 16-inch	11 feet
18-inch and larger	12 feet

   Stainless steel pipe, smaller than 4-inch shall be supported with stainless steel clamps, hangers, and supports. Fasteners for stainless steel clamps, hangers, and supports shall be stainless steel.

SECTION 15170

MOTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single phase electric motors.

B. Three phase electric motors.

1.2 RELATED SECTIONS

Section 16180 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.

D. NEMA MG 1 - Motors and Generators.

E. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Operation Data: Include instructions for safe operating procedures.

C. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.6 QUALIFICATIONS

Manufacturer: Company specializing in manufacture of electric motors for wastewater use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to NFPA 70.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of high efficiency motors.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.9 WARRANTY

A. Provide five year warranty under provisions of Section 01700.

B. Warranty: Include coverage for motors larger than 20 horsepower.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. U. S. Motors.

B. Lincoln.

C. Westinghouse.

D. Substitutions: Under provisions of Section 01600.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Motors Less Than 250 Watts, for Intermittent Service: Equipment manufacturer's standard and need not conform to these specifications.

B. Electrical Service:
1. Motors ½ HP and Smaller: 115 volts, single phase, 60 Hz.
2. Motors Larger than ¾ Horsepower: 460 volts, three phase, 60 Hz.

C. Type:
1. Totally enclosed fan cooled except where specifically noted otherwise.
2. Motors: Design for continuous operation in 40 degrees C environment.
3. Design for 40°C temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
4. Motors with frame sizes 254T and larger: Energy Efficient Type.

D. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.

E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

F. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (40 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (40 degrees C temperature rise) insulation, 1.15 Service Factor, prelubricated ball bearings.

2.4 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (40 degrees C temperature rise) insulation, minimum 1.15 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.5 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (40 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve ball bearings.

G. Enclosed Motors: Class A (40 degrees C temperature rise) insulation, 1.15 Service Factor, prelubricated ball bearings.

2.6 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 16483 - Motor Starters.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Part Winding Start Where Indicated: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

L. Weatherproof Epoxy Sealed Motors: Epoxy coat windings with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

3.2 PERFORMANCE SCHEDULE: THREE PHASE - ENERGY EFFICIENT, OPEN DRIP-PROOF

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
1	1200	145T	81	72
1½	1200	182T	83	73
2	1200	184T	85	75
3	1200	213T	86	60
5	1200	215T	87	65
7½	1200	254T	89	73
10	1200	256T	89	74
15	1200	284T	90	77
20	1200	286T	90	78
25	1200	324T	91	74
30	1200	326T	91	78
40	1200	364T	93	77
50	1200	365T	93	79
60	1200	404T	93	82
75	1200	405T	93	80
100	1200	444T	93	80
125	1200	444T	93	84
1	1800	143T	82	84
1½	1800	145T	84	85

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
2	1800	145T	84	85
3	1800	182T	86	86
5	1800	184T	87	87
7½	1800	213T	88	86
10	1800	215T	89	85
15	1800	256T	91	85
20	1800	256T	91	86
25	1800	284T	91	85
30	1800	286T	92	88
40	1800	324T	92	83
50	1800	326T	93	85
60	1800	364T	93	88
75	1800	365T	93	88
100	1800	404T	93	83
125	1800	405T	93	86
150	1800	444T	93	85
200	1800	445T	94	85
1½	3600	143T	82	85
2	3600	145T	82	87
3	3600	145T	84	85
5	3600	182T	85	86
7½	3600	184T	86	88

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
10	3600	213T	87	86
15	3600	215T	89	89
20	3600	254T	90	89
25	3600	256T	90	92
30	3600	284T	91	91
40	3600	286T	92	92
50	3600	324T	93	89
60	3600	326T	93	91
75	3600	364T	93	88
100	3600	365T	92	88

3.3 PERFORMANCE SCHEDULE: THREE PHASE-ENERGY EFFICIENT, TOTALLY ENCLOSED, FAN COOLED

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
1	1200	145T	81	72
1½	1200	182T	83	65
2	1200	184T	85	68
3	1200	213T	85	63
5	1200	215T	86	66
7½	1200	254T	89	68
10	1200	256T	89	75
15	1200	284T	90	72

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
20	1200	286T	90	76
25	1200	324T	90	71
30	1200	326T	91	79
40	1200	364T	92	78
50	1200	365T	92	81
60	1200	404T	92	83
75	1200	405T	92	80
100	1200	444T	93	83
125	1200	445T	93	85
1	1800	143T	82	84
1½	1800	145T	84	85
2	1800	145T	84	85
3	1800	182T	87	83
5	1800	184T	88	83
7½	1800	213T	89	85
10	1800	215T	90	84
15	1800	254T	91	86
20	1800	256T	91	85
25	1800	284T	92	84
30	1800	286T	93	86

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
40	1800	324T	93	83
50	1800	326T	93	85
60	1800	364T	93	87
75	1800	365T	93	87
100	1800	405T	94	86
125	1800	444T	94	87
150	1800	445T	94	88
200	1800	447T	95	87

SECTION 15190

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.2 RELATED SECTIONS

Section 09900 - Painting: Identification painting.

1.3 REFERENCES

ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Samples: Submit two labels, tags, 1 x 3 inch in size.

F. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Record actual locations of tagged valves.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Manufacturers:
   1. Seton Name Plate Company.
   2. FRS Industries.

B. Engraved valve tag: Each tag shall be 1/16 inch thick 2 ½.

2.2 TAGS

A. Manufacturers:
   1. Seton Name Plate Company.
   2. FRS Industries

B. Engraved Valve Tag: Each tag shall be 1/16 inch thick 2 ½" inches in diameter.

C. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

A. Manufacturers:
   1. Seton Name Plate Company.
   2. Other acceptable manufacturers offering equivalent products.

B. Stencils: With clean cut symbols and letters of following size:
   1. ¾ to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ½ inch high letters.
   2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ¾ inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
   4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
   5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
   6. Ductwork and Equipment: 2-1/2 inch high letters.

C. Stencil Paint: As specified in Section 09900, semi- gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

A. Manufacturers:
   1. Seton Name Plate Company.
   2. Other acceptable manufacturers offering equivalent products.
      a. Raychem Corporation.
      b. 3M.
      c. Brady USA, Signmark Division

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09900 for stencil painting.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09900.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify thermostats relating to terminal boxes or valves with nameplates.

J. Identify valves in main and branch piping with tags.

K. Identify air terminal units and radiator valves with numbered tags.

L. Tag automatic controls, instruments, and relays. Key to control schematic.

M. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

N. Identify ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

O. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 EXAMPLE

A. Gate Valve in Filter Plant

Water Plant Upgrade	Line 1
2008	Line 2
GV 1	Line 3

B. Line 3 will change depending on valve type, number and location.

C. Contractor shall furnish each valve with a valve marker labeled to match the valve number system in the specifications.

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Electrical General Provisions are in addition to the General Conditions and General Requirements and shall be extension of these sections of the Specifications.

B. The Electrical General Provisions apply to all electrical materials, equipment, installations, and services supplied under any portion of the work.

C. The Contractor shall coordinate the Electrical General Provisions as applicable to any equipment, installations, and services of an electrical nature.

D. It is the intention of this division of the Specifications and the accompanying Drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices and necessary appurtenances to provide a complete electrical system, together with such other miscellaneous installations of equipment hereinafter specified and/or shown on the Drawings. The work shall include all materials, appliances, and apparatus not specifically mentioned herein or noted on the Drawings but which are necessary to make a complete working installation of all electrical systems shown on the Drawings or described herein. Equipment and devices furnished and installed under other divisions of this Specification (or by the Owner) shall be connected under this division. The Drawings and Specifications are complementary and what is called for in either is binding as if called for in both.

E. Permits and Fees
This work shall include the procurement of any payment for all permits and fees for the performance of the electrical work.

1.2 RELATED SECTIONS

Equipment and devices furnished under other divisions of this specification shall be installed and connected under this division. The drawings and specifications are complementary and what is called for in either is binding as if called for in both.

1.3 COORDINATION OF ELECTRICAL WORK

A. General
1. Refer to General Conditions and Section 01001, General Requirements, for general coordination requirements applicable to the entire work. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the electrical work, and that such establishment is the exclusive responsibility of the Contractor.
    a. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction, and with a minimum of 7 feet 0 inch overhead clearance where possible.
    b. Locate operating and control equipment properly to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance.
    c. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical work (equipment).

B. Coordination Drawings
For locations where several elements of electrical (or combined mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual physical dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.

C. Coordination of Options and Substitutions
Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface requirements has been checked and the Engineer's satisfaction has been established.

D. Special attention is called to the following items, and all conflicts shall be reported to the Engineer before installation for decision and correction.
1. Locate light switches on the latch side of the door. Verify door hinge location in field prior to the switch outlet installation.
2. Location of grilles, pipes, sprinkler heads, ducts, and other mechanical equipment so that all electrical outlets, lighting fixtures, and other electrical outlets and equipment are clear from and in proper relation to these items.
3. Location of cabinets, counters, and doors so that electrical outlets, lighting fixtures, and equipment are clear from and in proper relation to these items.

E. The Contractor will not be paid for cutting, patching, and finishing required for relocation of work installed due to interference between the various Contractors' work.

1.4 QUALITY ASSURANCE

A. In case of difference between building codes, specifications, state laws and federal laws, local ordinances, industry standards, utility company regulations, and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Engineer in writing of any such difference.

B. Non-Compliance
Should the Contractor perform any work that does not comply with the requirements of the applicable building codes, state and federal laws, local ordinances, industry standards, and utility company regulations, he shall bear all costs in correcting all deficiencies.

C. Applicable codes and standards shall include all the state laws, local ordinances, utility company regulations, and the applicable requirements of the following nationally accepted codes and standards. All of the following codes shall apply to the equipment, and equipment installation, of Division l6, where applicable. All equipment of Division l6 shall bear U.L. labels where labeled equipment is available.

D. Industry Standards, Codes, and Specifications
1. NECNational Electric Code
2. ANSI C2National Electrical Safety Code
3. IEEEInstitute of Electrical and Electronic Engineers
4. ASAAmerican Standards Association
5. ASTMAmerican Society of Testing Materials
6. ICEAInsulated Cable Engineers Association
7. NBSNational Bureau of Standards
8. NEMANational Electrical Manufacturers Association - Standards for Materials & Products
9. NFPANational Fire Protection Association
10. UL Underwriters Laboratories

11. NECANational Electrical Contractors Association - Standard of Installation
12. NFPA #101Life Safety Code
13. ANSI C73 Dimensions of Attachment Plugs and Receptacles

E. All electric materials shall be new, in original cartons, bundles, or shipping crates.

F. Nothing in these drawings and specifications shall be construed to permit work not conforming with governing codes. Also, this shall not be construed as relieving the Contractor from complying with any requirements of the plans and specifications which may be in excess of requirements of the hereinbefore mentioned governing codes and rules and not contrary to same.

G. Additional quality assurance requirements are stated in specific sections of Division l6, where applicable.

H. Definitions
1. Manufacturers
Firms regularly engaged in the manufacture of the equipment specified of the types and capacities required, whose products have been in satisfactory use in similar service for not less than five years, unless specified otherwise in other sections of Division l6.
2. Installer
A firm with at least five years of successful installation experience on projects with electrical installation work similar to that required for the project, unless specified otherwise in other specific sections of Division l6.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Submit the following:
1. Shop drawings shall be submitted for all electrical equipment in Division l6, unless noted otherwise.
2. Include complete catalog information such as construction, physical dimensions, ratings, wiring diagrams, and insulation systems, as applicable.

1.6 SYMBOLS

Except as indicated otherwise, refer to "Electrical Legend" on drawings for definitions of symbols and abbreviations used on the drawings to show electrical work.

1.7 RECORD DRAWINGS

Record drawings shall be as specified in Section 01700.

1.8 INSTRUCTION PERIODS

A. Upon completion of the work and after all tests and final inspection of the work by the authority(s) having jurisdiction, the Contractor shall demonstrate and instruct the Owner's designated operating and maintenance personnel in the operation and maintenance of the various electrical systems. The Contractor shall arrange scheduled instruction periods with the Owner. The Contractor's representatives shall be superintendents or foremen knowledgeable in each system and suppliers representatives when so specified.

B. Scheduled instruction periods shall be as tabulated in the Data Sheet of this Section.

C. Costs for time involved by the Contractor and scheduled manufacturer's services shall be included in the bid.

1.9 PRODUCTS, ELECTRICAL WORK

A. Refer to the General Conditions and Section 0100l, General Requirements, for general requirements on products, materials, and equipment. The following provisions expand or modify the requirements as applicable work.
   1. Product Listing
      Prepare the product listing for electrical work, separately from the listing(s) of products for other work. Include listing of each significant item of equipment and material used in the work and indicate the generic name, product name, manufacturer, model number, related specification section number(s),and estimated date for start of installation. Materials such as conductors, conduit, and boxes taken from Installer's stock need not be listed.
   2. Compatibility
      Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with other work.

1.10 INSPECTION AND TESTING

A. All equipment installed shall be inspected for compliance with the specifications, manufacturer's requirements, and reasonableness of quality work.

B. All equipment shall be tested for grounds, shorts, opens, and proper working ability.

PART 2 - PRODUCTS

2.1 ELECTRICAL SYSTEM IDENTIFICATION

A. Distribution System Equipment
Provide engraved plastic laminate nameplates (black with white letters) on all distribution system equipment including but not limited to switchboards, distribution panels, panelboards, and system control panels. Text shall be panel name, designation, and electrical characteristics. Letters shall be l/8 inch high (minimum) or a larger size if required for clarity on large arrangements. Nameplates shall be secured to the equipment with screws or bolts.

B. Cable/Conductor Identification
Provide cable/wire labels on each conductor of principal electrical runs at enclosures where conductors of more than one circuit or system are present and interrupted. Mark to match contract document and other numbering as subsequently established.

C. Operational and Warning Signs
   1. General
      Provide warning signs where there is hazardous exposure or danger associated with access to or operation of electrical facilities. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with ANSI Al3.1 & NEC standard for color and design.
   2. Operational Tags
      Where needed for proper and adequate information on operation and maintenance of electrical systems, provide tags of plasticized card stock, pre-printed to convey the message; example "DO NOT OPEN THIS SWITCH WHEN BURNER IS OPERATING."

2.2 EXPLOSION - PROOF EQUIPMENT

A. Enclosures — Class 1, Group D, NEMA 7

B. Locations — digester pipe gallery, digesters

C. All conduit, fittings, boxes, lighting fixtures, sealing fittings and connectors shall meet Class 1, Group D requirements.

D. Light switches — Appleton Type ART

E. Motor Connections — Appleton Type EX

F. Seal-off Fittings — Appleton Type VSU

G. Unions and Connecters — Appleton Type UNY or UNF

PART 3 - EXECUTION

3.1 SITE INSPECTION

Installer must examine the areas and conditions under which electrical equipment is to be installed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Engineer.

3.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Handle all equipment carefully to prevent internal components damage, breakage, and denting and scoring the finish. Do not install damaged equipment.

B. Store equipment in a clean, dry space. Protect equipment from dirt, fumes, water, construction debris, and physical damage.

C. Provide auxiliary heaters, or store in a heated space, for any equipment that would be damaged by moisture condensation, such as electric motors, electronic components, contacts, etc.

3.3 WORK RESPONSIBILITIES

A. Drawings indicate diagrammatically desired locations or arrangement of conduit runs and outlets equipment. Proper judgement shall be exercised in executing work so as to secure best possible installation in available space and to overcome local difficulties due to space limitations or interference with structural conditions. Contractor shall be responsible for correct placing of work and proper location and connection of work in relation to work of other trades. Advise appropriate trade as to locations of access panels.

B. Locations shown on ceiling plans or on wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify Engineer for instructions.

C. In the event changes in indicated locations or arrangements are necessary, due to developed conditions in building construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, providing the change is ordered before the conduit runs, and work directly connected to same is installed and no extra materials are required.

D. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

E. Lighting fixtures in mechanical spaces are shown in their approximate locations only. Do not install outlets or fixtures until mechanical piping and ductwork is installed; then lights shall be installed in locations best suited for equipment arrangement or as directed by the Engineer.

F. Scaled and figure dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, check and verify dimensions and sizes with manufacturer's drawings to see that equipment will fit into spaces provided without violation of applicable codes.

G. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

H. Should any changes to work indicated on drawings or described in specifications be necessary in order to comply with above requirements, notify Engineer immediately and cease work on parts of Contract which are affected until approval for any required modifications to construction has been obtained from Engineer.

I. Contractor shall be responsible for any cooperative work which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such change shall be made to the Engineer's satisfaction.

J. Perform work with competent and skilled personnel.

K. Work, including aesthetic as well as electrical and mechanical aspects of work, shall be of quality consistent with best practices of trade.

L. Replace or repair, without additional compensation, any work which, in the opinion of the Engineer, does not comply with these requirements.

3.4 INSTALLATION, GENERAL (FOR SPECIAL REQUIREMENTS REFER TO SPECIFIC EQUIPMENT UNDER OTHER SECTIONS)

A. Excavation
Unless otherwise specified elsewhere in the specifications, do excavating necessary for installation of electrical work in accordance with Section 02200, Earthwork. Where conduit runs traverse public property, depth below finish grade shall be as required by legally constituted public authorities having jurisdiction.

B. Locations of Openings
Locate chases, shafts, and openings required for installation of electrical work during framing of structure. Do additional coring and/or cutting and patching required due to improperly located or omitted openings without cost to the Owner, and with approval of the Engineer. Coring and/or cutting or drilling in any structural member is prohibited without written approval of the Engineer. No coring or cutting in any post tension slab.

C. Location of Sleeves
Wherever conduits pass through concrete walls or suspended slabs, furnish and install sleeves of ample size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify locations with Engineer.

D. Type of Sleeves
Shall be PVC, steel pipe, or galvanized sheet metal.

E. Finish Around Sleeves
Rough edges shall be finished smooth. Space between conduit and sleeves where conduit passes through exterior walls shall be sealed to permit movement of conduit or sleeve. Space between conduit and sleeves where conduit passes through fire rated interior walls and slabs shall be sealed with a U.L. classified sealing device that is fireproof and will remain pliable. Provide adequate space around conduit for device installation . Where it is impossible to install the fire seal, sleeves and slots shall be packed with approved materials to provide a fire barrier conforming to the requirements of the legal authorities having jurisdiction. All unused sleeves shall be similarly packed. Acceptable seal is Dow Corning's 3-6548 Silicone RTV Foam.

F. Flashing
Wherever conduit extends through roof, furnish and install flashings consisting of roof jack and flashing collar sealed with duxeal to conduit and covering top of roof jack. Roof jack shall extend 6 inches out on roof and up conduit at least 8 inches. Coordinate installation of flashings with roofing installation to permit roofing installer to mop in flanges between roofing plies.

G. Cutting and Patching
Be responsible for cutting and patching which may be required for proper installation of electrical work. Work shall be performed by trade originally installing same and paid for under this section of work.

H. Storage of Equipment
Protect work, materials, and equipment from damage from any cause whatever, and provide storage facilities during progress of work. Storage out of doors shall be weather protected and shall include space heaters to prevent condensation. Provide for safety and good condition of work until final acceptance of work by Owner, and replace damaged or defective work, materials, and equipment before requesting final acceptance.

I. Conduit and Busway
Conduit, busway, and all equipment shall be installed. Clean to remove plaster, splattered paint, cement, and dirt on both exterior and interior.

J. Conduit and Equipment to be Painted
Clean conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil, and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.

K. Items with Factory Finish
Remove cement, plaster, grease, and oil and leave surfaces including cracks and corners, clean and polished. Touch up any scratched or bare spots.

L. Site Cleaning
Remove from site packing cartons, scrap materials, and other rubbish relating to electrical installation.

M. Painting
Electrical equipment, conduit and materials exposed to public and in finished areas shall be finished painted after installation to coordinate with surrounding walls. Surfaces shall be cleaned for receiving paint. Paint color coordination shall be as directed by the Engineer. Paint shall be identical to that on adjacent surfaces to ensure proper matching of quality and color with surrounding areas. Painting shall be as per Section 09900 of these Specifications.

N. Pads, Bases and Anchors
The Contractor shall provide all pads, bases, and anchors required to complete the electrical work.

Unless noted otherwise, 4 inch concrete pads shall be provided for floor mounted equipment such as switchboards, transformers, motor control centers, motor controllers, etc. Set bolts in pipe sleeves from templates or actual measurements. Set equipment level and grout in place.

O. Platforms and Support Stands
   1. The Contractor shall provide all platforms and supporting stands for electrical equipment required to complete his work.
      a. Each piece of equipment or apparatus suspended below ceiling or mounted above floor level shall be provided with suitable structural support, platform or carrier in accordance with the best recognized practice.
      b. The Contractor shall exercise extreme care that structural members of the building are not overloaded by such equipment. In all cases, details of such hangers, platforms, and supports, together with the total weights of mounted equipment, shall be reviewed by the Engineer.

P. Ceiling and Wall Access
   1. Ceiling and wall access panels for electrical equipment shall be provided by the Contractor.
      a. Provide where shown or required for access to the electrical equipment, access panels as hereinafter specified.
      b. Acoustical Tile Wall or Ceiling
         24 inch x l2 inch, unless otherwise noted. Constructed to receive plaster to match the adjacent finish.
      c. Plastered Wall or Ceiling
         24 inch x l2 inch, unless otherwise noted. Constructed to receive plaster to match the adjacent finish.

Q. Escutcheons
   Install chrome plated pipe escutcheons on exposed pipe at wall, floor, and ceiling.

R. Painting and Cabinets
   Painting of all equipment, cabinets, junction boxes, supports, etc., are required in accordance with these Specifications.

3.5 SERVICE TIE CONNECTIONS

A. Contractor shall check and verify all voltage and phasing of service tie connections at electrical equipment.

B. A record shall be submitted of each test made and the results submitted to the Engineer as shop drawings.

C. Phasing to be maintained shall be A.B.C. top to bottom, east to west, and north to south in all cases.

3.6 ELECTRICAL CONNECTIONS TO EQUIPMENT

A. Contractor shall provide all connections to mechanical equipment supplied under various sections of these specifications.

B. All equipment shall be wired complete in each detail, including all interlocks, safety switches, control devices, starters, and disconnects.

C. Drawings include equipment as anticipated to be furnished; however, in case other makes, etc., are furnished than shown, the furnished equipment shall be wired completely as required at no additional cost.

D. All connections and wiring diagrams, where shown on the drawings, are for bidding purposes only, and the Contractor shall obtain final wiring diagrams from equipment vendors. Diagrams as supplied shall be specifically for this project.

E. Motor sizes, where shown on the drawings, are for bidding purposes only, and the Contractor shall verify all motor sizes prior to wiring. Contractor shall furnish proper starters for the equipment as furnished at no additional cost to the Owner.

F. Conduits and wires, where shown on the contract documents, are for bidding purposes. Contractor shall verify all wire sizes, number of wires required, and supply the proper number to each piece of equipment before installation.

3.7 REMOVAL OF MATERIAL

A. The Contractor shall remove all unnecessary equipment, materials, fixtures, and wiring in those areas affected by the construction.

B. All materials and equipment removed and not reinstalled become the property of the Contractor and shall be removed from the site, unless indicated otherwise on the drawings.

3.8 WARRANTY

The Contractor shall be responsible for all work installed under this specification. He shall make good, repair or replace, at his own expense as may be necessary, any defective work, materials or parts in accordance with the General Conditions and Section 01001, General Requirements, and any additional requirements stated in specific sections of Division 16. Incandescent lamps are not warranted, but all shall be operating at time of final acceptance.

3.9 COMPLETION OF ELECTRICAL WORK

A. General
Refer to the General Conditions and Section 01001, General Requirements, for general completion work requirements.

B. Coordination with Mechanical
Coordinate completion of work operations with completion of work of mechanical systems and other power consuming equipment. Accurately record locations of conductors which are underground or otherwise concealed. Test run electrical equipment in coordination with test runs of mechanical systems. Clean and lubricate operational equipment. Instruct Owner's operating personnel thoroughly in the operation, sequencing, maintenance and safety/emergency provisions of the electrical systems. Turn over the operations to the Owner's personnel at the time(s) of substantial completion. Until the time of final acceptance of the total work of the Contract, respond promptly with consultation and services to assist the Owner's personnel with operation of electrical systems.

C. General Operating Instructions
1. In addition to specific training of Owner's operating personnel specified in Division l6 sections, and in addition to preparation of written operating instructions and complied maintenance manuals specified in the Division l6 sections and elsewhere in these specifications, provide general operating instructions for each operational system and equipment item of electrical work. Coordinate instructions with instructions for mechanical work and other equipment where associated with electrical systems or equipment.
   a. Describe each basic electrical system.
   b. Explain identification system, displayed diagrams, signals, alarms, communication systems, and similar audio visual provisions.

c. Describe interfaces with mechanical equipment, including interlocks, sequencing, start-up, shutdown, emergency, safety, system failure, security, and similar provisions.
d. Outline basic maintenance procedures and major equipment turnaround requirements, including adjustments to optimize output and efficiency of electrical systems.
e. Display an conduct a "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage of extra materials, meter readings, and similar service items.

D. Construction Equipment
After completion of performance testing and Owner's operating instructions and demonstrations, remove installer's tools, test facilities, construction equipment, and similar devices and materials used in execution of the work but not incorporated in the work.

E. Complete the Job Completion Form and submit to the Engineer. Final payment will be withheld until all items indicated on the form are completed to the Engineer's satisfaction.

SECTION 16111

CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal conduit.

F. Flexible nonmetallic conduit.

G. Fittings and conduit bodies.

1.2 RELATED SECTIONS

A. Section 16118 - Underground Duct Bank.

B. Section 16130 - Boxes.

C. Section 16170 - Grounding and Bonding.

D. Section 16190 - Supporting Devices.

E. Section 16195 - Electrical Identification.

1.3 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.5 - Rigid Aluminum Conduit.

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. ANSI/NFPA 70 - National Electrical Code.

F. NECA "Standard of Installation."

G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 DESIGN REQUIREMENTS

Conduit Size: As shown on drawings, minimum size shall be ¾"

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, nonmetallic conduit, fittings, conduit bodies.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual routing of conduits larger than 2 inches.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.8 FIELD SAMPLES

A. Provide under provisions of Section 01400.

B. Provide field sample of conduit, two each at 2 feet long.

C. Provide field sample of expansion/deflection fitting, two each.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Section 01600.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.10 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Minimum Size: ¾ inch unless otherwise specified.

B. Underground Installations:
   1. More than Five Feet from Foundation Wall: Use IMC or Schedule 80PVC conduit encased in concrete.
   2. Within Five Feet from Foundation Wall: Use rigid steel conduit.
   3. In or Under Slab on Grade: Use rigid steel conduit, and Schedule 40 PVC conduit.
   4. Minimum Size: ¾ inch.

C. Outdoor Locations, Above Grade: Use rigid steel or rigid aluminum.

D. In Slab Above Grade:
   1. Use rigid steel or rigid aluminum conduit.
   2. Maximum Size Conduit in Slab: 2 inch.

E. Wet and Damp Locations: Use rigid steel or rigid aluminum conduit.

F. Dry Locations:
   1. Concealed: Use rigid steel or rigid aluminum.
   2. Exposed: Use rigid steel or rigid aluminum.

G. Instrumentation
   1. Use rigid steel or rigid aluminum conduit.
   2. ¾" conduit minimum size.

2.2 METAL CONDUIT

A. Manufacturers:
   1. Allied Tube and Conduit Corp.
   2. Century Tube Corp.
   3. Steel Electric Products.
   4. Substitutions: Under provisions of Section 01600.

B. Rigid Steel Conduit: ANSI C80.1.

C. Rigid aluminum conduite ANSI C80.5

D. Intermediate Metal Conduit (IMC): Rigid steel.

E. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit. All steel fittings.

2.3 PVC COATED METAL CONDUIT

A. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type.

2.6 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 80 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. Route conduit in and under slab from point-to-point.

M. Do not cross conduits in slab.

N. Maintain adequate clearance between conduit and piping.

O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

P. Cut conduit square using saw or pipecutter; de-burr cut ends.

Q. Bring conduit to shoulder of fittings; fasten securely.

R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 2 inch size.

U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.

W. Provide suitable pull string in each empty conduit except sleeves and nipples.

X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Y. Ground and bond conduit under provisions of Section 16170.

Z. Identify conduit under provisions of Section 16195.

SECTION 16114

CABLE TRAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

Cable trays and accessories.

1.2 RELATED SECTIONS

A. Section 16121 - Insulated Wire and Cable.

B. Section 16190 - Supports.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NEMA VE 1 - Metallic Cable Tray Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate tray type, dimensions, support points, and finishes.

C. Product Data: Provide data for fittings and accessories.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Record actual routing of cable tray and locations of supports.

1.6 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 LADDER-TYPE CABLE TRAY

A. Description: NEMA VE 1, Class 20C ladder type tray.

B. Material: Aluminum.

C. None required.

D. Inside Width: 24 inches, minimum.

E. Inside Depth: 6 inches minimum.

F. Straight Section Rung Spacing: 9 inches on center.

G. Inside Radius of Fittings: 24 inches.

H. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.

I. Covers: Flanged, ventilated flush raised cover.

2.2 TROUGH-TYPE CABLE TRAY

A. Description: NEMA VE 1, Class 12B trough type tray.

B. Material: Aluminum.

C. None required.

D. Inside Width: 30 inches.

E. Inside Depth: 6 inches minimum.

F. Inside Radius of Fittings: 24 inches.

G. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.

H. Covers: Flanged, solid cover.

2.3 WARNING SIGNS

A. Engraved Nameplates: ½ inch high black letters on yellow laminated plastic nameplate, engraved with the following wording:

WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install metallic cable tray in accordance with NEMA VE 1.

C. Install fiberglass cable tray in accordance with NEMA FG 1.

D. Support trays in accordance with Section 16190. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 6 ft maximum.

E. Use expansion connectors where required.

F. Ground and bond cable tray under provisions of Section 16170.
   1. Provide continuity between tray components.
   2. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.
   3. Provide 2 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.
   4. Connections to tray may be made using mechanical or exothermic connectors.

G. Install warning signs at 50 ft centers along cable tray, located to be visible.

SECTION 16118

DUCTBANK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal conduit.

B. Duct.

C. Manholes.

1.2 RELATED SECTIONS

A. Section 02222 - Excavation.

B. Section 02223 - Backfilling.

C. Section 02225 - Trenching.

D. Section 02607 - Manholes and Covers.

E. Section 02781 - Site Grounding.

F. Section 03100 - Concrete Formwork.

G. Section 03200 - Concrete Reinforcement.

H. Section 03300 - Cast-In-Place Concrete.

I. Section 07160 - Bituminous Dampproofing.

J. Section 15430 - Plumbing Specialties.

1.3 REFERENCES

A. AASHTO - Standard Specification for Highway Bridges.

B. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.

C. ANSI/ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.

D. ANSI/ASTM A569 - Steel, Sheet and Strip, Carbon (0.15 Maximum Percent), Hot-Rolled, Commercial Quality.

E. ANSI/IEEE C2 - National Electrical Safety Code.

F. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

G. ANSI/NFPA 70 - National Electrical Code.

H. ASTM A48 - Gray Iron Castings.

I. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strips.

J. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

K. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.

L. NEMA TC 8 - Extra-Strength PVC Plastic Utilities Duct for Underground Installation.

M. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

N. NEMA TC 10 - PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.

O. NEMA TC 14 - Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes.

C. Product Data: Provide for metallic conduit, nonmetallic conduit, and manhole.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual locations of exact routing of ductbank.

C. Accurately record actual locations of each manhole.

1.6 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.8 FIELD SAMPLES

Provide under provisions of Section 01400.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Section 01600.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.10 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of duct bank prior to excavation for rough-in.

C. Verify locations of manholes prior to excavating for installation.

D. Duct bank routing is shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete duct system.

E. Manhole locations are shown on Drawings in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT

A. Manufacturers:
   1. Allied Tube and Conduit.
   2. Century Tube Corp.
   3. Steel Electric Products.
   4. Substitutions: Under provisions of Section 01600.

B. Rigid Steel Conduit: ANSI C80.1.

C. Fittings: ANSI/NEMA FB 1; steel.

D. Use: Instrumentation conduit.

2.2 PLASTIC CONDUIT

A. Manufacturers:
   1. Available Plastics, Inc.
   2. Carlon.
   3. Substitutions: Under provisions of Section 01600.

B. Description: NEMA TC 2; Schedule 80 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavation under provisions of Section 01039.

B. Verify that excavation, base material installation, and compaction is completed.

3.2 PREPARATION

Prepare excavation in accordance with manhole manufacturer's instructions.

3.3 DUCT BANK INSTALLATION

A. Install duct in accordance with manufacturer's instructions.

B. Install power and communications duct to locate top of ductbank minimum 30 inches below finished grade.

C. Install duct with minimum slope of 4 inches per 100 feet. Slope duct away from building entrances.

D. Cut duct square using saw or pipe cutter; de-burr cut ends.

E. Insert duct to shoulder of fittings; fasten securely.

F. Join nonmetallic duct using adhesive as recommended by manufacturer.

G. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

H. Install no more than equivalent of three 90-degree bends between pull points.

I. Provide suitable fittings to accommodate expansion and deflection where required.

J. Terminate duct at manhole entries using end bell.

K. Stagger duct joints vertically in concrete encasement 6 inches minimum.

L. Use suitable separators and chairs installed not greater than 4 feet on centers.

M. Band ducts together before placing concrete.

N. Securely anchor duct to prevent movement during concrete placement.

O. Place concrete under provisions of Section 03300. Use mineral pigment to color concrete red

P. Provide minimum 3 inch concrete cover at bottom, top, and sides of ductbank.

Q. Provide steel reinforcing bars in bank as shown on the drawings.

R. Connect to existing concrete encasement using dowels.

S. Connect to manhole wall using dowels.

T. Provide suitable pull string in each empty duct except sleeves and nipples.

U. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

V. Backfill trenches under provisions of Section 02225.

W. Interface installation of underground warning tape with backfilling specified in Section 02225. Install tape 6 inches below finished surface.

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable.

B. Nonmetallic-sheathed cable.

C. Underground feeder and branch circuit cable.

D. Service entrance cable.

E. Armored cable.

F. Metal clad cable.

G. Wiring connectors and connections.

1.2 RELATED SECTIONS

A. Section 16111 - Conduit.

B. Section 16130 - Boxes.

C. Section 16195 - Identification.

1.3 REFERENCES

ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide for each cable assembly type.

C. Test Reports: Indicate procedures and values obtained.

D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.7 FIELD SAMPLES

A. Provide under provisions of Section 01400.

B. Submit one length, each 18 inches of cable assembly from each reel.

C. Select each length to include complete set of manufacturer markings.

D. Attach tag indicating cable size and application information.

1.8 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.9 COORDINATION

A. Coordinate Work under provisions of Section 01300.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - BUILDING WIRE AND CABLE

A. Okonite

B. Southwire

C. Pirelli

2.2 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.
C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type RHW. THHN/THWN is also allowed.

2.3 MANUFACTURERS - UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Okonite.

B. Southwire.

C. Pirelli.

2.4 UNDERGROUND FEEDER AND BRANCH CIRCUIT CABLE

A. Description: ANSI/NFPA 70, Type RHH/RHW.

B. Conductor: Class B stranded coated copper in accordance with ASTM B-8 or B189.

C. Insulation Voltage Rating: 600 volts, ethylene-propylene type elastomer.

D. Insulation Temperature Rating: 90 degrees C in dry locations; 75 degrees C in wet locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Use stranded conductors for control circuits.

C. Use conductor not smaller than 12 AWG for power and lighting circuits.

D. Use conductor not smaller than 14 AWG for control circuits.

E. Pull all conductors into raceway at same time.

F. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

G. Protect exposed cable from damage.

H. Support cables above accessible ceiling, using spring metal clips or metal plastic cable ties to support cables from structure or ceiling suspension system . Do not rest cable on ceiling panels.

I. Use suitable cable fittings and connectors.

J. Neatly train and lace wiring inside boxes, equipment, and panelboards.

K. Clean conductor surfaces before installing lugs and connectors.

L. Make splices taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

M. Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

N. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

O. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

P. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

Q. All wire shall be color coded as follows:

120/208 VOLT	**277/480 VOLT**
Phase A - Red	Phase A - Brown
Phase B - Black	Phase B - Orange
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White
Ground - Green or Bare	Ground - Green or Bare

3.4 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

C. All cables shall be identified in each junction box and at each termination.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01400.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

E. Verify continuity of each central circuit.

SECTION 16130

BOXES AND ENCLOSURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.2 REFERENCES

A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

D. ANSI/NFPA 70 - National Electrical Code.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.5 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of floor boxes and outlets in buildings and work areas prior to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, stainless steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include ½ inch (13 mm) male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.2 FLOOR BOXES

A. Floor Boxes: ANSI/NEMA OS 1, semi-adjustable.

B. Material: Formed stainless steel.

C. Shape: As required.

D. Conform to regulatory requirements for concrete-tight floor boxes.

2.3 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: Stainless steel and aluminum.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface-mounted junction box.
1. Material: Cast aluminum.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. In-Ground Cast Metal Box: NEMA 250, Type 6, inside flanged, recessed cover box for flush mounting.
1. Material: Cast aluminum.
2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
3. Cover Legend: ELECTRIC.

2.4 ENCLOSURES

A. Construction: Aluminum or stainless steel.

B. Hardware & Hinges: Type 304L stainless steel.

C. Enclosure Base & Supports: Aluminum or stainless steel, two (2) inch by two (2) inch.

D. Latching: Three point latching shall be provided on all doors.

E. NEMA Rating: 3R

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

E. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07270.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation. Provide minimum 24 inches separation in acoustic rated walls.

I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Use stamped stainless steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Use adjustable stainless steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires.

N. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

O. Use gang box where more than one device is mounted together. Do not use sectional box.

P. Use gang box with plaster ring for single device outlets.

Q. Use cast outlet box in exterior locations exposed to the weather and wet locations.

R. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

S. Set floor boxes level.

T. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
   1. Interior Dry Locations: Use hinged enclosure.
   2. Other Locations: Use surface-mounted cast metal box.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for equipment furnished under Division 11.

B. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

C. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

D. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.3 ADJUSTING

A. Adjust floor box flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closure in unused box opening.

SECTION 16170

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.2 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement.

B. Section 03300 - Cast-In-Place Concrete.

C. Section 16670 - Lightning Protection System.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NPFA 99 - Health Care Facilities.

1.4 GROUNDING ELECTRODE SYSTEM

A. Metal frame of the building.

B. Concrete-encased electrode.

C. Rod electrode.

D. Plate electrode.

E. Active electrode.

1.5 PERFORMANCE REQUIREMENTS

Grounding System Resistance: 25 ohms.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual locations of grounding electrodes.

1.8 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 ROD ELECTRODE

A. Manufacturers:
   1. Thompson Lightning Protection, Inc.
   2. Advanced Lightning Technology, Inc.
   3. Substitutions: Under provisions of Section 01600.

B. Material: Copper-clad steel.

C. Diameter: ¾ inch.

D. Length: 10 feet.

2.2 MECHANICAL CONNECTORS

A. Manufacturers:
   1. Thompson Lightning Protection, Inc.
   2. Advanced Lightning Technology, Inc.
   3. Substitutions: Under provisions of Section 01600.

B. Material: Bronze.

2.3 EXOTHERMIC CONNECTIONS

A. Manufacturers:
   1. Thompson Lightning Protection, Inc.
   2. Advanced Lightning Technology, Inc.
   3. Substitutions: Under provisions of Section 01600.

2.4 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes:4/0 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

2.5 GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inch diameter by 24 inch long concrete pipe with belled end.

B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Provide grounding well pipe with cover at rod locations where indicated . Install well pipe top flush with finished grade.

D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated.

E. Provide bonding to meet Regulatory Requirements.

F. Bond together metal siding not attached to grounded structure; bond to ground.

G. Install transient suppression plate where indicated.

H. Install ground grid under access floors where indicated. Construct grid of 2 AWG bare copper wire installed on 24 inch centers both ways. Bond each access floor pedestal to grid.

I. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Use 2 AWG bare copper conductor.

J. Provide grounding and bonding in patient care areas to meet requirements of NFPA 99 and ANSI/NFPA 70.

K. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 INTERFACE WITH OTHER PRODUCTS

Interface with lightning protection system installed under Section 16670.

3.4 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall- of-potential method.

SECTION 16190

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide manufacturer's catalog data for fastening systems.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Stainless steel or aluminum.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Anchors and Fasteners:
1. Concrete Structural Elements: Use expansion anchors and preset inserts.
2. Steel Structural Elements: Use beam clamps, spring steel clips and welded fasteners.
3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors and preset inserts.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

2.2 ALUMINUM CHANNEL

A. Manufacturer:
   1. Unistrut.
   2. Substitutions: Under provisions of Section 01600.

2.3 POWDER ACTUATED ANCHORS

A. Manufacturer:
   1. Hilti.
   2. Ram Tool.
   3. Substitutions: Under provisions of Section 01600.

B. Description: Stainless steel anchors, Type 304

2.4 SPRING STEEL CLIPS

A. Manufacturer:
   1. Grinnel.
   2. Unistrut.
   3. Substitutions: Under provisions of Section 01600.
   4. Description: Stainless steel, Type 304.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not use spring steel clips and clamps.

E. Obtain permission from Engineer before using powder-actuated anchors.

F. Obtain permission from Engineer before drilling or cutting structural members.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. In wet and damp locations use stainless steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.

J. Use stainless sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

1.2 RELATED SECTIONS

Section 09900 - Painting.

1.3 REFERENCES

ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide two of each style marker.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Locations:
   1. Each electrical distribution and control equipment enclosure.
   2. Communication cabinets.

C. Letter Size:
   1. Use ⅛ inch letters for identifying individual equipment and loads.
   2. Use ¼ inch letters for identifying grouped equipment and loads.
   3. Use ⅛ inch letters for identifying circuits.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations.

2.2 WIRE MARKERS

A. Manufacturers:
   1. 3M.
   2. Southwire.
   3. Substitutions: Under provisions of Section 01600.

B. Description: Tape type wire markers.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

D. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
   2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.3 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. 3M.
   2. Seton.
   3. Substitutions: Under provisions of Section 01600.

B. Description: 4 inch wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.1 PREPARATION

Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws or adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Identify conduit using field painting under provisions of Section 09900.

E. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Distribution panelboards.

B. Branch circuit panelboards.

C. Load centers.

1.2 RELATED WORK

A. Section 16190 - Supporting Devices.

B. Section 16195 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

D. NEMA KS 1 - Enclosed Switches.

E. NEMA PB 1 - Panelboards.

F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

G. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Record actual locations of Products; indicate actual branch circuit arrangement.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.10 FIELD MEASUREMENTS

Verify that field measurements are as indicated on shop drawings.

1.11 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of Section 01700.

B. Provide two of each panelboard key.

C. Provide two fuse pullers.

1.12 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide three of each size and type of fuse.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Cutler Hammer

B. Square D

C. Furnas

D. Substitutions: Under provisions of Section 01600.

2.2 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, circuit breaker type.

B. Service Conditions:
   1. Temperature: 110 degrees F.
   2. Altitude: 1000 feet.

C. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

D. Minimum integrated short circuit rating: 25,000 amperes rms symmetrical for 480 volt panelboards.

E. Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

F. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1. Provide circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.

G. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

H. Provide circuit breaker accessory trip units and auxiliary switches as indicated.

I. Enclosure: NEMA PB 1, Type 3R. Cabinet box: 20 inches deep; width: 48 inches.

J. Cabinet Front: Surface type, fastened with concealed trim clamps. Provide hinged door with flush lock. Finish in manufacturer's standard gray enamel.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.

B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

C. Minimum integrated short circuit rating: 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated.

D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

E. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

F. Enclosure: NEMA PB 1, Type 3R.

G. Cabinet box: 6 inches deep; width: 20 inches for 480 volt panelboards.

H. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.4 LOAD CENTERS

A. Load Centers: Circuit breaker load center, with bus ratings as indicated.

B. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical.

C. Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where indicated. Do not use tandem circuit breakers.

D. Enclosure: Rainproof.

E. Box: Surface type with door, and pull ring and latch lock on door. Finish in manufacturer's standard gray enamel.

2.5 FUSES

A. Manufacturers:
1. Bussman.
2. Ferrule

B. Fuses 600 Amperes and Less: Dual element, current limiting, time delay, one-time fuse, 600] volt, UL Class RK 5. as indicated.

C. Fuses 601 Amperes and Larger: Current limiting, time delay fast-acting one time fuse, 600 volt, UL Class L.

D. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes. Provide supports in accordance with Section 16190.

C. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide engraved plastic nameplates under the provisions of Section 16195.

G. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. or below floor. Minimum spare conduits: 5 empty 1 inch. Identify each as SPARE.

3.2 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

C. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

SECTION 16477

FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.2 RELATED SECTIONS

Section 09900 - Painting: Painting of spare fuse cabinet.

1.3 REFERENCES

A. NFPA 70 - National Electric Code.

B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data sheets showing electrical characteristics including time-current curves.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Record actual fuse sizes.

1.6 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

1.8 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of Section 01700.

B. Provide two fuse pullers.

1.9 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide three of each size and type fuse installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Bussman.

B. Ferrule.

C. Substitutions: Under provisions of Section 01600.

2.2 FUSE REQUIREMENTS

A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

C. Main Service Switches Larger than 600 amperes: Class L (time delay).

D. Main Service Switches: Class RK1 (time delay).

E. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay).

F. Power Load Feeder Switches: Class RK1 (time delay).

G. Motor Load Feeder Switches: Class RK1 (time delay).

H. Lighting Load Feeder Switches Larger than 600 amperes: Class L time delay.

I. Lighting Load Feeder Switches: Class RK1 (time delay).

J. Other Feeder Switches Larger than 600 amperes: Class L time delay.

K. Other Feeder Switches: Class RK1 (time delay).

L. Power Branch Circuits: Class RK1 (time delay).

M. Motor Branch Circuits: Class RK1 (time delay).

N. Lighting Branch Circuits: Class G.

2.3 SPARE FUSE CABINET

A. Description: Wall-mounted sheet metal cabinet, suitably sized to store spare fuses and fuse pullers specified.

B. Doors: Hinged, with hasp for Owner's padlock.

C. Finish: Prime finish for field painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in accordance with manufacturer's instructions.

B. Install fuse with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet where indicated.

SECTION 16482

MOTOR CONTROL CENTER

PART 1 - GENERAL

1.1 SCOPE

The contractor shall furnish and install the motor control centers as specified herein and as shown on the contract drawings.

1.2 RELATED SECTIONS

A. Section 16475 - Circuit Breakers and Fusible Switches

B. Section 16481 - Par. 1.03 -- Freedom Electro - Mechanical Motor Control

C. Section 16481 - Par. 2.04 – ADVANTAGE Microprocessor Motor Control

D. Section 16481 - Par. 2.5 – Solid - State Reduced Voltage Motor Control

E. Section 16483 - Adjustable Frequency Drives

F. Section 16671 - Transient Voltage Surge Suppression

G. Section 16901 - Microprocessor Metering Equipment

H. Section 16902 - Electric Control Devices

I. Section 16903 - Protective Relays

J. Section 16905 - Programmable Controllers

K. Section 16911 - Electrical Monitoring and Control Systems

1.3 REFERENCES

The Motor Control Centers and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA, ANSI and UL 845.

1.4 SUBMITTALS - FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:
   1. Master drawing index
   2. Front view elevation
   3. Floor plan
   4. Top view
   5. Single Line
   6. Unit wiring diagrams depicting remote devices
   7. Nameplate schedule
   8. Starter and component schedule
   9. Conduit entry/exit locations
   10. Assembly ratings including:

a.Short -circuit rating
b.Voltage
c.Continuous current

11. Major component ratings including:
    a.Voltage
    b.Continuous current
    c.Interrupting ratings
12. Cable terminal sizes.

B. Where applicable the following information shall be submitted to the Engineer:
   1. Busway connection
   2. Connection details between close- coupled assemblies
   3. Composite floor plan of close-coupled assemblies
   4. Key interlock scheme drawing and sequence of operations.

C. Submit ten (10) copies of the above information.

D. The following product information shall be submitted:
   1. Descriptive bulletins
   2. Product sheets.

1.5 SUBMITTALS – FOR CLOSE OUT

A. The following information shall be submitted for record purposes:
   1. Final as built drawings and information for items listed in section 1.04
   2. Unit wiring diagrams
   3. Certified production test reports
   4. Installation information
   5. Seismic certification and equipment anchorage details.

B. Submit ten (10) copies of the above information.

1.6 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. The motor control center shall be suitable for and certified to meet all applicable seismic requirements of the Uniform Building Code (UBC) installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, UBC: a peak of 0.75g, and ZPA of 0.38g. These tests shall fully envelope this response spectrum for all equipment natural frequencies up to at least 35 Hz.

1.7 DELIVERY, STORAGE AND HANDLING

Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.8 FIELD MEASUREMENTS

Installing Contractor to verify equipment proposed shall fit into the available space. Coordinate installation with other trades and notify the approval authorities of any interferences or conflicts in the MCC system power and control wing.

1.9 OPERATION AND MAINTENANCE MANUALS

A. Ten (10) copies of the equipment operation and maintenance manuals shall be provided.

B. Operation and maintenance manuals shall include the following information:
   1. Instruction books and /or leaflets
   2. Recommended renewal parts list
   3. Drawings and information required by section 1.05.

1.10 EXTRA PRODUCTS

Manufacturer and contractor shall submit a renewal parts list showing the important maintenance items which will need to be available for proper maintenance and to provide normal equipment life.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Cutler Hammer.

B. Square D.

C. Fairness.

2.2 RATINGS

The Motor Control Center (s) shall be 600 -volt class suitable for operation on a three-phase, 60-hertz system. The system operating voltage and number of wires shall be as indicated on the drawings.

2.3 CONSTRUCTION

A. Motor Control Center shall be Cutler-Hammer type ADVANTAGE design or equivalent.

B. Structures shall be totally enclosed deadfront, free-standing assemblies. They shall be 90 inches high and [21 inches] deep for front-mounted units. Structures shall contain a horizontal wireway at the top, isolated form the horizontal bus and shall be readily accessible through a hinged cover. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference.

C. Compartments for mounting control units shall be incrementally arranged such that not more than six (6) size1 starters for front mounted only can be mounted within each vertical structure. Guide rails shall be provided.

D. Compartments for mounting control units shall be incrementally arranged such that not more than six (6) size 1 starters for front mounted only can be mounted within each vertical structure. Guide rails shall be provided.

E. All full voltage starter units through NEMA Size 5 shall be of the drawout type. Draw-out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. Draw-out units shall have a tin-plated stab assembly for connection to the vertical bus. No wiring to these stabs shall extend into the bus compartment. Interior of all units shall be painted white for increased visibility. Units shall be equipped with side-mounted, positive latch pull-apart type control terminal blocks rated 600-volts. Knockouts shall be provided for the addition of future terminal blocks. In addition, a master terminal block, when Type C wiring is specified, shall be drawout and shall be located in the bottom wireway, readily accessible through a hinged cover. All control wire to be 14 gauge minimum.

F. All drawout units shall be secured by a spring-loaded quarter turn indicating type fastening device located at the top front of the unit. Each unit compartment shall be provided with an individual front door.

G. An operating mechanism shall be mounted on the primary disconnect of each starter unit. It shall be mechanically interlocked with the unit door to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. A second interlock shall be provided to prevent removal or re-insertion of the unit while in the ON position. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one (1) to three (3) padlocks with the door open or closed. In addition, means shall be provided to padlock the unit in a partially withdrawn position with the stabs free of the vertical bus.

2.4 BUS

A. Each structure shall contain a main horizontal copper silver-plated bus, with minimum ampacity of 600 amperes or rated 2000 amperes as shown on the drawings. The horizontal bus shall be rated at 50 degrees C temperature rise over a 40 degree C ambient in compliance with UL standards. Vertical busses feeding unit compartments shall be copper and shall be securely bolted to the horizontal main bus. All joints shall be front accessible for ease of maintenance. The vertical bus shall have a minimum rating of 300 amperes for front mounted units and 600 amperes for back-to-back mounted units or fully rated 800 amperes.

B. Isolation of the vertical bus compartment from the unit compartment shall be by means of a full height insulating barrier. This barrier shall be a single sheet of glass reinforced polyester with cutouts to allow the unit stabs to engage the vertical bus. Provide snap-in covers for all unused openings.

C. Busses shall be braced for 100,000 amperes RMS symmetrical.

2.5 WIRING/TERMINATIONS

Wiring shall be NEMA Class Type B.

2.6 MOTOR CONTROLLERS

A. Combination starter units shall be full-voltage non-reversing, unless otherwise shown, and shall utilize Cutler-Hammer type HMCP Motor Circuit Protectors.
   1. Each combination unit shall be rated 100,000, AIC symmetrical at 480V. The HMCP shall provide adjustable magnetic protection and be provided with pin insert to stop magnetic adjustment at 1300% motor nameplate full load current to comply with NEC requirements. Al HMCP combination starter units shall have a “tripped” position on the unit disconnect and a push-to-test button on the HMCP. Type HMCP motor circuit protectors shall include transient override feature for motor inrush current.

B. Motor starters shall be Cutler-Hammer type ADVANTAGE, electrically operated, electrically held, three-pole assemblies with arc extinguishing characteristics and shall have silver-to-silver renewable contacts. They shall have provisions for a total of eight (8) NO or eight (8) NC auxiliary contacts. The overload protection shall consist of one (1) current sensor located in each phase monitored by the Microprocessor that yields a time current curve closely paralleling that of motor heating damage boundary, accurate to 2%. Running overload protection shall be DIP switch selectable for the specific motor full load amperes within the starter range. Provide DIP switch selectable overload trip class of 10, 20 and 30.
   1. Motor starters shall monitor current in each phase to provide phase loss and phase unbalance protection, such that if the unbalance on any of two phases is greater than 30% of the DIP switch selected trip rating, a phase loss/ unbalance trip occurs. Provide phase loss/unbalance protection which requires no time delay for reset.
   2. Motor starters shall provide ground fault protection. Ground fault protection shall be set at 2% of maximum continuous ampere rating and have a start delay of 20 seconds, and a run delay of 1 second to prevent nuisance trip on starting.
   3. Microprocessor shall apply voltage to the coil such that a guaranteed maximum of two (2) milliseconds of main contact bounce occurs on contactor closure.
   4. Microprocessor shall continuously measure coil circuit voltage and current so as to maintain constant coil power consumption.
   5. Provide Control Modules to perform the indicated input/output control functions shown on the drawings. Module to incorporate faceplates having membrane type pushbuttons and LEDs. All pushbutton and LED functions to be furnished with clearly written identification. Modules to be provided with the ability to replace conventional start, stop, hand, auto, and control functions, and when utilized in starter applications, overload reset function. Modules to be provided with the ability to replace conventional indicating light status of run, off, selector switch pushbutton position, and when utilized in starter applications, overload alarm and overload trip.
   6. Provide, where indicated on the drawings, a Metering Module capable of displaying control voltage, status and where utilized on starter applications, cause of trip, current at time of trip and current in each phase.
   7. Provide an addressable communication card capable of transmitting all data over a compatible two-wire local area network to a central personal computer for storage and/or printout. The network shall also be capable of transmitting data in RS232c format via a translator module.
      a. ON-OFF reset control functions
      b. Status (ON, OFF, TRIPPED, NO RESPONSE)
      c. Current in each phase
      d. Percent phase unbalance
      e. Control voltage
      f. Overload protection settings
      g. Cause of trip
      h. Trip current magnitude

C. Each starter shall be equipped with a fused control power transformer, two (2) indicating lights, HOA selector switch, and two (2) NO contacts, unless otherwise scheduled on the drawings. Device panel to have space to accommodate six (6) oil-tight pilot-control devices or indicating ammeters, voltmeters, or elapsed time meters.

D. Solid-state reduced-voltage starters, Cutler-Hammer type [EJ] [ES] [EA] shall be provided where shown on the contract drawings. The solid-state reduced-voltage starter shall be UL and CSA listed in the motor control center, and consist of an SCR based section, logic board and paralleling bypass contractor/starter. The paralleling bypass contractor shall be energized when the motor reaches full speed.

2.7 OVERCURRENT DEVICES

A. Circuit Breakers
Individual feeder breakers shall have a minimum interrupting capacity of 100 KAIC at rated voltage or as scheduled on the drawings.

B. Fusible Switches
Individual feeder switches shall be quick-make, quick-break gang-operated type utilize class R fuse clips. The fused switch shall be rated 100 KAIC at rated voltage.

2.8 INCOMING FEEDER TERMINATIONS AND DEVICE

Incoming cable shall terminate within the control center on a main breaker termination point. Main lug terminations shall have adequate dedicated space for the type and size of cable used and the lugs shall be standard mechanical screw with antiturn feature. Main breakers shall be provided as indicated on the drawings and shall be molded case.

2.9 CUSTOMER METERING

A. Where indicated on the drawings, provide a separate customer metering compartment with front hinged door. Include the associated instrument transformers.

B. Current transformers, where shown on the drawings or elsewhere specified, shall be wired to shorting-type terminal blocks.

C. Potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.

2.10 ENCLOSURES

The type of enclosure shall be in accordance with NEMA standards for type 12 dust-tight and drip-proof. All enclosing sheet steel, wireways and unit doors shall be gasketed.

2.11 NAMEPLATES

Each unit will have 1.0 x 2.5-inch hot stamped nameplate. The lettering shall be black 3/16-high, in a white background.

2.12 FINISH

A. The control center shall be given a phosphatizing pretreatment. The paint finish shall be an anionic, themoset acrylic. Manufacturer's standard color shall be used.

B. The control center finish shall pass 600 hours of corrosion resistance testing per ASTM B 117.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installing Contractor to fully inspect shipments for damage and report damage to manufacturer and file claim upon shipper, if necessary.

B. Overload relay heater ratings must be properly sized and co-ordinated for each motor starter unit.

C. Installing Contractor to verify NEC clearances as dictated on the contract drawings prior to installation. Verify UL labeling of the assembly prior to installation.

3.2 FACTORY TESTING

A. The motor control centers shall have been tested in a high-power laboratory to prove adequate mechanical and electrical capabilities.

B. All factory tests required by the latest ANSI, NEMA and UL standards shall be performed.

C. The manufacturer shall provide three (3) certified copies of factory test reports.

D. Factory tests as outlined above shall be witnessed by the owner's representative.
   1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed.
   2. The manufacturer shall include the cost of transportation and lodging for up to three (3) owner's representatives. The cost of meals and incidental expenses shall be the owner's responsibility.

3.3 INSTALLATION

A. Contractor to follow the installation instructions supplied by the manufacturer.

B. Control wiring shall be as shown on the contract drawings except as modified by the approval and submittal process. Interface all local and remote devices into the control wiring and operational systems for each load.

3.4 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and start-up of the equipment specified under this section for a period of five working days. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

B. The following minimum work shall be performed by the Contractor under the technical direction of the manufacturer's service representative:
   1. Rig the MCC assembly into final location and install on level surface.
   2. Check all removable cells and starter units for easy removal and insertion.
   3. Perform insulation tests on each phase and verify low-resistance ground connection on ground bus.
   4. Connect all power wiring and control wiring and verify basic operation of each starter from control power source.
   5. Torque all bolted connections made in the field and verify all factory bolted connections.
   6. Calibrate any solid-state metering or control relays for their intended purpose and make written notations of adjustments on record drawings. Perform startup of any solid-state starters and adjustable frequency drives.

C. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.5 FIELD ADJUSTMENTS

Follow the manufacturer's instructions and the contract documents concerning any short-circuit device settings, heater selection, timing relays, or startup of components.

3.6 FIELD TESTING

A. Follow the minimum requirements as stipulated in the NETA testing procedure for this type of motor control center assembly.

B. Generate a field report on tests performed, test values experienced, etc., and make available to owner upon request.

3.7 MANUFACTURER'S CERTIFICATION

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations. Equipment shall be inspected prior to the generation of any reports.

B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.8 TRAINING

A. The Contractor shall provide a training session for up to five owner's representatives for three normal workdays at the jobsite or other office location chosen by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative.

C. The training program shall consist of the following:
   1. Review of the MCC one-line drawings and schedules.
   2. Review of the factory record shop drawings and placement of the various cells.
   3. Review of each type of starter cell, components within, control, and power wiring.
   4. Review contractor coil replacement and contact replacement procedures.
   5. Discuss the maintenance timetable and procedures to be followed in an ongoing maintenance program.
   6. Provide three-ring binders to participants complete with copies of drawings and other course material covered.