

Burrillville Sewer Commission
Burrillville, Rhode Island

Headworks and Oakland Pump Station Improvements

Bid/Contract No. _____

January 2023

**Bidding Requirements, Bond Forms, Contract Agreement,
Conditions of the Contract and Technical Specifications**

Submission for Permitting Review

Professional Registration No.: 7967



B E T A

701 George Washington Highway
Lincoln, Rhode Island 02865
401.333.2382
www.BETA-Inc.com

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DIVISION 00

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SECTION 00100

NOTICE TO BIDDERS

Town of Burrillville, Rhode Island
Headworks and Oakland Pump Station Improvements
CONTRACT NO. 20

The **Town of Burrillville, Rhode Island**, acting through its Sewer Commission invites sealed bids for "**Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract NO. 20**", in accordance with the Contract Documents prepared by BETA GROUP, INC., Consulting Engineers, 701 George Washington Highway, Lincoln, Rhode Island, 02865.

Sealed bids for "**WWTF Headworks & Oakland Pump Station Improvements, Contract No. 20**", MUST be filed in sealed envelopes at the Burrillville WWTF, 141 Clear River Drive, Burrillville, Rhode Island, until **12:00 PM local time on Month date, 2023**. Bids, in duplicate [original marked "MASTER" and one (1) copy], shall be submitted on the forms provided in the specifications in a sealed envelope and plainly marked on the outside with **WWTF HEADWORKS & OAKLAND PUMP STATION, Contract No. 20**, and the Bidding date of **Month date, 2023**.

The location, general characteristics, and principal details of the Work are indicated in a set of Contract Documents, entitled "**Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract NO. 20**".

The work in this Contract includes, but is not limited to:

- Headworks Facility
 - Installation of a new influent channel fine screen unit
 - Installation of a new washer / compactor unit for screenings
 - Remove & replace influent sewer piping
 - Electrical work associated with the new equipment
 - Instrumentation and Control equipment
 - Demolition of existing seal water system and associated equipment
 - Construction and operation of a temporary bypass system
 - HVAC improvements
 - Plumbing improvements
 - Fire alarm system improvements
- Oakland Pump Station
 - Demolition of two (2) existing wastewater pumps, piping, valves, and appurtenances
 - Installation of two (2) 25-hp wastewater pumps, piping, valves, and appurtenances
 - Corrosion testing of existing drywell as specified in Section 01015 1.05.
 - Removal of existing UST, engine generator, and appurtenances.
 - Electrical work associated with new pumps and engine generator
 - Construction and operation of a temporary bypass system

Bids shall be on a **Lump Sum and Unit Price** basis. The project will be awarded to a single, lowest, responsible bidder for the **Total Base Bid**.

The overall Time for Completion for this project shall be **630** consecutive calendar days from the date stipulated in the Notice to Proceed to commence the Work. Work at the Headworks shall be completed within **460** consecutive calendar days from the date stipulated in the Notice to Proceed to commence the Work.

Contract Documents may be obtained electronically via the Town's website address: <https://www.burrillville.org/bids-rfps>.

Bid Security: Certified, treasurer's or cashier's check or bid bond in the sum of five (5) percent of the Total Bid is required.

Direct all inquiries to: Alan Gunnison, P.E., BETA Group, Inc.
Tel.: (401) 333-2382
Fax: (401) 333-9225
Email: agunnison@beta-inc.com

Attention of Bidders is particularly referred to the Federal and State requirements as to conditions of employment to be observed and wage rates to be paid under the Contract as determined by the Department of Labor and Industries under the provision of Chapters 12 and 13 of Title 37, General laws of Rhode Island, 1956, as amended.

A walking pre-bid conference advising bidders of bid conditions will be held on **Day, Month**, 2023, at 10:00 AM, local time at the Burrillville Wastewater Treatment Facility, 141 Clear River Drive, Burrillville, Rhode Island 02830. The pre-bid conference will be held weather permitting. If inclement weather is forecasted, the pre-bid conference will be rescheduled, and plan holders will be notified accordingly.

Bidders shall be required to comply with the President's Executive Order No. 11246 and State of Rhode Island Executive Order No. 85-11, as amended.

This project is also subject to Chapter 37-14.1 of the Rhode Island General Laws, and regulations, which require that ten percent (**10%**) of the dollar value of the work performed on the project, be performed by certified minority and/or woman's business enterprises.

The Bidder's attention is also called to the "Equal Opportunity Clause", the "Nondiscrimination in Employment", and the Federal and State MBE/WBE requirements of the Contract.

The Bidders attention is also called to the United States Environmental Protection Agency's Disadvantaged Business Enterprise (DBE) requirements of the Contract.

The successful bidder will be required to conform to all provisions of the Federal Davis-Bacon and Related Acts contractor's and subcontract's to pay prevailing wage rates and fringe benefits, as determined by the Secretary of Labor, for corresponding classes of work.

The successful bidder shall comply with the American Iron and Steel provisions of P.L. 113-76, “Consolidated Appropriations Act, 2014”.

All bids shall comply with the provisions of RIGL §37-2-18.

Each bidder must submit a copy of their bid proposal to be available for public inspection upon the opening of the bids.

No Bidder may withdraw his bid within Ninety (90) days after the actual date of the opening thereof.

The successful Bidder must furnish 100 percent Performance and Labor and Materials Bonds.

The Owner and Engineer, being considered the sole and only judge, reserves the right to waive any informalities in, or to reject, any or all bids, should the Owner deem it to be in the owner's best interest to do so.

**Burrillville Sewer Commission
Town of Burrillville, Rhode Island**

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SECTION 00200

INFORMATION FOR BIDDERS

- 1.01 Receipt and Opening of Bids
- 1.02 Location and Work to be Done
- 1.03 Contract Documents
- 1.04 Accessing Drawings and Documents
- 1.05 Questions Regarding Drawings and Documents
- 1.06 Pre-Bid Conference
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- 1.29 Nondiscrimination in Employment
- 1.30 Sequence of Operations
- 1.31 Wetlands and Waterways
- 1.32 American Iron and Steel Requirements

1.01 RECEIPT AND OPENING OF BIDS

- A. The Town of Burrillville, Rhode Island, herein called the Owner, acting through its Sewer Commission invites sealed bids for “Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. 20”, in accordance with the Contract Documents prepared by BETA Group, Inc., Consulting Engineers, 701 George Washington Highway, Lincoln, Rhode Island, 02865.

- B. Such Bids, submitted in sealed envelopes plainly marked in the upper left hand corner with the Bidder's name and address, plainly marked in the lower left hand corner with the date and time of opening;

Addressed to: **Burrillville Sewer Commission
P.O. Box 71
Harrisville, Rhode Island 02830
Attention: Burrillville Town Commission**

Endorsed: **"Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. 20".**

Received at: **Burrillville Wastewater Treatment Facility
141 Clear River Drive
Burrillville, Rhode Island 02830
Attention: Burrillville Town Commission**

Delivered by: **[time] local time on [date],**

Said Bids will be publicly opened and read aloud **[at that time] [insert time and place Bids to be opened].**

- C. The Owner may consider informal, any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities in or reject any and all Bids. Conditional or qualified Bids will not be accepted. Any Bid received after the time and date specified shall not be considered. Should there be reasons why the Contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the Owner and the Bidder.

1.02 LOCATION AND WORK TO BE DONE

- A. The location, general characteristics, and principal details of the Work are indicated in a set of drawings, entitled "**Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. 20**".
- B. Additional drawings showing details in accordance with which the Work is to be done will be furnished from time to time by the Engineer, if found necessary, and shall then become part of the Drawings.
- C. The Contractor shall furnish all labor, services, materials, equipment, plant machinery, apparatus, appliances, tools, supplies and all other things necessary to perform all work required for the completion of each item of the Work and as herein specified.

- D. The Work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or customarily done for the completion of that item.

1.03 CONTRACT DOCUMENTS

- A. The Contract Documents, INFORMATION FOR BIDDERS, SPECIFICATIONS, and forms for BID, AGREEMENT, and BONDS, may be examined and obtained at the locations designated in the “Notice to Bidders”.

1.04 ACCESSING DRAWINGS AND DOCUMENTS

- A. Contract Documents may be obtained electronically via the Town’s website address: <https://www.burrillville.org/bids-rfps>. Contract documents may be obtained at the Office of the BETA Group, Inc at 701 George Washington Highway, Lincoln RI 02865 401-333-2382.
- B. Bidders requesting Contract Documents to be mailed to them will be responsible for all shipping costs. Bidders shall coordinate mailing with the office of the BETA Group, Inc at 701 George Washington Highway, Lincoln RI 02865. The Town of Burrillville and BETA are not responsible for delivery of any mailed or delivered documents or delivery of said documents within the prescribed time set for the receipt of bids.

1.05 QUESTIONS REGARDING DRAWINGS AND DOCUMENTS

- A. In general, no answer will be given to prospective bidders in reply to an oral question of the intent or meaning of the Drawings or other Contract Documents, or the equality or use of products or methods other than those designated or described on the Drawings or in the Specifications. Any information given to bidders other than by means of the Drawings and other Contract Documents, including Addenda, as described below, is given informally, for information and the convenience of the bidder only and is not guaranteed. The bidder agrees that such information shall not be used as the basis of nor shall the giving of any such information entitle the bidder to assert any claim or demand against the Owner or the Engineer on account thereof.

- B. To receive consideration, such questions shall be submitted in writing or faxed to the Engineer. For this purpose:

Alan Gunnison, P.E.
BETA Group, Inc.
701 George Washington Highway, Lincoln, Rhode Island, 02865
Telephone (401) 333-2382, Fax (401) 333-9225, email: agunnison@beta-inc.com

All questions must be received by the engineer at least seven calendar days before the established date for receipt of Bids. If the question involves the equality or use of products or methods, it must be accompanied by drawings, specifications or other data in sufficient detail to enable the Engineer to determine the equality or suitability of the product or method. In general, the Engineer will neither approve nor disapprove particular products prior to the opening of Bids; such products will be considered when offered by the Contractor for incorporation into the Work.

- C. The Engineer will set forth as Addenda, which shall become a part of the Contract Documents, such questions received as above provided as in his sole judgement are appropriate or necessary and his decision regarding each. At least five days prior to the receipt of Bids, he will send a copy of these Addenda to those prospective bidders known to have taken out sets of the Drawings and other Contract Documents.
- D. The Contractor agrees to use the products and methods designated or described in the Specifications as amended by the Addenda.

1.06 PRE-BID CONFERENCE

- A. A pre-bid conference advising bidders of bid conditions will be held on **[Day and Date], at Time]**, local time at Burrillville Wastewater Treatment Facility located at 141 Clear River Drive, Burrillville, RI 02830.
- B. Attending the Pre-bid conference is **not mandatory but is strongly encouraged** to submit a bid.

1.07 BIDDERS TO INVESTIGATE

- A. Bidders are required to submit their Bids upon the following express conditions, which shall apply to and be deemed a part of every Bid received, viz.:

Bidders must satisfy themselves by personal examination of the Work and by such other means as they may wish, as to the actual conditions there existing, the character and requirements of the Work and difficulties attendant upon its execution, and the accuracy of all estimated quantities stated in the Bid.

1.08 INFORMATION NOT GUARANTEED

- A. All information given on the Drawings or in the other Contract Drawings relating to subsurface and other conditions, natural phenomena, existing pipes and other structures is from the best sources at present available to the Owner. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

- B. It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes or other structures encountered during construction will be the same as those indicated on the Drawings or in the other Contract Documents.
- C. It is agreed further and understood that no bidder or Contractor shall use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner or the Engineer, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

1.09 CONDITIONS OF WORK

- A. Each bidder must inform himself fully of the conditions relating to the construction and labor under which the work is now or will be performed; failure to do so will not relieve the successful bidder of his obligation to furnish all materials and all labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated Work for the consideration set forth in his bid. Insofar as possible, the Contractor, in the carrying out of his work, shall employ such methods or means as will not cause any interruption of or interference with: the operation of the existing sewer; traffic; use of existing facilities and utilities; locations of existing utilities and structures affecting the work or other similar conditions at the site; character of equipment and facilities needed preliminary to and during prosecution of the work; requirements of owners and controlling authorities, having jurisdiction over the various lands, existing structures, facilities, and utilities; and all other conditions affecting the work to be done, and the labor and materials needed; and he shall make his bid in sole reliance thereon; and shall not, at any time after submission of a bid, assert that there was any misunderstanding in regard to the nature or amount of the work to be done.

1.10 BLANK FORM FOR BID

- A. Each bid must be submitted on the prescribed form, accompanied by the Bid Security and any other requested information. All blank spaces for bid prices must be filled in, in ink or typewritten, both in words and numerical figures, and be signed by the bidder with his business address and place of residence. Where both written words and numerical figures are given, the written words shall apply in the event of conflict. All bids shall be prepared in conformity with, and based upon and submitted subject to, all requirements of the Specifications and Drawings, together with all addenda thereto.

- B. Bidders shall submit the Bid pages (section 00300) and Bid Bond pages (Section 00400) only. All pages shall be correctly assembled and submitted in accordance with Section 00100.** All erasures or other changes in the Bid must be properly initialed by an authorized representative of the Bidder.

1.11 WITHDRAWAL OF BIDS

- A. Except as hereinafter in this subsection otherwise expressly provided, once his Bid is submitted and received by the Owner for consideration and comparison with other bids similarly submitted, the bidder agrees that he may not and will not withdraw it within Ninety (90) consecutive calendar days after the actual date of the opening of Bids.
- B. Upon proper written request and identification, Bids may be withdrawn only as follows:
1. At any time prior to the designated time for the opening of Bids.
 2. Provided the Bid has not theretofore been accepted by the Owner, at any time subsequent to the expiration of the period during which the bidder has agreed not to withdraw his Bid.
- C. Unless a Bid is withdrawn as provided above, the bidder agrees that it shall be deemed open for acceptance until the AGREEMENT has been executed by both parties thereto or until the Owner notifies a bidder in writing that his Bid is rejected or that the Owner does not intend to accept it, or returns his Bid deposit. Notice of acceptance of a Bid shall not constitute rejection of any other Bid.

1.12 BID SECURITY

- A. Each bid must be accompanied by a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company and payable to the order of the Owner, or by a bid bond prepared on the form of BID BOND attached hereto duly executed and acknowledged by the bidder, as Principal, and by a surety company qualified to do business in the State of **Rhode Island** and satisfactory to the Owner, as Surety. The check or bid bond shall be in the sum of five (5) percent of the total bid and shall be enclosed in the sealed envelope containing the Bid.
- B. Each such check or bid bond may be held by the Owner as security for the fulfillment of the bidder's agreements as hereinabove set forth and as set forth in the BID. Should the bidder fail to fulfill such agreements, his bid check shall become the property of the Owner or if a bid bond was furnished, the bid bond shall become payable to the Owner, as liquidated damages; otherwise, the bid check shall be returned to the bidder as hereinafter provided, or if the security is a bid bond, the bid bond shall become null and void.
- C. Bid checks will be returned to all except the three lowest bidders within five days, Sundays and legal holidays excluded, after the opening of Bids, and to the three lowest bidders within five days, Sunday and legal holidays excluded, after the Owner

and the accepted bidder have executed the AGREEMENT. In the event that the AGREEMENT has not been executed by both the accepted bidder and the Owner within 90 consecutive calendar days after the opening of Bids, the bid check will be returned promptly upon demand of any bidder who has not been notified of the acceptance of his Bid.

- D. Bid checks accompanying Bids, which are rejected, will be returned within five days, Sundays and legal holidays excluded, after rejection.
- E. None of the three lowest Bids shall be deemed rejected, notwithstanding acceptance of any Bid, until the AGREEMENT has been executed by both the Owner and the accepted bidder.

1.13 INTERESTED PARTIES TO CONTRACT

- A. The undersigned declares; that the only person interested in this Bid as principals are named herein as such; that no official of the Owner and no person acting for or employed by the Owner is interested directly or indirectly in this Bid, or in any contract which may be made under it, or in any expected profits to arise therefrom; that this Bid is made in good faith, without fraud, collusion or connection with any other person bidding or refraining from bidding for the same work; that he has examined carefully the said instructions and all other documents bound herewith and the Contract Drawings relating to the Contract covered by this Bid and hereby makes them part of this Bid; that he has informed himself fully in regard to all conditions pertaining to the work and place where it is to be done; and that he has made his own examination and carefully checked his estimates for cost and from them makes this Bid.

1.14 ABILITY AND EXPERIENCE OF BIDDER

- A. No award will be made to any bidder who cannot satisfy the Owner that he has sufficient ability and experience in this class of work and sufficient capital to enable him to prosecute and complete the Work successfully within the time named. The Engineer and the Owner may make such investigation as they deem necessary to determine the ability of the bidder to perform the work; and the bidder shall furnish to the Engineer and the Owner all such information and data for this purpose as the Engineer and the Owner may request.
- B. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein within the time stated. The Owner's decision or judgement on these matters shall be final, conclusive, and binding for all parties involved.

1.15 BIDS

- A. The Owner reserves the right to waive any informalities in, or to reject any or all Bids which in its sole judgement are either incomplete, conditional, obscure, or not responsive or which contain additions not called for, erasures not properly initialed, alternative, or similar irregularities, or the Owner may waive such omissions, conditions, or irregularities as he may feel appropriate.
- B. Conditional bids will not be accepted. Bidder(s) will be disqualified if more than one proposal is received from an individual, firm, partnership, corporation or association, under the same or different names and such proposals will not be considered.
- C. The Owner reserves the right to reject any or all Bids, should the Owner deem it to be in the public interest to do so.

1.16 COMPARISON OF BIDS

- A. Bids will be compared on the basis of the experience and competence of the bidders and on the basis of the totals of the quantities listed in the proposal under the enumerated items at the unit prices or lump sums bid for these items. The Contract will be awarded to the lowest responsive, responsible and eligible bidder as determined by the Owner and/or its authorized representatives or agents. However, the Owner may reject any and all bids if it is in the public interest to do so.
- B. The term, "Lowest responsive, responsible and eligible bidder," shall mean the bidder whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the Work; who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work.
- C. Bids should be made on each separate item of work shown in the bid (proposal) with reasonable relation to the probable cost of doing the work included in such items. The Owner reserves the right to reject, wholly, any bid on which an item or items thereof are obviously unbalanced or appear to the Owner to be so unbalanced as to affect or to be liable to affect adversely any interests of the Owner. The attention of the bidder is called to the fact that unbalancing of bids may adversely affect the Contractor if certain portions for the Work are increased or decreased as provided in the Contract Documents.
- D. A bidder shall state the proposed price for the work by which the bids will be compared. This price is to cover all the expenses incidental to the completion of the work in full conformity with the Contract, Specifications, and Drawings. In the event that there is a discrepancy between the unit prices and the extended totals, the unit prices shall govern. In the event that there is a discrepancy between the lump-sum or unit prices written in words and numerical figures, the prices written in words shall govern. No bid will be accepted which does not contain a unit price or lump sum as indicated for each of the applicable items enumerated in the proposal form.

1.17 REDUCTION IN SCOPE OF WORK

- A. The Owner reserves the right to decrease the scope of the work to be done under this Contract and to omit any work in order to bring the cost within available funds. To this end, the Owner reserves the right to reduce the quantity of any items or omit all of any as set forth in the BID, either prior to executing the Contract or at any time during the progress of the Work. The Owner further reserves the right, at any time during the progress of the Work, to restore all or part of any items previously omitted or reduced. Exercise by the Owner of the above rights shall not constitute any ground or basis of claim for damages or for anticipated profits on the work omitted.

1.18 CONTRACT BONDS

- A. The Bidder whose Bid is accepted agrees to furnish the Contract Bonds in the forms which follow in Section 00600, titled CONTRACT BONDS, each in the sum of the full amount of the Bid and/or Contract Price as determined by the Engineer, and duly executed and acknowledged by the said bidder as Principal and by a surety company qualified to do business under the laws of **Rhode Island** and satisfactory to the Owner, as Surety, for the faithful performance of the contract and payment for labor and materials. The premiums for such Bonds shall be paid by the Contractor.
- B. Surety Companies executing the Contract Bonds must also appear on the U.S. Treasury Department's most 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 Audit Staff Bureau of Accounts.

1.19 POWER OF ATTORNEY

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

1.20 EXECUTION OF AGREEMENT

- A. The Bidder whose Bid is accepted will be required and agrees to duly execute the AGREEMENT and furnish the required CONTRACT BONDS within the time limit stated in the BID after notification that the AGREEMENT is ready for signature.
- B. The Bidder whose Bid is accepted upon his failure or refusal to duly execute the AGREEMENT and furnish the required CONTRACT BONDS within the time limit stated in the BID, shall forfeit to the Owner as liquidated damages for such failure or refusal, the surety deposited with his BID.

1.21 INSURANCE CERTIFICATES

- A. The Contractor will not be permitted to start any construction work until he has submitted certificates covering all insurances called for under that subsection of the AGREEMENT, titled "Insurance." The Contractor shall submit said certificates using the forms supplied by the Engineer under said subsection.

1.22 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

- A. The bidder must agree to commence work on or before the date specified in the written "NOTICE TO PROCEED" issued by the Owner, and/or Engineer acting on behalf of the Owner, and to fully complete the project within the time specified in Table A of the Agreement, after the date specified in the written "NOTICE TO PROCEED" as stipulated in Table A of the AGREEMENT. The bidder must further agree to pay as liquidated damages to the Owner, the sum as specified in Table A of the Agreement for each consecutive calendar day thereafter as hereafter provided in the AGREEMENT.

1.23 LAWS AND REGULATIONS

- A. The bidder's attention is directed to the fact that all applicable Federal and State laws, municipal ordinances, and rules and regulations or authorities having jurisdiction over construction of the project, shall apply to the Contract throughout, and shall be deemed to be included in the Contract the same as though herein written out in full.

1.24 WORK ON STATE, MUNICIPAL, AND PRIVATE PROPERTY

- A. Particular attention is hereby directed to the fact that portions of the Work included under this Contract will be done within the limits of properties that are State-owned, municipal-owned, or privately owned. The Contractor shall be responsible for coordinating the prosecution of the Work of this Contract with the property owner and for providing work in accordance with any additional requirements as specified herein.

1.25 DATUM OR LEVELS

- A. The figures given in the Contract and Specifications or upon the Drawings after the word elevation, shall mean the distance in feet above mean sea level, the base of the State of **Rhode Island** and North American Vertical Datum of 1988 (NAVD88)

1.26 STATE SALES AND USE TAX

- A. Materials and equipment purchased for installation under this Contract are exempt from the **Rhode Island** Sales Tax. The Contractor shall file for exemption on behalf of the Owner with the State of **Rhode Island** Department of Taxation as required by

law. The exemption from the Sales Tax shall be taken into account by the Contractor during bidding.

1.27 MANUFACTURER'S EXPERIENCE

- A. Wherever it may be written that an equipment manufacturer must have a specified period of experience with his product, equipment which does not meet the specified experience period may be considered by the Owner and/or Engineer if the equipment supplier or manufacturer is willing to provide a sufficient bond or cash deposit as determined by the Owner and/or Engineer for the duration of the specified time period which will guarantee full replacement of that equipment in the event of failure at no additional cost to the Owner.

1.28 PROTECTION OF LIVES AND HEALTH

- A. The project is subject to all of the Safety and Health Regulations as promulgated by the United States Department of Labor (Title 29, Part 1926/1910 CFR, 1985 revisions); the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.) as supplemented by the Department of Labor Regulations (Title 29 CFR Part 5); and OSHA 2207, 1983 revisions; and all subsequent amendments thereto. Contractors are urged to make themselves familiar with the requirements of these regulations.

1.29 NONDISCRIMINATION IN EMPLOYMENT

- A. Contracts for work under this bid (proposal) will obligate the Contractors and subcontractors not to discriminate in employment practices.
- B. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, handicap, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed and the employees are treated during employment without regard to their race, color, religion, sex, age, handicap, or national origin. Such actions shall include, but not be limited to, the following: employment, upgrading; demotions, or transfers; recruitment or recruitment advertising, layoffs, or terminations; rates of pay or other forms of compensation; selection for training including apprenticeship; and participation in recreational and education activities. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notice to be provided setting forth the provisions of this non-discrimination clause. The Contractor will in all solicitations or advertisements for employees placed by or on behalf on the Contractor state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age, handicap or national origin. The Contractor will cause the foregoing provisions to be inserted in all sub-contracts for any work covered by this Contract so that such provisions will be binding upon each sub-contractor and upon sub-contracts for standard commercial supplies or raw materials.

- C. The Contractor shall keep such records and submit such reports concerning the racial and ethnic origin of applicants for employment and employees as the Owner may require as consistent with Federal and State law. The Contractor agrees to comply with such rules, regulations, or guidelines as the State of **Rhode Island** may implement these requirements. The Contractor further warrants, that he will comply with the President's Executive Order No. 11246 or any preceding similar Executive Order relating thereto.
- D. Bidders and Contractors must, if required, submit a compliance report (EPA Form 5720-4) concerning their employment practices and policies in order to maintain their eligibility to receive award of the Contract.
- E. Successful bidders and Contractors must, if required, submit a list of all Subcontractors who will perform work on the project, and written signed statements from authorized agents of labor pools with which they will or may deal with for employees on the work, together with any information to the effect that such labor pools' practices or policies are in conformity with said Executive Order that they will affirmatively cooperate in or offer no hindrance to the recruitment, employment, and equal treatment of employees seeking employment and performing work under this Contract; or a certification as to when such agents or labor pools have failed or refused to furnish them, prior to award of the Contract.
- F. The successful bidder will be required to comply with Equal Opportunity Requirements and to abide by the prevailing wage rates for Public Work Projects for all employees on the job. It is the responsibility of Bidders to inform themselves as to the local labor conditions, overtime compensation, health and welfare contributions, labor supply and prospective changes or adjustment of wage rates. Information is available at the Department of Labor.
- G. The successful bidder must be prepared to comply with the provisions of the General Laws of Rhode Island and attention is called to Title 37, Chapter 13, Section 1-16, relative to the payment of wages, obligations and charges by Contractors on public works projects. Non-resident Contractors are subject to Section 44-1-6 of the RI General Laws, as amended, regarding OUT-OF-STATE CONTRACTORS.

1.30 SEQUENCE OF OPERATIONS

- A. The Contractor must submit to the Engineer within fourteen (14) calendar days after execution of the Contractor Documents, a sequence of operations, giving detailed plans and schedules of his operation including any elements for by-pass pumping and/or flow diversion during the Work. Said sequence of operations shall be reviewed and must be approved by the Owner and Engineer prior to the start of the Work. The Owner reserves the right to limit or, if found necessary and/or required, delay construction, or certain activities thereof, in certain areas of the Contract should the Owner deem it to be in the public's best interest to do so.

- B. The Contractor shall have no claim for additional compensation or damage on account of any such delays and/or required sequence of operations.
- C. The Contractor shall maintain uninterrupted utility services at all times, and plan his work accordingly.
- D. The Contractor shall coordinate his activities with any other contract and/or contractor to complete the Work as detailed on the Plans and Specifications.

1.31 WETLANDS AND WATERWAYS

- A. The Contractor's attention is directed to the fact that a portion of the work is located within and/or immediately adjacent to wetlands and waterways. Work within these areas is subject to the jurisdiction of the Rhode Island Department of Environmental Management and Coastal Resource Management Council. All requirements and/or control measures deemed necessary by the Department shall be strictly adhered to throughout the duration of this Contract.
- B. The Contractor shall not have or assert any claim for nor shall he be entitled to any additional compensation or damages on account of requirements set forth by the Department of Environmental Management and Coastal Resource Management Council regarding the wetlands and waterways encountered during construction.

1.32 AMERICAN IRON AND STEEL REQUIREMENTS

- A. The Contractor acknowledges to and for the benefit of the Town of Burrillville (Purchaser”) and the State of Rhode Island (the “State”) that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking 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 Requirement”) 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 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. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the

Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State 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.

END OF SECTION

SECTION 00300

BID

To the Town of Burrillville, Rhode Island, herein called the "Owner", for **“Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. 20”**.

The Undersigned, as a bidder herein referred to as singular and masculine, declares as follows:

- (1) The only parties interested in this BID as Principals are named herein;
- (2) this BID is made without collusion with any other person, firm, or corporation;
- (3) no officer, agent, or employee of the Owner is directly or indirectly interested in this BID;
- (4) he has carefully examined the site of the proposed Work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed Work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this BID, and he has carefully read and examined the Drawings, the annexed proposed AGREEMENT and the Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;
- (5) he understands that information relative to subsurface and other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) has been furnished only for his information and convenience without any warranty or guarantee, expressed or implied, that the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered will be the same as those shown on the Drawings or in any of the other Contract Documents and he agrees that he shall not use or be entitled to use any such information made available to him through the Contract Documents or otherwise or obtained by him in his own examination of the site, as a basis of or ground for any claim against the Owner or the Engineer arising from or by reason of any variance which may exist between the aforesaid information made available to or acquired by him and the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered during the construction work, and he has made due allowance therefore in this BID;
- (6) and he understands that the quantities of work tabulated in this BID or indicated on the Drawings or in the Specifications or other Contract Documents are only approximate and are subject to increase or decrease as deemed necessary by the Engineer; and he agrees that, if this BID is accepted he will contract with the Owner, as provided in the copy of the Contract Documents deposited in the office of the Engineer, this BID form being part of said Contract Documents, and that he will perform all the work and furnish all the materials and equipment, and provide all labor, services, plant, machinery, apparatus, appliances, tools, supplies and all other things required by the Contract Documents in the manner and within the time therein prescribed and according to the requirements of the

Engineer as therein set forth, and that he will take in full compensation therefore the total dollar amount tabulated from the actual measured quantities of said work and each unit or lump sum price stated in this BID as hereinafter set forth.

(Note: All entries in the entire BID must be made clearly and in ink; price bid must be written in both words and figures.)

<u>Item Number</u>	<u>Estimated Quantity</u>	<u>Brief Description: unit or lump-sum price bid in both words and figures.</u>	<u>Total in Figures</u>
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BASE BID

1.1	1 LS	WWTF headworks improvements complete, as indicated on the drawings and as specified, for the lump sum of _____dollars and _____ cents (\$ _____) \$ _____	
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1.2	10* Each	Clean existing wet wells complete, as indicated on the drawings and as specified, per day _____dollars and _____ cents (\$ _____) \$ _____	
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1.3	50* Ton	Dewatering of wet well debris, complete as specified, per Ton _____dollars and _____ cents (\$ _____) \$ _____	
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1.4	50* Ton	Disposal of dewatered wet well debris, complete as specified, per Ton _____dollars and _____ cents (\$ _____) \$ _____	
-----	------------	---	--

2.1	1 LS	Construct Oakland Pump Station improvements complete, as indicated on the drawings and as specified, for the lump sum of _____dollars and _____ cents (\$ _____) \$ _____	
-----	---------	--	--

<u>Item Number</u>	<u>Estimated Quantity</u>	<u>Brief Description: unit or lump-sum price bid in both words and figures.</u>	<u>Total in Figures</u>
2.2	400* Gallon	Pumping, removal, handling, and disposal of liquid virgin fuel from existing tanks, complete as required and directed, per gallon, _____dollars and _____ cents (\$ _____) \$ _____	
2.3	100* Gallon	Pumping, removal, handling and disposal of liquid fuel residuals from existing tanks, complete as required and directed, per gallon, _____dollars and _____ cents (\$ _____) \$ _____	
2.4	50* Ton	Excavation, removal, transportation, and disposal of petroleum impacted soil, complete as required and directed, per gallon, _____dollars and _____ cents (\$ _____) \$ _____	
2.5	1 LS	Corrosion testing Oakland Pump Station allowance, the lump sum, <u>Twenty Five Thousand</u> dollars and <u>zero</u> cents (\$ <u>25,000.00</u>) <u>\$ 25,000.00</u>	

* - Indeterminate quantity for comparison of Bids

ADD/ALTERNATE ITEMS

ADD/ALTERNATE NO. A-1 is for improvements associated with and specifically located (as indicated within the Bidding Documents) within the headworks at the wastewater treatment facility. This work is supplemental to the improvements included within the Base Bid Items presented on Page 00300-3 to 00300-5.

Additional item(s) for ADD ALTERNATE NO. A-1:

<u>Item Number</u>	<u>Brief Description:</u>	<u>Lump Sum Prices</u>
A-1	Electric hoist and trolley, complete as indicated on the drawings and as specified, _____dollars and _____ cents (\$ _____) \$ _____	

ADD/ALTERNATE NO. A-2 is for improvements associated with and specifically located (as indicated within the Bidding Documents) at the headworks at the wastewater treatment facility. This work is supplemental to the improvements included within the Base Bid Items presented on Page 00300-3 to 00300-5.

Additional item(s) for ADD ALTERNATE NO. A-2:

<u>Item Number</u>	<u>Brief Description:</u>	<u>Lump Sum Prices</u>
A-2	Vertical conveyor and discharge platform, complete as indicated on the drawings and as specified, _____dollars and _____ cents (\$ _____) \$ _____	

ADD/ALTERNATE NO. A-3 is for improvements associated with and specifically located (as indicated within the Bidding Documents) at the headworks at the wastewater treatment facility. This work is supplemental to the improvements included within the Base Bid Items presented on Page 00300-3 to 00300-5.

Additional item(s) for ADD ALTERNATE NO. A-3:

<u>Item Number</u>	<u>Brief Description:</u>	<u>Lump Sum Prices</u>
A-3	Pump Room Piping Replacement, complete as indicated on the drawings and as specified,	
		_____dollars
	and _____cents (\$_____)	
	\$_____	

The undersigned agrees that for extra work, if any, performed in accordance with the terms and provisions of the annexed form of AGREEMENT, he will accept compensation as stipulated therein as full payment for such extra work.

If the Bid is accepted by the OWNER, the undersigned agrees to commence work under this Contract on a date to be specified in a written "Notice to Proceed" by the Owner and complete the entire work provided to be done under this Contract within the time stipulated in Table "A" of the AGREEMENT. If this bid is accepted by the Owner, the undersigned, also agrees to comply with the provisions of Section 00200 1.22 "Liquidated Damages" and Table A of the Agreement.

As provided in the INFORMATION FOR BIDDERS, the bidder hereby agrees that he will not withdraw this BID, within 90 consecutive calendar days after the actual date of the opening of Bids, and that, if the Owner shall accept this BID, the bidder will duly execute and acknowledge the AGREEMENT and furnish, duly executed and acknowledged, the required CONTRACT BONDS within ten (10) calendar days after notification that the AGREEMENT and other Contract Documents are ready for signature.

Should the bidder fail to execute any of his agreements as hereinabove set forth, the Owner shall have the right to retain as liquidated damages, the Bid Security attached in the sum of (5 percent of Total Bid)

_____ Dollars,

(\$ _____) which shall become the Owner's property for the delay and additional expense to the Owner caused thereby. If a bid bond was given, it is agreed that the amount thereof shall be paid as liquidated damages to the Owner by the Surety. (Bidder must fill in this blank.)

The bidder hereby acknowledges the receipt of, and has included in this BID, the following Addenda:

(To be filled in by Bidder, if Addendums are issues.)

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

The bidder, by submittal of this BID, agrees with the Owner that the amount of the bid security deposited with this BID fairly and reasonably represents the amount of damages the Owner will suffer due to the failure of the bidder to fulfill his agreements as above provided.

(SEAL)

(Name of Bidder) L.S.

By _____
(Signature and title of authorized representative)

(Business address)

(City and State)

Date _____

The bidder is a corporation incorporated in the State (or Commonwealth) of _____ - a partnership - an individual. (Bidder must add and delete as necessary to make this sentence read correctly.)

(Note: If the bidder is a corporation, affix corporate seal and give below the names of its president treasurer, and general manager, if any; if a partnership, give full names and residential addresses of all partners; and if an individual, give residential address, if different from business address.)

The required names and addresses of all persons interested in the foregoing Bid, as Principals, are as follows:

(Add supplementary page if necessary)

CERTIFICATE OF AUTHORIZATION
FOR
BIDDING REPRESENTATIVE

(Note: Bidder must complete for certification of authorized representative signing Bid.)

At a duly authorized meeting of the Board of Directors of the

_____ held on _____,
(Name of Corporation) (Date)

at which all the Directors were present or waived notice, it was voted that

_____ (Title)
(Name of Authorized Representative)

of this company shall be, and hereby is, authorized to execute bidding documents, contracts and bonds in the name and on behalf of said company, and to affix the corporate seal thereto, and such execution of any contract obligation in this company's name on its behalf of such

_____ under seal of the company shall be valid and binding upon this company.
(Title)

A true copy

ATTEST _____
(Clerk)

Place of Business _____

I hereby certify that I am the clerk of the _____
(Name of Corporation)

_____, that _____
(Name of Authorized Representative)

is the duly elected _____ of said company, and that the
(Title)

above vote has not been amended or rescinded and remains in full force and effect as of the date of this contract.

Corporate
Seal

(Clerk)

STATEMENT OF BIDDERS' QUALIFICATIONS

The following shall accompany the bid and is required as evidence of the bidder's qualifications to perform the work, as bid upon, in accordance with the contract drawings and specifications. This statement must be notarized. All questions must be answered. Additional data may be submitted on separate attached sheets.

- 1. Name of Bidder _____
- 2. Permanent Main Office Address _____
- 3. Official Mailing Address For This Contract _____
- 4. When Organized? _____
- 5. Where Incorporated, If a Corporation _____
- 6. Years Contracting under Present Name _____
- 7. List contracts on hand, and those completed similar in nature to this kind of project.

Owner/Ph.#	Engineer/Ph.#	Contract	Description	Contract Amount	Completion Date
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

- 8. List any work the firm has failed to complete, state where and why.

- 9. If you have ever defaulted on any contract, state where and why.

10. List full names and residences of all principals (i.e.: Officers, Directors, Partners, Owners) interested in this bid.

<u>Name</u>	<u>Residence</u>	<u>Title</u>	<u>Firm</u>

11. State name(s) and qualifications of resident supervisor(s) for this project.

12. List major equipment available for this project and identify ownership or rental.

13. Will you furnish a detailed financial statement and other information, requested by the Owner?

14. List bank references for verifying financial ability of your company.

Name	Address

15. The undersigned hereby authorized and requests any person, firm or corporation, to furnish all information requested by the Owner and/or its designated agents relative to the recitals comprising this Statement of the Bidder's Qualifications.

Dated at _____ this _____ day of _____ 20_____.

(Name of Bidder)

By: _____

(Title)

State of _____

County of _____

_____ being duly sworn in person, deposes and says

That he is _____ of _____,
(Title) (Name of Bidder)

that he is the firm's duly authorized agent to execute these contract documents, and that the answers to the foregoing questions and all statements therein contained are correct and true.

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

(SEAL)

(Notary Public)

(My Commission Expires)

STATEMENT OF PROPOSED SUBCONTRACTORS

The following shall accompany the bid and is required as evidence of the bidder's qualifications to perform the work as bid upon, in accordance with the contract drawings and specifications. The Bidder must state the names and appurtenant information of all major subcontractors he proposed to use to complete the work as bid upon. Additional data may be submitted on separate attached sheets.

If subcontractors are not to be used to complete the Work and/or any portion thereof, as herein bid upon, the Bidder must acknowledge by writing "NONE" _____.

Description of Work _____

Approximate percentage of Total Bid _____

Proposed Subcontractor, Name _____

Address _____

Description of Work _____

Approximate percentage of Total Bid _____

Proposed Subcontractor, Name _____

Address _____

Description of Work _____

Approximate percentage of Total Bid _____

Proposed Subcontractor, Name _____

Address _____

Bidder to insert description of work, percentage of Total BID, and subcontractors' names as may be required.

This is to certify that all names of the above-mentioned subcontractors are submitted with full knowledge and consent of the respective parties.

The Bidder warrants that none of the proposed subcontractors have any conflict of interest as respects this contract.

Date _____

Bidder

(Name of Bidder)

By

(Signature)

(Title)

(Business Address)

(City and State)

AMERICAN IRON AND STEEL REQUIREMENTS

The Contractor acknowledges to and for the benefit of the Town of Bristol (Purchaser”) and the State of Rhode Island (the “State”) that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking 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 Requirement”) including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State 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. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State 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.

This bidder certifies that the requirements of the P.L. 113-76 “Consolidated Appropriations Act, 2014” will be satisfied:

Date _____

Bidder

(Name of Bidder)

By _____
(Signature)

(Title)

(Business Address)

(City and State)

STATE OF RHODE ISLAND

UTILIZATION OF MINORITY BUSINESS ENTERPRISES

This project is subject to Chapter 37-14.1 of the Rhode island General Laws, and regulations promulgated thereunder, which require that ten percent (10%) of the dollar value of work performed on the project be performed by minority business enterprises.

The Bidder, as part of the Bid, must submit a MBE PLAN outlining the manner in which he shall make a substantial and concerted effort to meet the ten percent (10%) MBE requirement and submit said plan to the Director of the Rhode Island Department of Administration for approval.

The plan shall include a projection of the number and types of subcontracts to be awarded and a projection of the number and types of MBE's likely to be available to compete for subcontracts from the prime contractor over the period of the project.

PROPOSED MBE PLAN

(All bidders must complete and submit this State Plan with Bid, attach additional sheets as needed)

Proposed MBE Subcontractor	Description of Work	Dollar Value (\$)	% of Total Contract
Total MBE Participation		\$ _____	

Bidder to insert description of work, percentage of Total BID, and MBE subcontractors' names as may be required.

This is to certify that all names of the above-mentioned MBE subcontractors are submitted with full knowledge and consent of the respective parties.

The Bidder warrants that none of the proposed MBE subcontractors have any conflict of interest as respects this contract.

Date _____

Bidder

(Name of Bidder)

By

(Signature)

(Title)

(Business Address)

(City and State)

DEBARMENT & SUSPENSION

Executive Order 12549--Debarment and Suspension

Source: The provisions of Executive Order 12549 of Feb. 18, 1986, appear at 51 FR 6370, 3 CFR, 1986 Comp., p. 189, unless otherwise noted.

By the authority vested in me as President by the Constitution and laws of the United States of America, and in order to curb fraud, waste, and abuse in Federal programs, increase agency accountability, and ensure consistency among agency regulations concerning debarment and suspension of participants in Federal programs, it is hereby ordered that:

Section 1. (a) To the extent permitted by law and subject to the limitations in Section 1(c), Executive departments and agencies shall participate in a system for debarment and suspension from programs and activities involving Federal financial and nonfinancial assistance and benefits. Debarment or suspension of a participant in a program by one agency shall have government-wide effect. (b) Activities covered by this Order include but are not limited to: grants, cooperative agreements, contracts of assistance, loans, and loan guarantees. (c) This Order does not cover procurement programs and activities, direct Federal statutory entitlements or mandatory awards, direct awards to foreign governments or public international organizations, benefits to an individual as a personal entitlement, or Federal employment.

Sec. 2. To the extent permitted by law, Executive departments and agencies shall: (a) Follow government-wide criteria and government-wide minimum due process procedures when they act to debar or suspend participants in affected programs. (b) Send to the agency designated pursuant to Section 5 identifying information concerning debarred and suspended participants in affected programs, participants who have agreed to exclusion from participation, and participants declared ineligible under applicable law, including Executive Orders. This information shall be included in the list to be maintained pursuant to Section 5. (c) Not allow a party to participate in any affected program if any Executive department or agency has debarred, suspended, or otherwise excluded (to the extent specified in the exclusion agreement) that party from participation in an affected program. An agency may grant an exception permitting a debarred, suspended, or excluded party to participate in a particular transaction upon a written determination by the agency head or authorized designee stating the reason(s) for deviating from this Presidential policy. However, I intend that exceptions to this policy should be granted only infrequently.

Sec. 3. Executive departments and agencies shall issue regulations governing their implementation of this Order that shall be consistent with the guidelines issued under Section 6. Proposed regulations shall be submitted to the Office of Management and Budget for review within four months of the date of the guidelines issued under Section 6. The Director of the Office of Management and Budget may return for reconsideration proposed regulations that the Director believes are inconsistent with the guidelines. Final regulations shall be published within twelve months of the date of the guidelines.

Sec. 4. There is hereby constituted the Interagency Committee on Debarment and Suspension, which shall monitor implementation of this Order. The Committee shall consist of representatives of agencies designated by the Director of the Office of Management and Budget.

Sec. 5. The Director of the Office of Management and Budget shall designate a Federal agency to perform the following functions: maintain a current list of all individuals and organizations excluded from program participation under this Order, periodically distribute the list to Federal agencies, and study the feasibility of automating the list; coordinate with the lead agency responsible for government-wide debarment and suspension of contractors; chair the Interagency Committee established by Section 4; and report periodically to the Director on implementation of this Order, with the first report due within two years of the date of the Order.

Sec. 6. The Director of the Office of Management and Budget is authorized to issue guidelines to Executive departments and agencies that govern which programs and activities are covered by this Order, prescribe government-wide criteria and government-wide minimum due process procedures, and set forth other related details for the effective administration of the guidelines.

Sec. 7. The Director of the Office of Management and Budget shall report to the President within three years of the date of this Order on Federal agency compliance with the Order, including the number of exceptions made under Section 2(c), and shall make recommendations as are appropriate further to curb fraud, waste, and abuse.

Implementation in the SRF Programs

A company or individual who is debarred or suspended cannot participate in primary and lower-tiered covered transactions. These transactions include SRF loans and contracts and subcontracts awarded with SRF loan funds.

Under 40 C.F.R. 32.510, the SRF agency must submit a certification stating that it shall not knowingly enter into any transaction with a person who is proposed for debarment, suspended, declared ineligible, or voluntarily excluded from participation in the SRF program. This certification is reviewed by the EPA regional office before the capitalization grant is awarded.

A recipient of SRF assistance directly made available by capitalization grants must provide a certification that it will not knowingly enter into a contract with anyone who is ineligible under the regulations to participate in the project. Contractors on the project have to provide a similar certification prior to the award of a contract and subcontractors on the project have to provide the general contractor with the certification prior to the award of any subcontract.

In addition to actions taken under 40 C.F.R. Part 32, there are a wide range of other sanctions that can render a party ineligible to participate in the SRF program. Lists of debarred, suspended and otherwise ineligible parties are maintained by the General Services Administration and should be checked by the SRF agency and all recipients of funds directly made available by capitalization grants to ensure the accuracy of certifications.

Additional References: C 40 C.F.R. Part 32: EPA Regulations on Debarment and Suspension.

CERTIFICATION REGARDING DEBARMENT & SUSPENSION
AND OTHER RESPONSIBILITY MATTERS

In accordance with the Executive Order 12549, the prospective primary participant certifies to the best of his / her knowledge and belief, that its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
- b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification.
- d. Have not within a three-year period preceding this application / proposal had one or more public transactions (federal, state, or local) terminated for cause of default.
- e. Acknowledge that all sub-contractors selected for this project must be in compliance with paragraphs (1) (a – d) of this certification.

Name and Title of Authorized Agent

Date

Signature of Authorized Agent

_____ I am unable to certify to the above statements. My explanation is attached.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

UTILIZATION OF DISADVANTAGED BUSINESS ENTERPRISES

This project is subject to the Environmental Protection Agency's requirements for Disadvantaged Business Enterprise (DBE).

The Bidder, as part of the Bid, must submit the following completed EPA Disadvantaged Business Enterprise Forms (attached to this Specification Section):

- **EPA Form 6100-3: DBE Program Subcontractor Performance Form**
- **EPA Form 6100-4: DBE Program Subcontractor Utilization Form**

EPA Form 6100-3 must be completed for each Subcontractor.

Upon completion of the Contract, the Contractor shall provide the following EPA Disadvantaged Business Enterprise Form (also attached to this Specification Section) to the DBE Subcontractor(s) for submittal to the EPA DBE Coordinator:

- **EPA Form 6100-2: DBE Program Subcontractor Participation Form**

EPA Region 1 DBE Program Coordinator Contact Information:

Larry Wells
(617) 918-1836
wells.larry@epa.gov

The successful Bidder shall comply with the appropriate sections of the "Good Faith Efforts" Fact Sheet, attached to this Specification Section.

The Bidder warrants that none of the proposed DBE subcontractors have any conflict of interest as respects this contract.

Date _____

Bidder:

(Name of Bidder)

By:

(Signature)

(Title)

(Business Address)

(City and State)

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SECTION 00300 ATTACHMENTS

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Good Faith Efforts

What is the Purpose of the Good Faith Efforts?

The Good Faith Efforts are methods employed by all EPA financial assistance agreement recipients to ensure that disadvantaged business enterprises (DBEs) have the opportunity to compete for procurements funded by EPA financial assistance funds.

What Are the Good Faith Efforts?

- ❖ Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and local government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
- ❖ 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.
- ❖ 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.
- ❖ Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
- ❖ Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.
- ❖ If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

What are the New Contract Administration Provisions?

When the DBE rule goes into effect, there are a number of new provisions designed to prevent unfair practices that adversely affect DBEs. Those provisions are as follows:

- ❖ A recipient must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient.
- ❖ A recipient must be notified in writing by its prime contractor prior to any

termination of a DBE subcontractor for convenience by the prime contractor.

- ❖ If a DBE subcontractor fails to complete work under the subcontract for any reason, the recipient must require the prime contractor to employ the Six Good Faith Efforts if soliciting a replacement subcontractor.
- ❖ A recipient must require its prime contractor to employ the Six Good Faith Efforts even if the prime contractor has achieved its fair share objectives.

What are the New Forms Associated With the New Contract Administration Provisions?

EPA Form 6100-2 - DBE Program Subcontractor Participation Form. This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid and any other concerns the DBE subcontractor might have.

EPA Form 6100-3 - DBE Program Subcontractor Performance Form. This form captures an intended subcontractor's description of work to be performed for the prime contractor and the price of the work submitted to the prime.

EPA Form 6100-4 – DBE Program Subcontractor Utilization Form. This form captures the prime's intended use of an identified DBE subcontractor, and the estimated dollar amount of the subcontract.

Form	Requirement	Provided By	Completed By	Submitted To
EPA Form 6100-2	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	EPA DBE Coordinator
EPA Form 6100-3	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Recipients as part of bid or proposal package
EPA Form 6100-4	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	Recipients as part of bid or proposal package



Environmental
Protection Agency

OMB Control No: _____
Approved: _____
Approval Expires: _____

**Disadvantaged Business Enterprise Program
DBE Subcontractor Participation Form**

NAME OF SUBCONTRACTOR¹	PROJECT NAME
ADDRESS	CONTRACT NO.
TELEPHONE NO.	E-MAIL ADDRESS
PRIME CONTRACTOR NAME	

Please use the space below to report any concerns regarding the above EPA-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	AMOUNT SUBCONTRACTOR WAS PAID BY PRIME CONTRACTOR

_____	_____
Subcontractor Signature	Title/Date

¹Subcontractor 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.



Environmental
Protection Agency

OMB Control No: _____
Approved: _____
Approval Expires: _____

Disadvantaged Business Enterprise Program DBE Subcontractor Participation Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose 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 the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Participation Form to this address.



Environmental
Protection Agency

OMB Control No: _____
Approved: _____
Approval Expires: _____

**Disadvantaged Business Enterprise Program
DBE Subcontractor Performance Form**

NAME OF SUBCONTRACTOR¹	PROJECT NAME
ADDRESS	BID/PROPOSAL NO.
TELEPHONE NO.	E-MAIL ADDRESS

PRIME CONTRACTOR NAME

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES BID TO PRIME	PRICE OF WORK SUBMITTED TO PRIME CONTRACTOR

Currently certified as an MBE or WBE under EPA's DBE Program? _____ Yes _____ No

_____	_____
Signature of Prime Contractor	Date
_____	_____
Print Name	Title
_____	_____
Signature of Subcontractor	Date
_____	_____
Print Name	Title

¹Subcontractor 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.



Environmental
Protection Agency

OMB Control No: _____
Approved: _____
Approval Expires: _____

Disadvantaged Business Enterprise Program DBE Subcontractor Performance Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose 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.

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Environmental
Protection Agency

OMB Control No: _____
Approved: _____
Approval Expires: _____

**Disadvantaged Business Enterprise Program
DBE Subcontractor Utilization Form**

BID/PROPOSAL NO.	PROJECT NAME
NAME OF PRIME BIDDER/PROPOSER	E-MAIL ADDRESS
ADDRESS	
TELEPHONE NO.	FAX NO.

The following subcontractors¹ will be used on this project:			
COMPANY NAME, ADDRESS, PHONE NUMBER, AND E-MAIL ADDRESS	TYPE OF WORK TO BE PERFORMED	ESTIMATE D DOLLAR AMOUNT	CURRENTLY CERTIFIED AS AN MBE OR WBE?

I certify under penalty of perjury that the forgoing statements are true and correct. 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).

_____	_____
Signature Of Prime Contractor	Date
_____	_____
Print Name	Title

¹Subcontractor 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.



Environmental
Protection Agency

OMB Control No: _____
Approved: _____
Approval Expires: _____

Disadvantaged Business Enterprise Program DBE Subcontractor Utilization Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose 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 the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Utilization Form to this address.

SECTION 00400

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned (Insert Name of Bidder)
_____, as Principal, and (Insert Name of Surety)
_____, as Surety, are hereby held
and firmly bound and obligated unto the Town of Burrillville, Rhode Island, as Owner, in the
sum
of _____ Dollars (\$_____),
as liquidated damages for payment of which, well and truly to be made, we hereby jointly and
severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the
Town of Burrillville, Rhode Island a certain Bid attached hereto and hereby made a part hereof,
to enter into a contract in writing, hereinafter referred to as the "AGREEMENT" and/or
"Contract", for **“Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station
Improvements, Contract No. _____”**.

NOW THEREFORE,

- (a) If said BID shall be rejected or withdrawn as provided in the INFORMATION FOR
BIDDERS attached hereto or, in the alternative,
- (b) If said BID shall be accepted and the Principal shall duly execute and deliver the form of
AGREEMENT attached hereto and shall furnish the specified bonds for the faithful
performance of the AGREEMENT and/or Contract and for the payment for labor and
materials furnished for the performance of the AGREEMENT and/or Contract,

then this obligation shall be void, otherwise it shall remain in full force and effect; it being
expressly understood and agreed that the liability of the Surety for any and all claims hereunder
in no event shall exceed the amount of this obligation.

The Surety, for value received, hereby agrees that the obligations of said Surety and its bond
shall in no way be impaired or affected by any extensions of the time with which such BID may
be accepted, and said Surety does hereby waive notice of any such extensions.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, have duly executed this bond on the _____ day of _____, 20 _____.

(SEAL)

(Name of Principal) L.S.

BY: _____
(Signature)

(Title)

(Name of Surety (Seal)

BY: _____
(Signature and Title)

BY: _____
Attorney-In-Fact

Sealed and delivered in
the presence of:

IMPORTANT: Surety Companies executing BONDS must appear on the U.S. Treasury Department's most 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 Audit Staff Bureau of Accounts and be authorized to transact business in the state where the PROJECT is located.

If the Bond is signed on behalf of the Surety by an Attorney-In-Fact, there should be attached, a duly certified copy of his power of attorney showing his authority to sign such Bond.

SECTION 00500

CONTRACT AGREEMENT
TOWN OF BURRILLVILLE, RHODE ISLAND

“HEADWORKS AND OAKLAND PUMP STATION IMPROVEMENTS,
CONTRACT NO. _____”

THIS AGREEMENT, is executed this _____ day of _____ in the year Two Thousand and Twenty Two (herein referred to as the "AGREEMENT") by and between the **Town of Burrillville, Rhode Island**, party of the first part, and _____ (Name of Contractor) party of the second part.

WITNESSETH, that the parties to these presents, each in consideration of the undertakings, promises, and agreements on the part of the other herein contained, have undertaken, promised, and agreed and do hereby undertake, promise, and agree, the party of the first part for itself, its successors and assigns, and the party of the second part for himself and his heirs, executors, administrators, successors and assigns, as follows:

1.01	Definitions	1.30	Prices for Work
1.02	The Contract Documents	1.31	Moneys May Be Retained
1.03	Obligations and Liability of Contractor	1.32	Formal Acceptance
1.04	Authority of the Engineer	1.33	Progress Estimates
1.05	Supervision of Work	1.34	Partial Acceptance
1.06	Insurance	1.35	Final Estimate and Payment
1.07	Patents	1.36	Liens
1.08	Compliance with Laws	1.37	Claims
1.09	Provisions Required by Law Deemed Inserted	1.38	Application of Moneys Retained
1.10	Permits	1.39	No Waiver
1.11	Not to Sublet or Assign	1.40	Liability of Owner
1.12	Delay by Owner	1.41	Guarantee
1.13	Time for Completion	1.42	Retain Money for Repairs
1.14	Liquidated Damages	1.43	Return of Drawings
1.15	Night, Saturday, Sunday and Holiday Work	1.44	Cleaning Up
1.16	Employ Competent Persons	1.45	Legal Address of Contractor
1.17	Employ Sufficient Labor and Equipment	1.46	Headings
1.18	Intoxicating Liquors and/or Drugs	1.47	Modification or Termination
1.19	Access to Work	1.48	Remedies and Arbitration
1.20	Examination of Work	1.49	Direct Labor cost
1.21	Defective Work, Etc.	1.50	Minority Business
1.22	Protection Against Water and Storm	1.51	Termination for Convenience
1.23	Right to Materials	1.52	Equal Employment Opportunity...
1.24	Changes	1.53	USEPA DBE Requirements
1.25	Extra Work	1.54	Davis Bacon Act
1.26	Extension of Time on Account of Extra Work	1.55	American Iron and Steel Requirements
1.27	Changes Not to Affect Bonds		
1.28	Claims for Damages		
1.29	Abandonment of Work or Other Default		

1.01 DEFINITIONS

Wherever the words hereinafter defined or pronouns used in their stead occur in the Contract Documents, they shall have the following meaning indicated which

shall be applicable to both the singular and plural thereof:

ADDENDA - Written or graphic instruments prior to the opening of Bids which Clarify, correct or change the Bidding Requirements or Contract Documents.

AGREEMENT - the written contract between Owner and Contractor covering the Work to be performed.

"AS DIRECTED," "AS ORDERED," "AS REQUESTED," "AS REQUIRED", "AS PERMITTED," or words of like import are used, it shall be understood that the direction, order, request, requirement, or permission of the Engineer is intended.

"APPROVED," "ACCEPTABLE," "SUITABLE," "SATISFACTORY," and words of like import shall mean approved by, acceptable to, suitable to, or satisfactory to the Engineer.

APPLICATION FOR PAYMENT - Form used by Contractor in requesting progress or final payments, format to be acceptable to the Engineer.

bid - The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidder - Any person, firm or corporation submitting a bid for the work.

CHANGE ORDER - A document recommended by the Engineer, which is signed by the Contractor and Owner authorizing the addition, deletion or revision in the Work, or adjustment in the Contract Price or Contract Time, issued on or after the effective date of the Agreement.

CONTRACTOR - The person, firm or corporation with whom the Owner has entered into the Agreement.
Contract Bonds - Bid, Performance, and Labor and Materials Bonds and other instruments of security furnished by the Contractor and his surety in accordance with the Contract Documents.

CONTRACT DOCUMENTS - The Agreement, Addenda, Bid, Post Bid documentation submitted prior to the Notice Award, The Notice to Proceed, Bonds, General Conditions, Supplementary Conditions, The Specifications, the Drawings, all written Amendments, Change Orders, Field Orders, and Engineers written interpretations and clarifications.

Contract Price - The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

Contract Time - The number of calendar days stated in the Contract Documents for the completion of the Work.

Construction superintendent - That person designated by the Contractor to carry out the provisions of the Contract.

Datum or levels - The figures given in the Contract and Specifications or upon the Drawings after the word elevation or abbreviation of it, shall mean the distance in feet above mean sea level, the base of the State in which the Work is located and the United States Geodetic Survey (U.S.G.S.).

Drawings - The part of the Contract Drawings which show the characteristics and Scope of the Work to be performed and which have been prepared or approved by the Engineer.

EARTH - Wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material other than rock as defined in this section.

Elevation - The figures given on the Drawings or in the other Contract Documents after the word "elevation" or abbreviation of it shall mean the distance in feet above the datum adopted by the Engineer.

Engineer - The person, firm or corporation duly appointed by the Owner to undertake the duties and powers herein assigned to the Engineer, acting either directly or through duly authorized representatives. (For this Contract, BETA Group, Inc.)

FIELD ORDER - A written order issued by the Engineer which orders minor changes in the Work which do not involve a change in the Contract Price or an extension of the Contract time.

GENERAL REQUIREMENTS - Sections of Division 1 of the Specifications.

"HEREIN," "HEREINAFTER," "HEREUNDER," and words of like import shall be deemed to refer to the Contract Documents.

Notice of award - The written notice of the acceptance of the Bid from the Owner to the successful Bidder.
notice to proceed - Written communication issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

OWNER - The public body or authority, corporation, association, firm or person with whom the Contractor has entered into the Agreement and for whom the Work is to be provided.

project or contract - The undertaking to be performed in the Contract Documents.

project representative - The authorized representative of the owner who is assigned to the project site or any part thereof.

ROCK - wherever used as the name of an excavated material to be excavated, shall mean only boulders and pieces of concrete and masonry exceeding 1 cu. yd. in volume, or igneous, sedimentary, metamorphic, and conglomerate rock which, in the opinion of the Engineer, requires, for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel, no loose, shaken, or previously blasted rock or broken stone in rock fillings, or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as "rock."

SHOP DRAWINGS - All drawings, diagrams, schedules and other data or information prepared for and submitted by the Contractor, to illustrate portions of the Work.

SPECIFICATIONS - The portions of the Contract documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.
subcontractor - An individual, firm or corporation, approved by the Owner and Engineer having a direct contract with the Contractor or with any other Sub-Contractor for the performance of a part of the Work on the Project.

SUBSTANTIAL COMPLETION - Date certified by the Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for which it was intended, as expressed in the Contract documents.

SUPPLEMENTARY CONDITIONS - The part of the Contract Documents which amends or supplements the General Conditions.

supplier - Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

written notice - Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service

thereof completed when posted by certified or registered mail to the said party at his last given address or delivered in person to said party or his authorized representative on the Work.

WORK - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

1.02 THE CONTRACT DOCUMENTS

A. The Contract Documents, as defined above, are sometimes herein referred to as the "Contract".

The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. In the event of any conflict or inconsistency between the provisions of the AGREEMENT and the provisions of any of the other Contract Documents, the provisions of the AGREEMENT shall prevail.

A. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the edition of the standard specification, manual, code or laws or regulations identified in the reference. In the event a particular edition is not identified, the reference shall mean the latest amended edition in effect at the time of receipt of the Bid. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall change the duties and responsibilities of the Owner, the Contractor or the Designer, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the Engineer, or any of the Engineer's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the provisions of the AGREEMENT.

1.03 OBLIGATIONS AND LIABILITY OF CONTRACTOR

A. The Contractor shall do all the work and perform and furnish all the labor, services, materials, equipment, plant, machinery, apparatus, appliances,

tools, supplies and all other things (except as otherwise expressly provided herein) necessary and as herein specified for the proper performance and completion of the Work in the manner and within the time hereinafter specified, in strict accordance with the Drawings, Specifications and other Contract Documents, in conformity with the directions and to the satisfaction of the Engineer, and at the prices herein agreed upon therefor.

B. All parts of the Work and all fixtures, equipment, apparatus and other items indicated on the Drawings and not mentioned in the Specifications, or vice versa, and all work and material usual and necessary to make the work complete in all its parts, including all incidental work necessary to make it complete and satisfactory and ready for use and operation, whether or not they are indicated on the Drawings or mentioned in the Specifications, shall be furnished and executed the same as if they were called for both by the Drawings and by the Specifications.

C. The Contractor shall coordinate his operations with those of any other contractors who may be employed on other work of the Owner, shall avoid interference therewith, and shall cooperate in the arrangements for storage of materials and equipment.

D. The Contractor shall conduct his work so as to interfere as little as possible with private business and public travel. Wherever and whenever necessary or required, he shall maintain fences, furnish watchmen, maintain lights, and take such other precaution as may be necessary to protect life and property.

E. The Contractor shall indemnify and save harmless the Owner and the Engineer and their officers, agents, servants and employees, from and against any and all claims, demands, suits, proceedings, liabilities, judgments, awards, losses, damages, costs and expenses, including attorneys' fees, on account of bodily injury, sickness, disease or death sustained by any person or persons or injury or damage to or destruction of any property, directly or indirectly arising out of, relating to or in connection with the Work, whether or not due or claimed to be due in whole or in part to the active, passive or concurrent negligence or fault of the Contractor, his officers, agents, servants or employees, any of his subcontractors, or any of their respective officers, agents, servants or employees and/or any other person or persons, and whether or not such claims, demands, suits or proceedings are just, unjust, groundless, false or fraudulent; and the Contractor shall and does hereby

assume and agrees to pay for the defense of all such claims, demands, suits and proceedings, provided, however, that the Contractor shall not be required to indemnify the Engineer, his officers, agents, servants or employees, against any such damages occasioned solely by defects in maps, plans, drawings, designs or specifications prepared, acquired or used by the Engineer and/or solely by the negligence or fault of the Engineer; and provided further, that the Contractor shall not be required to indemnify the Owner, his officers, agents, servants or employees, against any such damages occasioned solely by acts or omissions of the Owner other than supervisory acts or omissions of the Owner in the Work.

F. The Contractor shall have complete responsibility for the Work and the protection thereof, and for preventing injuries to persons and damage to the Work and property and utilities on or about the Work, until final completion and final acceptance thereof. He shall in no way be relieved of his responsibility by and right of the Engineer to give permission or directions relating to any part of the Work, by any such permission or directions given, or by failure of the Engineer to give such permission or directions. The Contractor shall bear all costs, expenses, losses and damages on account of the quantity or character of the Work or the nature of the land (including but not limited to subsurface conditions) in or under or on which the Work is done being different from that indicated or shown in the Contract Documents or from what was estimated or expected, or on account of the weather, elements, or other causes.

G. The Contractor shall conduct his operations so as not to damage existing structures or work installed either by him or by other contractors. In case of any such damage resulting from his operations, he shall repair and make good as new the damaged portions at his own expense with the consent of the damaged party. In the event that consent is not given, the Contractor shall continue liable for the damage caused.

H. The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors, their officers, agents, servants and employees as he is for his own acts and omissions and those of his own officers, agents, servants and employees.

I. Should the Contractor sustain any loss, damage or delay through any act or omission of any other contractor or any subcontractor of any such other contractor, the Contractor shall have no claim against the Owner therefor, other than for an extension of time,

but shall have recourse solely to such other contractor or subcontractor.

J. If any other contractor or any subcontractor of any such other contractor shall suffer or claim to have suffered loss, damage or delay by reason of the acts or omissions of the contractor or of any of his subcontractors, the Contractor agrees to assume the defense against any such claim and to reimburse such other contractor or subcontractor for such loss or damage.

K. The Contractor agrees to and does hereby indemnify and save harmless the Owner from and against any and all claims by such other contractors or subcontractors alleging such loss, damage or delay from and against any and all claims, demands, suits, proceedings, liabilities, judgments, awards, losses, damages, costs and expenses, including attorneys' fees, arising out of, relating to or resulting from such claims.

L. The Contractor shall promptly pay all federal, state and local taxes which may be assessed against him in connection with the Work or his operations under the AGREEMENT and/or the other Contract Documents, including, but not limited to, taxes attributable to the purchase of material and equipment, to the performance of services, and the employment of persons in the prosecution of the Work.

M. Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material

1. The Owner shall be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site which was not shown or indicated in Drawings or Specification or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. The Owner shall not be responsible for any such materials brought to the site by the Contractor, Subcontractors, Suppliers or anyone else for whom the Contractor is responsible.

2. To the fullest extent permitted by Laws and Regulations, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Engineer, Engineer's Consultants and the officers, directors, employees, agents other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from such hazardous condition, provided that: (i) 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, and (ii) nothing in this subparagraph shall obligate the Owner to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.

1.04 AUTHORITY OF THE ENGINEER

A. The Engineer shall be the sole judge of the intent and meaning of the Drawings and Specifications and his decisions thereon and his interpretation thereof shall be final, conclusive and binding on all parties.

B. The Engineer shall be the Owner's representative during the life of the Contract and he shall observe the Work in progress on behalf of the Owner. He shall have authority (1) to act on behalf of the Owner to the extent expressly provided in the Contract or otherwise in writing; (2) to determine the amount, quality, acceptability and fitness of all work, materials and equipment required by the Contract; and (3) to decide all questions which arise in relation to the Work, the execution thereof, and the fulfillment of the Contract.

C. The Contractor shall proceed without delay to perform the work as directed, instructed, determined or decided by the Engineer and shall comply promptly with such directions, instructions, determinations or decisions. If the Contractor has any objection thereto he may, within ten (10) days of having received any such direction, instruction, determination or decision, require that any such direction, instruction, determination or decision be put in writing and within ten (10) days after receipt of any such writing he may file a written protest with the Owner stating clearly and in detail his objections, the reasons therefor, and the nature and amount of additional compensation, if any, to which he claims he will be entitled thereby. A copy of such protest shall be filed with the Engineer at the same time it is filed with the Owner. Unless the Contractor requires that any such direction, instruction, determination or decision be put in writing within ten (10) days of having received such direction, instruction, determination or decision and unless the Contractor files such written protest with the Owner and Engineer within such ten (10) day period, he shall be deemed to have waived all grounds for protest of such direction, instruction, determination, or decision and all claims for additional compensation or damages occasioned thereby, and shall further be deemed to have accepted such direction, instruction, determination, or decision as being fair, reasonable,

and finally determinative of his obligations and rights under the Contract.

1.05 SUPERVISION OF WORK

A. The Contractor shall be solely responsible for supervision of the Work, shall give the work the constant attention necessary to ensure the expeditious and orderly progress thereof, and shall cooperate with the Engineer in every possible way.

B. At all times, the Contractor shall have his agent on the Work a competent superintendent capable of reading and thoroughly understanding the Drawings and Specifications, with full authority to execute the directions of the Engineer without delay and to supply promptly such labor, services, materials, equipment, plant, apparatus, appliances, tools, supplies and other items as may be required. Such superintendent shall not be removed from the Work without the prior written consent of the Engineer. If, in the opinion of the Engineer, the superintendent or any successor proves incompetent, the Contractor shall replace him with another person approved by the Engineer; such approval, however, shall in no way relieve or diminish the Contractor's responsibility for supervision of the Work.

C. Whenever the Contractor or his agent or superintendent is not present on any part of the Work where it may be necessary to give directions or instructions with respect to such work, such directions or instructions may be given by the Engineer to and shall be received and obeyed by the designated foreman or any other person in charge of the particular work involved.

1.06 INSURANCE

A. Before starting and until final completion and acceptance of the Work and expiration of the guarantee period provided for in the AGREEMENT the Contractor shall procure and maintain insurance of the types specified in paragraphs (1) to (10), inclusive, below, and to the limits for this insurance specified in Table A at the end of this section. All insurance shall be obtained from companies satisfactory to the Owner and Engineer.

B. Insurance shall be in such forms as will protect the Contractor from all claims and liability for damages for bodily and personal injury, including accidental death, and for property damage, which may arise from operations under the Contract, whether such operations

be by himself, his subcontractors, or by anyone directly or indirectly employed or engaged by him.

C. The **Town of Burrillville (Owner) and Engineer** shall be named as an "additionally insured".

D. The following types of insurance shall be provided on all policies:

1. Workmen's Compensation and Employer's Liability Insurance.

2. Bodily Injury Insurance for operations and completed operations and Contractor's Protective Bodily Injury Insurance.

3. Property Damage Insurance for operations and completed operations and Contractor's Protective Property Damage Insurance, each including coverage for injury to or destruction of wires or pipes and similar property and appurtenant apparatus and the collapse of or structural injury to any building or structure except those on which work under the Contract is being done. Blasting and explosion coverage shall be obtained if there is a need for blasting under the Contract, and no blasting shall be performed until such insurance has been secured.

4. Bodily Injury Insurance covering the operation of all motor vehicles owned by the Contractor.

5. Personal Injury Insurance to cover claims for personal injury and including claims brought by employees.

6. Property Damage Insurance covering the operation of all motor vehicles owned by the Contractor.

7. Insurance to cover bodily injuries and property damage resulting from the use of motor vehicles not owned by the Contractor, while such vehicles are being operated in connection with the prosecution of the Work.

8. Contractual Liability Insurance covering the liability assumed by the Contractor under the fifth paragraph of that subsection titled "Obligations and Liability of Contractor" of this AGREEMENT.

9. Owner's Protective Liability and Property Damage Insurance to protect the Owner and the Engineer against claims for Property damage and for bodily injuries, including accidental death, caused by the operations of the Contractor or his subcontractors on the Work. The policy shall indicate the Owner and the Engineer as the named insured. A copy of the policy shall be furnished to the Owner and a Certificate of Insurance shall be furnished to the Engineer.

10. Builders' Risk Insurance with an "All Risk" Installation Floater covering loss by fire and extended coverage in the completed value form in the amount of the total insurable value of all structures, materials, and equipment to be built and installed. The insurance shall be obtained from a company satisfactory to the Owner. The policy shall indicate Owner, the Contractor, all subcontractors, and the Engineer as the named insured with loss payable to the Owner as Trustee. The policy shall provide for a 30-day notice to the Owner of cancellation or restrictive amendment. A copy of the policy shall be furnished to the Owner and a Certificate of Insurance shall be furnished to the Engineer. The insurance shall be obtained before the work is started and shall be maintained until the date of completion of the work as stated in the final estimate, or until the Owner occupies or otherwise take possession of the structure, whichever occurs first.

E. All policies shall be so written that the Owner will be notified in writing of cancellation or restrictive amendment at least 30 days prior to the effective date of such cancellation or amendment.

F. Certificates from the Contractor's insurance carriers stating the coverage provided, the limits of liability, and expiration dates shall be filed in triplicate with the Owner before operations are begun. Such certificates shall be on the form furnished by the Owner.

G. Certificates from the contractor naming the **Town of Burrillville, Rhode Island** as additionally insured must be received by the Owner prior to initiating the work.

H. Renewal certificates must be furnished by the Contractor prior to the expiration date of any of the initial insurances.

I. No insurance required or furnished hereunder shall in any way relieve the Contractor of or diminish any of his responsibilities, obligations and liabilities under the Contract.

1.07 PATENTS

A. The Contractor's attention is directed to the following "Patent Indemnity Clause" illustrating the format and/or required wording therefore which shall be used by all manufacturers and/or suppliers, as deemed necessary by the Owner and Engineer, as an Indemnification and Hold Harmless Agreement.

B. This Agreement shall be accepted and approved in form by the Owner and Engineer prior to the approval and/or installation of the product.

PATENT INDEMNIFICATION

"In consideration for their purchase and use of the (Name of product and/or equipment) manufactured by (name of Manufacturer) and for other good and valuable consideration, (Name of Manufacturer) agrees to defend and hold harmless (Name of Contractor), BETA Group, Inc., and the (Name of Owner), and their employees and agents, from and against any liability, loss, cost, expense or damage including reasonable attorneys' and accountants' fees incurred by these entities in defending or prosecuting any claim for such liability, loss, cost, expense or damage resulting or arising out of a claim that the use of the above mentioned product and/or equipment delivered hereunder directly infringes any United States Patent, provided that (Name of Manufacturer) is given authority, information, and assistance for the defense of such suit, and (Name of Manufacturer) shall pay all damages and costs assessed against the above named entities for the use of such produce and/or equipment provided, however, that this indemnification shall not apply to equipment of (Name of Contractor) design, and provided further that if the use of such product and/or equipment is enjoined in any suit, (Name of Manufacturer) shall at its own expense and its option either procure for (name of Contractor) the right to continue the normal use of such produce and/or equipment, replace said product and/or equipment, modify said equipment or refund the purchase price thereof; and provided further that (Name of Manufacturer) indemnity as to use shall not apply to infringement resulting from the use of the produce and/or equipment delivered hereunder in combination with other items where use of the product and/or equipment per se does not constitute infringement."

1.08 COMPLIANCE WITH LAWS

A. The Contractor shall keep himself fully informed of all existing and future federal, state, and local laws, ordinances, rules, and regulations affecting those engaged or employed on the Work, the materials and equipment used in the Work or the conduct of the Work, and of all orders, decrees and other requirements of bodies of tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the Drawings, Specifications or other Contract Documents in relation to any such law, ordinance, rule, regulation, order,

decree or other requirement, the Contractor shall forthwith report the same to the Engineer in writing. The Contractor shall at all times observe and comply with, and cause all his agents, with all such existing and future laws, ordinances, rules, regulations, orders, decrees and other requirements, and he shall protect, indemnify and save harmless the Owner, its officers, agents, servants and employees, from and against any and all claims, demands, suits, proceedings, liabilities, judgements, penalties, losses, damages, costs and expenses, including attorneys' fees, arising from or based upon any violation or claimed violation of any such law, ordinance, rule, regulation, order, decree or other requirement, whether committed by the Contractor or any of his agents, servants, employees or subcontractors.

1.09 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

A. Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though they were included herein. If through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

1.10 PERMITS

A. The Contractor shall, at his own expense, take out and maintain all necessary permits from the county, municipal, or other public authorities; shall give the notices required by law; and shall post all bonds and pay all fees and charges incident to the due and lawful prosecution of the Work.

1.11 NOT TO SUBLET OR ASSIGN

A. The Contractor shall constantly give his personal attention to the faithful prosecution of the Work, shall keep the same under his personal control, shall not assign the Contract or sublet the Work or any part thereof without the previous written consent of the Owner, and shall not assign any of the moneys payable under the Contract, or his claim thereto, unless by and with the like written consent of the Owner and the Surety on the Contract Bonds. Any assignment or subletting in violation hereof shall be void and unenforceable.

B. The Contractor shall not sublet or assign work to a subcontractor(s), for a total in excess of fifty (50)

percent of the Contract Price, without prior written approval of the Owner and Engineer.

C. The Contractor shall be fully responsible to the Owner for the acts and omissions of his subcontractors, suppliers, and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

D. The Contractor shall cause appropriate provisions, and applicable State or Federal regulations, to be inserted in all subcontractors relative to the work to bind subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the work of subcontractors, and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

E. The Contractor's attention is directed to the fact that nothing contained in this Contract shall create any contractual relation between any subcontractor and the Owner.

1.12 DELAY BY OWNER

A. The Owner may delay the beginning of the Work or any part thereof if the necessary lands or rights-of-way for such work shall not have been obtained. The Contractor shall have no claim for additional compensation or damages on account of such delay, but shall be entitled only to any extension of time as hereinafter provided.

1.13 TIME FOR COMPLETION

A. The rate of progress shall be such that the Work shall be performed and completed in accordance with the Contract before the expiration of the time limit stipulated in Table A at the end of this section, except as otherwise expressly provided herein.

B. It is agreed that the rate of progress herein required has been purposely made low enough to allow for the ordinary and foreseeable delays incident to construction work of this character. No extension of time will be given for ordinary or foreseeable delays, inclement weather, or accidents, and the occurrence of such will not relieve the Contractor from the necessity of maintaining this rate of progress and completing the Work within the stipulated time limit.

C. If delays are caused by acts of God, acts of Government, unavoidable strikes, extra work, or other cause or contingencies clearly beyond the control or responsibility of the Contractor, the Contractor may be entitled to additional time to perform and complete the Work, provided that the Contractor shall, within ten (10) days from the beginning of such delay notify the Owner in writing, with a copy to the Engineer, of the cause and particulars of the delay. Upon receipt of such notification, the Owner shall review and evaluate the cause and extent of the delay. If, under the terms of the AGREEMENT, the delay is properly excusable, the Owner will, in writing, appropriately extend the time for completion of the Work. (This paragraph will be interpreted to include delays in receipt of equipment provided that the Contractor placed his order and submitted shop drawings for such equipment promptly after execution of the Contract, that he has shown due diligence in following the progress of the order, and that the time required for delivery is in accordance with conditions generally prevailing in the industry.) The Contractor agrees that he shall not have or assert any claim for nor shall he be entitled to any additional compensation or damages on account of such delays.

D. The time in which the Work is to be performed and completed is of the essence of this AGREEMENT.

1.14 LIQUIDATED DAMAGES

A. In case the Contractor fails to complete the Work satisfactorily on or before the date of completion fixed herein or as duly extended as hereinbefore provided, the Contractor agrees that the Owner shall deduct from the payments due the Contractor each month the sum set forth in Table A at the end of this section for each calendar day of delay, which sum is agreed upon not as a penalty, but as fixed and liquidated damages for each day of such delay. If the payments due the Contractor are less than the amount of such liquidated damages, said damages shall be deducted from any other moneys due or to become due the Contractor, and, in case such damages shall exceed the amount of all moneys due or to become due the Contractor, the Contractor or his Surety shall pay the balance to the Owner.

1.15 NIGHT, SATURDAY, SUNDAY AND HOLIDAY WORK

A. No work shall be done at night, on Saturday on Sunday or on a holiday except (1) usual protective work, such as pumping and the tending of lights, (2) work done in case of emergency threatening injury to persons or property, or (3) if all of the conditions set forth in the next paragraph below are met.

B. No work other than that included in (1) and (2) above shall be done between July 1 and July 7 except when (a) in the sole judgment of the Owner, the work will be of advantage to the Owner and can be performed satisfactorily, (b) the work will be done by a crew organized for regular and continuous night work, and (c) in the sole judgment of the Owner and Engineer, adequate noise prevention measures are incorporated into the Work by the Contractor to minimize any noise impact within the work area and (d) the Owner has given written permission for such work. The Contractor is responsible for obtaining all permits and approvals required.

C. No work other than that included in (1) and (2) above shall be done at night except when (a) in the sole judgment of the Owner, the work will be of advantage to the Owner and can be performed satisfactorily at night, (b) the work will be done by a crew organized for regular and continuous night work, and (c) in the sole judgment of the Owner and Engineer, adequate noise prevention measures are incorporated into the Work by the Contractor to minimize any noise impact within the work area and (d) the Owner has given written permission for such night work. The Contractor is responsible for obtaining all permits and approvals required.

1.16 EMPLOY COMPETENT PERSONS

A. The Contractor shall employ only competent persons on the Work and shall not employ persons or means which may cause strikes, work stoppages or any disturbances by persons employed by the Contractor, any subcontractor, the Owner, the Engineer or any other contractor. Whenever the Engineer notifies the Contractor in writing that in his opinion any person on the Work is incompetent, unfaithful, disorderly, or otherwise unsatisfactory, or not employed in accordance with the provisions of the Contract, such person shall be discharged from the Work and shall not again be employed on it, except with the written consent of the Engineer.

1.17 EMPLOY SUFFICIENT LABOR AND EQUIPMENT

A. If in the sole judgment of the Engineer the Contractor is not employing sufficient labor, plant, equipment or other means to complete the Work within the time specified, the Engineer may, after giving written notice, require the Contractor to employ such additional labor, plant, equipment and other means as the Engineer deems necessary to enable the Work to progress properly.

1.18 INTOXICATING LIQUORS AND/OR DRUGS

A. The Contractor shall not sell and shall neither permit nor suffer the introduction and/or use of intoxicating liquors and/or drugs upon or about the Work.

1.19 ACCESS TO WORK

A. The Owner, the Engineer, and their officers, agents, servants and employees may at any and all times and for any and all purposes, enter upon the Work and the site thereof and the premises used by the Contractor, and the Contractor shall at all times provide safe and proper facilities therefor.

1.20 EXAMINATION OF WORK

A. The Engineer shall be furnished by the Contractor with every reasonable facility for examining and inspecting the Work and for ascertaining that the Work is being performed in accordance with the requirements and intent of the Contract, even to the extent of requiring the uncovering or taking down portions of furnished work by the Contractor.

B. Should the work thus uncovered or taken down prove satisfactory, the cost of uncovering or taking down and the replacement thereof shall be considered as extra work unless the original work was done in violation of the Contract in point of time or in the absence of the Engineer or his inspector and without his written authorization, which case said cost shall be borne by the Contractor. Should the work uncovered or taken down prove unsatisfactory, said cost shall likewise borne by the Contractor.

C. Examination of inspection of the Work shall not relieve the Contractor of any of his obligations to perform and complete the Work as required by the Contract.

1.21 DEFECTIVE WORK, ETC.

A. Until acceptance and during the applicable guarantee period thereafter, the Contractor shall promptly, without charge, repair, correct or replace work, equipment, materials, apparatus or parts thereof which are defective, damaged or unsuitable or which in any way fail to comply with or be in strict accordance with the provisions and requirements of the Contract or applicable guarantee and shall pay to the Owner all

resulting costs, expenses, losses or damages suffered by the Owner.

B. If any material, equipment, apparatus or other items brought upon the site for use or incorporation in the Work, or selected for the same, is rejected by the Engineer as unsuitable or not in conformity with the Specifications or any of the other Contract Documents, the Contractor shall forthwith remove such materials, equipment, apparatus and other items from the site of the Work and shall at his own cost and expense make good and replace the same and any material furnished by the Owner which shall be damaged or rendered defective by the handling or improper installation by the Contractor, his agents, servants, employees or subcontractors.

1.22 PROTECTION AGAINST WATER AND STORM

A. The Contractor shall take all precautions necessary to prevent damage to the Work by storms or by water entering the site of the Work directly or through the ground. In case of damage by storm or water, the Contractor shall at his own cost and expense make such repairs or replacements or rebuild such parts of the Work as the Engineer may require in order that the finished Work may be completed as required by the Contract.

1.23 RIGHT TO MATERIALS

A. Nothing in the Contract shall be construed as vesting in the Contractor any right of property in the materials, equipment, apparatus and other items furnished after they have been installed or incorporated in or attached or affixed to the Work or the site, but all such materials, equipment, apparatus and other items shall, upon being so installed, incorporated, attached or affixed, become the property of the Owner. Nothing in this subsection shall relieve the Contractor of his duty to protect and maintain all such materials, equipment, apparatus and other items.

1.24 CHANGES

A. The Owner, through the Engineer, may make changes in the Work and in the Drawings and Specifications therefor by making alterations therein, additions thereto or omissions therefrom. All work resulting from such changes shall be performed and furnished under the pursuant to the terms and conditions of the Contract. If such changes result in an increase or decrease in the Work to be done hereunder,

or increase or decrease the quantities thereof, adjustment in compensation shall be made therefor at the unit prices stipulated in the Contract for such work, except that if unit prices are not stipulated for such work, compensation for additional or increased work shall be made as provided hereinafter under the subsection titled "Extra Work"; and for eliminated or decreased work the Contractor shall allow the Owner a reasonable credit as determined by the Engineer.

B. Except in an emergency endangering life or property, no change shall be made unless in pursuance of a written order from the Engineer authorizing the change, and no claim for additional compensation shall be valid unless the change is so ordered.

C. The Contractor agrees that he shall neither have nor assert any claim for or be entitled to any additional compensation for damages or for loss of anticipated profits on work that is eliminated.

1.25 EXTRA WORK

A. The Contractor shall perform any extra work (work in connection with the Contract but not provided for herein) when and as ordered in writing by the Engineer, at the unit prices stipulated in the Contract for such work or, if none are so stipulated, whether (a) at the price agreed upon before such work is commenced and named in the written order for such work, or (b) if the Engineer so elects, for the reasonable cost of such work, as determined by the contractor and approved by the Engineer, plus a percentage of such cost, as set forth below. No extra work shall be paid for unless specifically ordered as such in writing by the Engineer.

B. The Contractor shall submit claim for any extra work within fourteen (14) calendar days of performing said extra work.

C. The cost of extra work done under (b) above shall include the reasonable cost to the Contractor of materials used and equipment installed, common and skilled labor, and foremen, and the fair rental of all machinery and equipment used on the extra work for the period of such use.

D. At the request of the Engineer, the Contractor shall furnish itemized statements for the cost of the extra work ordered as above and give the Engineer access to all records, accounts, bills and vouchers and correspondence relating thereto.

E. The Contractor may include in the cost of extra work the amounts of additional premiums, if any, (other than premiums on bonds) paid on the required insurance on account of such extra work, of Social Security or other direct assessments upon the Contractor's payroll by Federal or other properly authorized public agencies, and of other approved assessments when such assessments are not normally included in payments made by the Contractor directly to his employees, but in fact are, and are customarily recognized as, part of the cost of doing work.

F. The fair rental hourly rate for all machinery and equipment shall be based upon the most recent edition of "Rental Rate Blue Book" published by Equipment Watch or a similar publication approved by the Engineer. Hourly rental rates for machinery and equipment shall be developed by dividing the monthly Blue Book rates by 176 hours per month plus Estimated Hourly Operating Costs (FHWA rate). Rate Adjustment tables shall be utilized for equipment model year and region of operation. If said extra work requires the use of machinery or equipment not already on the site of the Work the cost of transportation, not exceeding a distance of 100 miles, of such machinery or equipment to and from the Work shall be added to the fair monthly rental; provided, however, that this shall not apply to machinery or equipment already required to be furnished under the terms of the Contract.

G. The Contractor shall not include in the cost of extra work any cost or rental of small tools, building, or any portion of the time of the Contractor, his superintendent, or his office and engineering staff.

H. To the cost of extra work done by the Contractor's own forces under (b) above (determined as stated above), the Contractor may add **15** percent to cover his overhead, use of capital, the premium on the Bonds as assessed upon the amount of this extra work, and profit.

I. In the case of extra work done under (b) by a subcontractor the subcontractor shall compute, as above, his cost for the extra work, to which he may add **15** percent as in the case of the Contractor. The Contractor shall be allowed an additional 5 percent of the subcontractor's initial cost for the extra work prior to the **15** percent adjustment, to cover the costs of the Contractor's overhead use of capital, the premium on the Bonds as assessed upon the amount of this work, and profit. Said subcontractor's cost must be reasonable and approved by the Engineer.

J. If extra work is done under (b) above, the Contractor and/or subcontractor shall keep daily records of such extra work. The daily record shall include the names of men employed, the nature of the work performed, and hours worked, materials and equipment incorporated, and machinery or equipment used, if any, in the prosecution of such extra work. This daily record, to constitute verification that the work was done, must be signed both by the Contractor's authorized representative and by the Engineer. A separate daily record shall be submitted for each Extra Work Order.

1.26 EXTENSION OF TIME ON ACCOUNT OF EXTRA WORK

A. When extra work is ordered near the completion of the Contract or at any time during the progress of the Work which unavoidably increases the time for the completion of the Work, and extension of time shall be granted as hereinbefore provided.

1.27 CHANGES NOT TO AFFECT BONDS

A. It is distinctly agreed and understood that any changes made in the Work or the Drawings or Specifications therefor (whether such changes increase or decrease the amount thereof or the time required for its performance) or any changes in the manner of time of payments made by the Owner to the Contractor, or any other modifications of the Contract, shall in no way annul, release, diminish or affect the liability of the Surety on the CONTRACT BONDS given by the Contractor, it being the intent hereof that notwithstanding such changes the liability of the Surety on said bonds continue and remain in full force and effect.

1.28 CLAIMS FOR DAMAGES

A. If the Contractor makes claim for any damages alleged to have been sustained by breach of contract or otherwise, he shall, within ten (10) days after occurrence of the alleged breach or within ten (10) days after such damages are alleged to have been sustained, whichever date is the earlier, file with the Engineer a written, itemized statement of the details of the alleged breach and the details and amount of the alleged damages. The Contractor agrees that unless such statement is made and filed as so required, his claim for damages shall be deemed waived, invalid and unenforceable, and that he shall not be entitled to any compensation for any such alleged damages. Within ten (10) days after the timely filing of such statement, the Engineer shall file with the Owner a copy of the

statement, together with his recommendations for action by the Owner.

B. The Contractor shall not be entitled to claim any additional compensation for damages by reason of any direction instruction, determination or decision of the Engineer, nor shall any such claims be considered, unless the Contractor shall have complied in all respects with the Article titled "Authority of the Engineer", including, but not limited to the filing of a written protest in the manner and within the time therein provided.

1.29 ABANDONMENT OF WORK OR OTHER DEFAULT

A. If the Work shall be abandoned, or any part thereof shall be sublet without previous written consent of the Owner, or the Contract or any moneys payable hereunder shall be assigned otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing, that the conditions herein specified as to rate of progress are not being complied with, or that the Work or any part thereof is being unnecessarily or unreasonably delayed, or that the Contractor has violated or is in default under any of the provisions of the Contract, or if the Contractor becomes bankrupt or insolvent or goes or is put into liquidation or dissolution, either voluntarily or involuntarily, or petitions for an arrangement or reorganization under the Bankruptcy Act, or makes a general assignment for the benefit of creditors or otherwise acknowledges insolvency, the happening of any of which shall be and constitute a default under the Contract, the Owner may notify the Contractor in writing, with a copy of such notice mailed to the Surety, to discontinue all Work or any part thereof; thereupon the Contractor shall discontinue such Work or such part thereof as the Owner may designate; and the Owner may, upon giving such notice, by contract or otherwise as it may determine, complete the Work or such part thereof and charge the entire cost and expense of so completing the Work or such part thereof to the Contractor. In addition to the said entire cost and expense of completing the Work, the Owner shall be entitled to reimbursement from the Contractor and the Contractor agrees to pay to the Owner any losses, damages, costs and expenses, including attorney's fees, sustained or incurred by the Owner by reason of any of the foregoing causes. For the purposes of such completion the Owner may for itself or for any Contractors employed by the Owner take possession of and use or cause to be used any and all materials, equipment, plant, machinery, appliances, tools,

supplies and such other items of every description that may be found or located at the site of the Work.

B. All costs, expenses, losses, damages, attorney's fees and any and all other charges incurred by the Owner under this subsection shall be charged against the Contractor and deducted and/or paid by the Owner out of any moneys due of payable or to become due or payable under the Contract to the Contractor; in computing the amounts chargeable to the Contractor the Owner shall not be held to a basis of the lowest prices for which the completion of the Work or any part thereof might have been accomplished, but all sums actually paid or obligated therefor to effect its prompt completion shall be charged to and against the account of the Contractor. In case the costs, expenses, losses, damages, attorney's fees and other charges together with all payments theretofore made to or for the account of the Contractor are less than the sum which would have been payable under the Contract if the Work had been properly performed and completed by the Contractor, the Contractor shall be entitled to receive the difference, and, in case such costs, expenses, losses, damages, attorneys' fees and other charges, together with all payments theretofore made to or for the account of the Contractor, shall exceed the said sum, the Contractor shall pay the amount of the excess to the Owner.

1.30 PRICES FOR WORK

A. The Owner shall pay and the Contractor shall receive the prices stipulated in the BID made a part hereof as full compensation for everything performed and furnished and for all risks and obligations undertaken by the Contractor under and as required by the Contract.

1.31 MONEYS MAY BE RETAINED

A. The Owner may at any time retain from any moneys which would otherwise be payable hereunder so much thereof as the Owner may deem necessary to complete the Work hereunder and to reimburse it for all costs, expenses, losses, damage and damages chargeable to the Contractor hereunder, in accordance with the States General Laws.

1.32 FORMAL ACCEPTANCE

A. This Agreement constitutes an entire contract for one whole and complete Work or result. Fixing of the date of completion and acceptance of the Work or a specified part thereof shall only be effective when

accomplished by a writing specifically so stating and signed by the Owner.

1.33 PROGRESS ESTIMATES

A. Once a month, except as hereinafter provided, the Engineer shall make an estimate in writing of the total amount and value of the work done to the first of the month by the Contractor. The Owner shall retain a percentage of such estimated value, as set forth in Table A at the end of this section, as part security for fulfillment of the Contract by the Contractor and shall deduct from the balance all previous payments made to the Contractor, all sums chargeable against the Contractor and all sums to be retained under the provisions of the Contract.

B. The Owner shall pay monthly to the Contractor the balance not deducted and/or retained as aforesaid, except that payment may be withheld at any time if, in the sole judgment of the Engineer, the work is not proceeding in accordance with the Contract. If the Owner deems it expedient to do so, it may cause estimates and payments to be made more frequently than one in each month. No progress estimate or payment need be made when, in the sole judgement of the Engineer, the total value of the work done since the last estimate amounts to less than the amount set forth in Table A at the end of this section.

C. Estimates of lump-sum items shall be based on a schedule dividing each such item into its appropriate component parts together with a quantity and a unit price for each part so that the sum of the products of prices and quantities will equal the Contract price for the item. This schedule must be submitted by the Contractor for and must have the approval of the Engineer before the first estimate becomes due.

D. If the Engineer determines that the progress of the Work will be benefited by the delivery to the site of certain materials and equipment, when available, in advance of actual requirement therefor and if such materials and equipment are delivered and properly stored, protected and insured as determined by the Engineer, the cost to the Contractor or subcontractor as established by invoices or other suitable vouchers satisfactory to the Engineer, less the retained percentages as above provided, may be included in the progress estimates; provided always that there be duly executed and delivered by the Contractor to the Engineer at the same time a Bill of Sale in form satisfactory to the Owner, transferring and assigning to

the Owner full ownership and title to such materials or equipment.

1.34 PARTIAL ACCEPTANCE

A. The Owner may, at any time in a written order to the Contractor (1) declare that he intends to use a specified part of the Work which in his opinion is sufficiently complete, in accordance with the Contract Documents, to permit its use; (2) enclose a tentative list of items remaining to be completed or corrected, and (3) fix the date of acceptance of that specified part of the Work.

B. Within 45 days after acceptance under this subsection, the Engineer shall make an estimate in writing of the amount and value of the part of the Work so accepted. The Owner shall pay said amount to the Contractor after deducting therefrom all previous payments, all charges against the Contractor as provided for hereunder, and all amounts to be retained under the provisions of the Contract, said payment to be made at the time of the next monthly progress estimate.

C. Acceptance by the Owner under this subsection shall not relieve the Contractor of any obligations under the Contract Documents except to the extent agreed upon in writing between the Owner and the Contractor.

D. The Owner shall have the right to exclude the Contractor from any part of the Work which has been accepted, but the Owner will allow the Contractor reasonable access thereto to complete or correct items on the tentative list.

1.35 FINAL ESTIMATE AND PAYMENT

A. All quantities shown on progress estimates and all prior payments shall be subject to correction in the final estimate and payment as determined by the Engineer.

B. The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor under or by virtue of this Agreement; and upon satisfactory completion of the work performed under this Agreement, as a condition before final payment under this Agreement or as a termination settlement under this Agreement the Contractor shall execute and deliver to the Owner a release of all claims against the Owner

arising under or by virtue of, this Agreement, except claims which are specifically exempted by the Contractor to be set forth herein. Unless otherwise provided in this Agreement, by State law or otherwise expressly agreed to be the parties to this Agreement, any payment, including final payment under, this Agreement or settlement upon termination of this Agreement shall not constitute a waiver of the Owner's claims against the Contractor or his sureties under this Agreement or applicable Performance and Labor and Materials Bonds.

1.36 LIENS

A. If at any time any notices of lien are filed and labor performed or materials or equipment manufactured, furnished, or delivered to or for the Work, the Contractor shall, at its own cost and expense, promptly discharge, remove or otherwise dispose of the same, and until such discharge, removal or disposition, the Owner shall have the right to retain from any moneys payable hereunder an amount which, in its sole judgement, it deems necessary to satisfy such liens and pay the costs and expenses, including attorneys' fees, of defending any actions brought to enforce the same, or incurred in connection therewith or by reason thereof.

1.37 CLAIMS

A. If at any time there be any evidence of any claims for which the Contractor is or may be liable or responsible hereunder, the Contractor shall promptly settle or otherwise dispose of the same, and until such claims are settled or disposed of, the Owner may retain from any moneys which would otherwise be payable hereunder so much thereof as, in its sole judgement, it may deem necessary to settle or otherwise dispose of such claims and to pay the costs and expenses, including attorney's fees, of defending any actions brought to enforce such claims, or incurred in connection therewith or by reason thereof.

1.38 APPLICATION OF MONEYS RETAINED

A. The Owner may apply any moneys retained hereunder to reimburse itself for any and all costs, expenses, losses, damage and damages, liabilities, suits, judgements and awards incurred, suffered or sustained by the Owner and chargeable to the Contractor hereunder or as determined hereunder.

1.39 NO WAIVER

A. Neither the inspection by the Owner or the Engineer, nor any order, measurement, approval, determination, decision or certificate by the Engineer, nor any order by the Owner for the payment of money, nor any payment for or use, occupancy, possession or acceptance of the whole or any part of the Work by the Owner, nor any extension of time, nor any other act or omission of the Owner or of the Engineer shall constitute or be deemed to be an acceptance of any defective or improper work, materials, or equipment nor operate as a waiver of any requirement or provision of the Contract, nor of any remedy, power or right of or herein reserved to the Owner, nor of any right to damages for breach of contract. Any and all rights and/or remedies provided for in the Contract are intended and shall be construed to be cumulative; and, in addition to each and every other right and remedy provided for herein or by law, the Owner shall be entitled as of right to a writ of injunction against any breach or threatened breach of the Contract by the Contractor, by his subcontractors or by any other person or persons.

1.40 LIABILITY OF OWNER

A. No person, firm or corporation, other than the Contractor who signed this Contract as such, shall have any interest herein or right hereunder. No claim shall be made or be valid either against the Owner or any agent of the Owner and neither the Owner nor any agent of the Owner shall be liable for or be held to pay any money, except as herein provided. The acceptance by the Contractor of the payment as fixed in the final estimate shall operate as and shall be a full and complete release of the Owner and of every agent of the Owner of and from any and all claims, demands, damages and liabilities of, by or to the Contractor for anything done or furnished for or arising out of or relating to or by reason of the Work or for or on account of any act or neglect of the Owner or of an agent of the Owner or of any other person, arising out of, relating to or by reason of the Work, except the claim against the Owner for the unpaid balance, if any there be, of the amounts retained as herein provided.

1.41 GUARANTEE

A. The Contractor guarantees that the Work and services to be performed under the Contract, and all workmanship, materials and equipment performed, furnished, used or installed in the construction of the same, shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the

Drawings, Specifications, and other Contract Documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract shall be fulfilled. This guarantee shall be for a period of one year from and after the date of completion and acceptance of the Work as stated in the final estimate. If part of the Work is accepted in accordance with that subsection of this AGREEMENT titled "Partial Acceptance", the guarantee for that part of the Work shall be for a period of one year from the date fixed for such acceptance.

B. If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction, or replacements. If the Contractor neglects to commence making such repairs, correction, or replacements to the satisfaction of the Owner within three (3) days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make the same, and all direct and indirect costs of making said repairs, correction or replacements, including compensation for additional professional services, shall be paid by the Contractor.

1.42 RETAIN MONEY FOR REPAIRS

A. The Owner may retain out of the moneys otherwise payable to the Contractor hereunder a percentage of the amount thereof as set forth in Table A at the end of this section, and may expend the same, in the manner hereinafter provided, in making such repairs, corrections and replacements in the Work as the Owner, in its sole judgement, may deem necessary.

B. If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, correction, or replacements to the satisfaction of the Owner within three (3) days from the date of receipt of such notice, or having commenced fails to prosecute such work with diligence, the Owner may employ other persons to make the same. The Owner shall pay the cost and expense of the same out of the amounts retained for that purpose. Upon the expiration of the said period of guarantee, provided that the Work at that time is in good order, the Contractor will be entitled to receive the whole or such part of the sum last aforesaid, if any, as may remain after the cost

and expense of making said repairs, correction or replacements, in the manner aforesaid, have been paid therefrom.

1.43 RETURN OF DRAWINGS

A. All Drawings furnished by the Owner or the Engineer to the Contractor may be used only in connection with the prosecution of the Work and shall be returned by the Contractor upon completion of the Work.

1.44 CLEANING UP

A. The Contractor at all times shall keep the site of the Work free from rubbish and debris caused by his operations under the Contract. When the Work has been completed, the Contractor shall remove from the site of the Work all of his plant, machinery, tools, construction equipment, temporary work, and surplus materials so as to leave the Work and the site clean and ready for use.

1.45 LEGAL ADDRESS OF CONTRACTOR

A. The Contractor's business address and his office at or near the site of the Work are both hereby designated as places to which communications shall be delivered. The depositing of any letter, notice, or other communication in a postpaid wrapper directed to the Contractor's business address in a post office box regularly maintained by the Post Office Department or the delivery at either designated address of any letter, notice, or other communication by mail or otherwise shall be deemed sufficient service thereof upon the Contractor, and the date of such service shall be the date of receipt. The first-named address may be charged at any time by an instrument in writing, executed and acknowledged by the Contractor delivered to the Engineer. Service of any notice, letter, or other communication upon the Contractor personally shall likewise be deemed sufficient service.

1.46 HEADINGS

A. The headings or titles of any section, subsection, paragraph, provision, or part of the Contract Documents shall not be deemed to limit or restrict the content, meaning or effect of such section, subsection, paragraph, provision or part.

1.47 MODIFICATION OR TERMINATION

A. Except as otherwise expressly provided herein, the Contract may not be modified or terminated except in writing signed by the parties hereto.

1.48 REMEDIES AND ARBITRATION

A. The Contractor's attention is directed to the fact that this Contract is subject to the Public Works Arbitration Act of R.I. General Laws Section 37-16-1 et., seq Unless otherwise provided in this agreement, all claims, counterclaims, disputes and other matters in question between the Owner and the Contractor arising out of, or relating to, this Agreement or in performance interpretation or breach of it will be decided by arbitration at the election of either party, or in a court of competent jurisdiction within the State in which the Owner is located.

B. Any dispute to be arbitrated shall be done so in accordance with the Construction Industry Arbitration Rules and Regulations of the American Arbitration Association, and judgment upon the award rendered by the Arbitrator(s) may be entered in any court having jurisdiction thereof.

C. However, to the extent allowed by law, if neither party wishes to elect arbitration, and if both parties agree, such claim or controversy may be litigated in a court of competent jurisdiction, as provided in this Agreement. Furthermore, if either party elects to bring such claim or controversy to arbitration, it shall first notify the other party and allow that other party ten (10) calendar days (before filing) within which to have the claim mediated, and shall negotiate in good faith during any such mediation effort.

D. In addition, the method of the appointment of an arbitrator shall vary for the method set forth in Article 13 (Appointment form Panel) of the American Arbitration Association (AAA) Construction Industry Arbitration Rules only so far as that: the AAA Shall submit a second, but no further, set of lists should the parties fail to agree upon any of the persons names, or if acceptable arbitrators are unable to act, or if for any other reason the appointment cannot be made from the original submitted lists. If for any reason an appointment cannot be made from the second set of lists, the AAA shall have the power to make the appointment from other members of the Panel without the submission of any additional lists.

1.49 DIRECT LABOR COST

A. Direct labor cost percentage for change orders shall be ____ percent. (Direct labor cost percent shall be established following award and prior to execution of the Contract).

1.50 MINORITY BUSINESS

A. A. The goal for minority business enterprise (MBE/WBE) participation for this contract is a minimum of ten percent (10%) MBE and/or WBE participation, on the basis of the total dollars paid. The Contractor shall take all affirmative steps necessary to achieve this goal, and shall provide reports documenting the portion of contract and subcontract dollars paid to minority businesses, and its efforts to achieve the goals, with each invoice submitted or at such greater intervals as specified by the **Town of Burrillville**. The Contractor shall require similar reports from its subcontractors.

1.51 TERMINATION FOR CONVENIENCE

A. This Agreement may be terminated by the Owner upon not less than seven days' written notice for the Owner's convenience. In the case of termination for convenience, the Owner shall be responsible for amounts due the Contractor for work performed through the date of termination, provided that the Contractor shall submit a request for payment in accordance with the provisions hereof. The Contractor shall have no other claim for payments due with respect to such termination including any claim for lost profits with respect to the balance of the project.

1.52 EQUAL EMPLOYMENT OPPORTUNITY, ANTIDISCRIMINATION AND AFFIRMATIVE ACTION

A. The Contractor shall not discriminate against or exclude any person from participation herein on grounds of race, religion, color, sex, age, or national origin; and that it shall take affirmative actions to insure that applicants are employed, and that employees are treated during their employment, without regard to race, religion, color, sex, age, handicapped status, or national origin.

1.53 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) DISADVANTAGED BUSINESS ENTERPRISE REQUIREMENTS

A. The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

1.54 DAVIS BACON ACT

A. The successful bidder will be required to conform to all provisions of the federal Davis-Bacon and Related Acts which requires all laborers and mechanics employed by contractors and subcontractors in excess of \$2,000 to pay their laborers and mechanics not less than the prevailing wage rates and fringe benefits, as determined by the Secretary of Labor, for corresponding classes of laborers and mechanics employed on similar projects in the area.

1.55 AMERICAN IRON AND STEEL REQUIREMENTS

A. The Contractor acknowledges to and for the benefit of the **Town of Burrillville** (Purchaser") and the State of Rhode Island (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking 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 Requirement") 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 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. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State 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.

IN WITNESS WHEREOF, the parties to this AGREEMENT have hereunto set their hands and seals, and have executed, or caused to be executed by their duly authorized officials, the AGREEMENT in Four (4) copies, each of which shall be deemed an original, as of the day and year first above-written.

WITNESSES

Town of Burrillville, Rhode Island,
(Owner - party of the first part)

BY: _____

(SEAL)

ATTEST:

(Contractor - party of the second part)

BY: _____

(SEAL)

(Title)

ATTEST:

(Address)

Approved As To Form:

Legal Counsel for **Town of Burrillville, Rhode Island Board of Sewer Commissioners**

CERTIFICATE OF OWNER'S LEGAL COUNSEL

I, the undersigned, _____ the duly authorized and acting legal representative of the _____, acting herein through its _____, do hereby certify as follows:

I have examined the foregoing contract and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

By: _____
(Signature)

Date: _____

(Name)

(Title)

(Address)

(City, State, Postal code)

TABLE A

Agreement subsection reference	Item	Minimum limits
1.06	Workman's Compensation and Employer's Liability Insurance	As required by the law of the State of Rhode Island
1.06	Public Liability including Contractor's Protective, Completed Operations and Contractual Liability	<p>Bodily Injury/Property Damage including C.U. Coverage</p> <hr/> <p>\$1,000,000 each occurrence \$2,000,000 aggregate</p> <p>Blasting and explosion coverage shall be obtained if there is a need for blasting under the contract.</p>
1.06	Personal Injury Insurance	\$2,000,000 (aggregate)
1.06	Automobile Liability including coverage for owned, hired or borrowed vehicles	<p>Bodily Injury/Property Damage</p> <hr/> <p>\$1,000,000 Combined Single Limit (Each Occurrence)</p>
1.06	Owner's/Contractor's Protective (OCP) Damage Liability & Property Damage Occurrence)	<p>Bodily Injury/Property</p> <hr/> <p>\$3,000,000 (Each Occurrence) \$3,000,000 (Aggregate)</p>
1.06	Excess/Umbrella Liability Coverage	<p>\$5,000,000 (Each Occurrence) \$5,000,000 (Aggregate)</p>

1.06	Builder's Risk Insurance (Not Applicable)	Total insurable value of all structures, materials, and equipment to be built and installed.
1.13	a) Time of Completion - Total Contract	Within 630 consecutive calendar days after the date specified in the Notice to Proceed
	b) Time of Completion – Headworks Improvements	Within 400 consecutive calendar days after the date specified in the Notice to Proceed
1.14	Liquidated Damages for each consecutive calendar day of delay in completion time	\$1,500.00
1.33	Percentage of Progress Estimates to be Retained The retainage to be paid the Contractor within Ninety (90) days of the date the work is accepted By the awarding authority unless a dispute exists With respect to the work.	5%
1.33	Amount of Minimum Progress Estimates	\$10,000

INSURANCE CERTIFICATE

SHEET 1 OF 2

Issued to

The Town of Burrillville, Rhode Island

This is to certify that this Company, _____, (Name of Insurance Company) has enforced the following policies covering all work and operations of _____ (Name of Contractor), as the designate Contractor under a Contract with the **Town of Burrillville, Rhode Island**, as the designated Owner, dated _____ **“Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. _____”**.

POLICY NUMBER

EFFECTIVE AND

KINDS OF INSURANCE

LIMITS

EXPIRATION DATE

Workmen's Compensation and Employers Liability and Harbor Workers Coverage *

Number: _____
Effective: _____
Expires: _____

Public Liability including Contractor's Protective Personal Injury, Completed Operations, and Contractual Liability**

Bodily Injury \$_____ each occurrence
\$_____ aggregate
Property Damage including C.U. \$_____ each occurrence

Number: _____
Effective: _____
Expires: _____

***Note:
Explosion Collapse and underground coverage is provided

Coverage***\$_____ aggregate
Personal Injury \$_____ aggregate

* Longshoremen's and Harbor Workers' Coverage may be deleted if not required by contract.

** Contractual Liability covers the liability assumed by the Contractor under the subsection entitled "Obligations and Liability of Contractor" of the AGREEMENT, as required by subsection entitled "Insurance" of the agreement.

*** Blasting coverage is not required.

INSURANCE CERTIFICATE

SHEET 2 OF 2

Issued to

The Town of Burrillville, Rhode Island

Contract Reference: **“Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. _____”**.

POLICY NUMBER

EFFECTIVE AND

KINDS OF INSURANCE

LIMITS

EXPIRATION DATE

Automobile Liability including Coverage for hired or borrowed vehicles	Bodily Injury	\$_____ each person	Number: _____
			Effective: _____
		\$_____ each occurrence	Expires: _____

Property Damage	\$_____ each occurrence
-----------------	-------------------------

Owner's Protective Liability and Property Damage	Bodily Injury	\$ _____ each occurrence	Number: _____
			Effective: _____
		\$ _____ aggregate	

Property Damage	\$ _____ each occurrence
	\$ _____ aggregate

Note: A copy of the Owner's Protective Policy for the Owner is to be furnished with the completed certificates.

Town of Burrillville to be named as additional insured as applicable.

It is agreed that thirty (30) days notice of cancellation or restrictive amendment of said policies shall be mailed to Owner.

INSURANCE COMPANY

INSURANCE AGENCY

BY: _____
AUTHORIZED AGENT OR OFFICER

DATE: _____

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SECTION 00600

CONTRACT BONDS

PERFORMANCE BOND

(NOTE: This Bond is issued simultaneously with the attached Labor and Materials Bond in favor of the Owner.)

KNOW ALL MEN BY THESE PRESENTS:

That we, _____ (an individual, a partnership, a corporation)

duly organized under the Laws of the State (or Commonwealth) of _____,

and having a usual place of business at _____,

as Principal, and _____, a corporation duly organized

under the Laws of the State (or Commonwealth) of _____,

and duly authorized to do business in the State (or Commonwealth) of Rhode Island,

and having a usual place of business at _____

as Surety, are holden and stand firmly bound and obligated unto the **Town of Burrillville, Rhode Island** as obligee, in the sum of

_____ lawful money of the United States of America, to and for the true payment whereof we bind ourselves and, each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal, be means of a written AGREEMENT (which together with the Contract Documents in said AGREEMENT referred to are collectively sometimes referred to as the "Contract") dated _____, has entered into a contract with the said obligee for **“Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. _____”** in the **Town of Burrillville, Rhode Island**, a copy of which agreement is attached hereto and by references made a part hereof.

NOW THEREFORE, THE CONDITION of this obligation is such that if the Principal shall well and truly keep and fully and faithfully perform all of the terms and conditions of said AGREEMENT and of the "Contract Documents" referred to in said AGREEMENT (which

collectively are hereinafter and in said AGREEMENT sometimes referred to as the "Contract") and all modifications thereof on the Principal's part to be performed, this obligation shall be void; otherwise it shall remain in full force and effect.

Whenever the said Principal shall be, and declared by the Owner to be, in default under the said Contract, the Owner having performed the Owner's obligations thereunder Surety, for value received, shall promptly remedy the default, or, at the option of the Owner, shall promptly.

- (a) Complete the said AGREEMENT and/or Contract in accordance with its terms and conditions, or
- (b) Obtain a bid or bids for submission to and the approval of the Owner for completing the said AGREEMENT and/or Contract and any modifications thereof in accordance with the terms and conditions thereof, and upon determination by the Owner and the Surety of the lowest responsible and acceptable bidder, arrange for a contract between such bidder and the Owner, and make available to the Owner as the work progresses (even though there should be default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less a sum that shall be equal to the difference between the Contract price as fixed and provided in said AGREEMENT and/or Contract or any modifications thereof to be paid thereunder to the Principal and the amount previously paid by the Owner to and/or for the account of and/or chargeable against the Principal, but not exceeding (including other costs and damages for which the Surety may be liable hereunder) the amount set forth in the first paragraph hereof.

The Surety, for value received, agrees further that no changes in, omissions from, or alterations, modifications or additions to the terms and provisions of said AGREEMENT and/or Contract or the Work to be performed thereunder, and that no extensions of time given or changes made in the manner or time of making payments thereunder, shall in any way effect the Surety's obligations on this bond, and the Surety hereby waives notice of any such changes, omissions, alterations, modifications, additions or extensions.

No right of action shall accrue on this Bond to or for the use of any persons other than the Owner named herein or the heirs, executors, administrators, successors and assigns of the Owner.

IN WITNESS WHEREOF, we have hereunto set our hands and seals to _____
_____ counterparts of this bond, this _____ day of _____,
in the year Two Thousand and _____.

Principal (SEAL)

Principal (SEAL)

Principal (SEAL)

Surety (SEAL)

Surety (SEAL)

NOTE:

If the Principal (Contractor) is a partnership, the Bond should be signed by each of the partners.

If the Principal (Contractor) is a corporation, the Bond should be signed in its correct corporate name by its duly authorized officer or officers.

If this Bond is signed on behalf of the Surety by an attorney-in-fact, there should be attached to it a duly certified copy of his power of attorney showing his authority to sign such Bonds.

There should be executed an appropriate number of counterparts of the Bond corresponding to the number of counterparts of the AGREEMENT.

Date of Bond must not be prior to the date of Contract.

Important

Surety Companies executing BONDS must appear on the U.S. Treasury Department's most 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 Audit Staff Bureau of Accounts and be authorized to transact business in the state where the PROJECT is located.

The attention of the Surety Companies and Principal executing this Performance Bond is directed to the fact that said Bond shall remain in full effect throughout the life of any guaranty or warranty periods stipulated in the Contract Documents and/or Agreement.

LABOR AND MATERIALS BOND

(NOTE: This Bond is issued simultaneously with the attached Performance Bonds in favor of the Owner.)

KNOW ALL MEN BY THESE PRESENTS:

That we, _____ (an individual, a partnership, a corporation)

duly organized under the Laws of the State (or Commonwealth) of _____,

having a usual place of business at _____,

as Principal, and _____ a corporation duly organized

under the Laws of the State (or Commonwealth) of _____,

and duly authorized to do business in the State(or Commonwealth) of _____,

and having a usual place of business at _____,

as Surety, are holden and stand firmly bound and obligated unto the Town of Burrillville, Rhode Island, as obligee, in the sum of

_____ lawful money of the United States of America, to and for the true payment whereof we bind ourselves and, each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal, be means of a written AGREEMENT (which together with the Contract Documents in said AGREEMENT referred to are collectively sometimes referred to as the "Contract") dated _____, has entered into a contract with the said obligee for **“Town of Burrillville, Rhode Island, Headworks and Oakland Pump Station Improvements, Contract No. _____”**, a copy of which agreement is attached hereto and by references made a part hereof.

NOW, THEREFORE, THE CONDITION of this obligation is such, that if the Principal shall promptly make payments to all claimants as hereinafter defined, for all labor performed or furnished and for all materials and equipment furnished for or used in or in connection with the Work called for by said AGREEMENT and/or Contract and any modifications thereof, including lumber used but not incorporated in said Work, and for the rental or hire of vehicles, tools and other appliances and equipment furnished for or used in connection with said Work, this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

- (a) A claimant is defined as one having a direct contract with the Principal or with a subcontractor of the Principal for labor, materials and/or equipment used or reasonably required for use in the performance of the said Work, labor and materials being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental or equipment directly applicable to the said AGREEMENT and/or Contract and any modifications thereof.
- (b) The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials or equipment were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.
- (c) No suit or action shall be commenced hereunder by any claimant.

Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials or equipment for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials or equipment were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the said Work is located, save that such service need not be made by a public officer;

After the expiration of one (1) year following the date on which the Principal ceased work on said AGREEMENT and/or Contract and any modifications thereof, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the State in which the said Work, or any part thereof, is situated, or in the United States District Court for the district in which the said Work, or any part thereof, is situated, and not elsewhere.

- (d) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said AGREEMENT and/Contract or said Work, whether or not claim for the amount of such lien be presented under and against this bond.

The surety, for value received, agrees further that no changes in, omissions from, or alterations, modifications or additions to the terms and provisions of said AGREEMENT and/or Contract or the Work to be performed thereunder, and that no extensions of time given or changes made in the manner or time of making payments thereunder, shall in any way affect the Surety's obligations on this Bond, and the Surety hereby waives notice of any such changes, omissions, alterations, modifications, additions or extensions.

IN WITNESS WHEREOF, we have hereunto set our hands and seals to _____
counterparts of this Bond, this _____ day of _____, in
the year Two Thousand and _____.

Principal (SEAL)

Principal (SEAL)

Principal (SEAL)

Surety (SEAL)

Surety (SEAL)

NOTE:

If the Principal (Contractor) is a partnership, the Bond should be signed by each of the partners.

If the Principal (Contractor) is a corporation, the Bond should be signed in its correct corporate name by its duly authorized officer or officers.

If this Bond is signed on behalf of the Surety by an attorney-in-fact, there should be attached to it a duly certified copy of his power of attorney showing his authority to sign such Bonds.

There should be executed an approximate number of counterparts of the Bond corresponding to the number of counterparts of the AGREEMENT.

Date of Bond must not be prior to the date of Contract.

Important

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

The attention of the Surety Companies and Principal executing this Labor and Materials Bond is directed to the fact that said Bond shall remain in full effect throughout the life of any guaranty or warranty periods stipulated in the Contract Documents and/or Agreement.

CERTIFICATE OF ACKNOWLEDGMENT OF CONTRACTOR IF A CORPORATION
For CONTRACT BONDS

State of _____)

) ss:

County of _____)

On this _____ day of _____, 20 _____, before
me personally came _____ to me known, who being by me duly
sworn, did depose and say as follows:

That he resides at _____

and is the _____

of _____

the corporation described in and which executed the foregoing instrument; that he knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he signed thereto his name and official designation.

Notary Public (Seal)

My commission expires _____

SECTION 00700

GENERAL CONDITIONS

- 1.01 General Provisions
- 1.02 Definitions
- 1.03 Materials and Equipment
 - A. General
 - B. Handling
 - C. Storage of Excavated Material
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 - E. Inspection Away from Site
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- 1.04 Contractor's Shop and Working Drawings
- 1.05 Occupying Private Land
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- 1.07 Safety
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 - A. Dimensions of Existing Structures
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- 1.16 "Or Equal" Clause
- 1.17 Additional or Substitute Bonds
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- 1.20 Payments by Contractor
- 1.21 "Dig Safe" Law
- 1.22 Fire Prevention and Protection
- 1.23 Dust Control
- 1.24 Disposal of Debris
- 1.25 Disposal of "Special Wastes"
- 1.26 Night, Saturday, Sunday and Holiday Work
- 1.27 Length of Work Day
- 1.28 Hurricane Protection
- 1.29 Reduction in Scope of Work

1.01 GENERAL PROVISIONS

- A. The duties and obligations imposed by these General Conditions 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.
- B. Sections of Division 1, General Requirements govern the execution of the Work of all sections of the specifications.
- C. The Specifications are written in imperative and streamlined form. This imperative language is directed to the Contractor, unless stated otherwise.

1.02 DEFINITIONS

- A. Wherever the words as listed in subsection 1.01 of the AGREEMENT or pronouns used in their stead occur in the Contract Documents, they shall have the meanings as given in the AGREEMENT.

1.03 MATERIALS AND EQUIPMENT

A. General

1. Unless otherwise provided in the Contract Documents, only new materials and equipment shall be incorporated in the Work.
2. As soon as possible after execution of the AGREEMENT, submit to the Engineer the names and addresses of the manufacturers and suppliers of all materials and equipment proposed to be incorporated into the Work.
3. When shop and working drawings are required as specified below, submit, prior to the submission of such drawings, data in sufficient detail to enable the Engineer to determine whether the manufacturer and/or the supplier have the ability to furnish a product meeting the Specifications.
4. Submit data relating to the materials and equipment proposed to be incorporated into the Work in sufficient detail to enable the Engineer to identify and evaluate the particular product and to determine whether it conforms to the Contract requirements. Such data shall be submitted in a manner similar to that specified for submission of shop and working drawings.

B. Handling

1. Handle, haul, and distribute materials and all surplus materials on the different portions of the Work, required to complete the Work in accordance with the Contract Documents.
2. Provide suitable storage room for materials and equipment during the progress of the Work, and be responsible for the protection, loss of, or damage to materials

and equipment furnished under this Contract, until the final completion and acceptance of the Work.

3. Pay all storage and demurrage charges by transportation companies and vendors.

C. Storage of Excavated Material

1. Place excavated materials and equipment to be incorporated in the Work so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work.
2. Materials shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

D. Inspection

1. All materials and equipment furnished by the Contractor to be incorporated in the Work shall be subject to the inspection of the Engineer.
2. No material shall be processed or fabricated for the Work or delivered to the work site without prior concurrence of the Engineer.
3. Facilities and labor for the storage, handling, and inspection of all materials and equipment shall be furnished by the Contractor.
4. Defective materials and equipment shall be removed immediately from the site of the Work.

E. Inspection away from Site

1. If work to be done, away from the construction site, is to be inspected on behalf of the Owner during its fabrication, manufacture, or testing, or before shipment, the Contractor shall give notice to the Engineer of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Engineer in ample time, as determined solely by the Engineer, so that the necessary arrangements for the inspection can be made.

F. Samples

1. Submit samples of materials for tests, as the Engineer deems necessary to demonstrate conformance with the Specifications. Such samples, including concrete test cylinders, shall be furnished, taken, stored, packed, and shipped by the Contractor as directed by the Engineer.
2. Furnish suitable molds for making concrete test cylinders. Except as otherwise expressly specified, the Owner shall make arrangements for, and pay for, the tests.
3. Pack samples so as to reach their destination in good condition, and label to indicate the material represented, the name of the building or work and location for which the material is intended, and the name of the Contractor submitting the

sample. To ensure consideration of samples, notify the Engineer by letter that the samples have been shipped and properly describe the samples in the letter. Send letter of notification separate from the samples.

4. Submit data and samples, or place his orders, sufficiently early to permit consideration, inspection and testing before the materials and equipment are needed for incorporation in the Work. The consequences for failure to do so shall be the Contractor's sole responsibility.
5. In order to demonstrate the proficiency of workmen, or to facilitate the choice among several textures, types, finishes, surfaces, etc., provide such samples of workmanship of wall, floor, finish, etc., as may be required.
6. After review of the samples, data, etc. the materials and equipment used for the Work shall in all respects conform therewith.

G. Shop Testing

1. When required, furnish to the Engineer in triplicate, sworn copies of manufacturer's shop or mill tests (or reports from independent testing laboratories) relative to materials, equipment performance ratings, and concrete data.

1.04 CONTRACTOR'S SHOP AND WORKING DRAWINGS

- A. Submit shop drawings to the Engineer for review and approval.
- B. All submittals will be identified as the Engineer may require and in the number of copies also as required by the Engineer.
- C. The data shown on the Shop Drawings will be complete regarding quantities, dimensions, specified performance and design criteria, materials and other data as particular to the Work that the Contractor proposes to provide.

1.05 OCCUPYING PRIVATE LAND

- A. Entering or occupying with men, tools, materials, or equipment, any land outside the rights-of-way or property of the Owner (except after written consent from the proper parties) will not be permitted. A copy of the written consent shall be given to the Engineer.

1.06 INTERFERENCE WITH AND PROTECTION OF STREETS

- A. Obtain permits from the governing authorities prior to obstructing any portion of a street, road, or private way. If any street, road or private way is rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as ordered by the governing authorities.

- B. Maintain streets, roads, private ways, and walks not closed in a passable and safe condition,
- C. Provide at least 24 hours in advance, notice to the Owner, Police, Fire and School Departments in writing, with a copy to the Engineer, if the closure of a street or road is necessary. Cooperate with all Departments in the establishment of alternate routes and provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

1.07 SAFETY

- A. Take all precautions and provide safeguards to prevent personal injury and property damage. Provide protection for all persons including but not limited to employees and employees of other contractors and subcontractors; members of the public; and employees, agents and representatives of the Owner, the Engineer, and regulatory agencies that may be on or about the Work. Provide protection for all public and private property including but not limited to structures, pipes, and utilities, above and below ground.
- B. Provide and maintain all safety equipment such as fences, barriers, signs, lights, walkways, guards and fire prevention and fire-fighting equipment.
- C. Comply with all applicable Federal, State and local laws, ordinances, rules and regulations and lawful orders of all authorities having jurisdiction for the safety of persons and protection of property.
- D. Designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This responsible person shall have the authority to take immediate action to correct unsafe or hazardous conditions and to enforce safety precautions and programs.

1.08 EXISTING FACILITIES

A. Dimensions of Existing Structures

- 1. Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the Work, verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

B. Proposed Pipe Location

- 1. Exterior pipelines will be located substantially as indicated on the Drawings, but the right is reserved to the Owner, acting through the Engineer, to make such modifications in location as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings, etc., are noted on the

Drawings, such notation is for the Contractor's convenience and does not relieve him for laying and jointing different or additional items where required.

2. Small interior piping is indicated diagrammatically on the Drawings, and the exact location is to be determined in the field. Piping shall be arranged in a neat, compact, and workmanlike manner, with a minimum of crossing and interlacing, so as not to interfere with equipment or access way, and, in general, without diagonal runs.

C. Interference with Existing Works

1. Conduct operations so as to interfere as little as possible with existing works. Develop a program, in cooperation with the Engineer and interested officials, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as deviations therefrom are expressly permitted. All work of connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest time when the demands on the facilities best permit such interference, even though it may be necessary to work outside of normal working hours to meet these requirements. Electrical connections should be coordinated with the Owner so as to minimize disruption of normal plant operations. Before starting work which will interfere with the operation of existing facilities, perform preparatory work and see that all tools, materials and equipment are made ready and at hand.
2. Repair utilities damaged by the Contractors operations during the progress of the work, and be responsible for correcting all damages to existing utilities and structures at no additional expense to the Owner. Contact the proper utility or authority to correct or make any changes due to utility or other obstructions during the work but the entire responsibility and expense shall be with the Contractor.
3. Make such minor modifications in the work relating to existing structures as may be necessary, without additional compensation.
4. Submit no claim for additional compensation by reason of delay or inconvenience in adapting his operations to the need for continuous flow of sewage.

D. Existing Utilities or Connections

1. The location of existing underground pipes, conduits, and structures, as shown, has been collected from the best available sources. The Owner, together with its agents, does not imply nor guarantee the data and information in connection with underground pipes, conduits, structures and such other parts as to their completeness, nor their locations as indicated. The Contractor shall assume that there are existing water, sewer, gas and other utility connections to each and every building enroute, whether they appear on the drawings or not. An expense and/or delay occasioned by utilities and structures, or damage thereof, including those not shown, shall be the responsibility of the Contractor, at no additional expense to the Owner.

2. Above ground utilities may be present in the areas of the proposed Work. Take all necessary actions and/or precautions, including, but not limited to, utility company notification and necessary relocations (both temporary and permanent), to insure proper protection of those aboveground utilities and appurtenances to be affected by his operations. All costs associated with the aboveground utilities shall be paid by the Contractor at no additional expense to the Owner.
3. If and when encountered, existing utilities shall be properly supported and protected during the construction work and the Engineer shall be notified accordingly. The operation of existing utilities shall not be interrupted except with written permission of the operator and owner of such utilities. Allow ample time for all measures as may be required for the continuance of existing utility operations. Take extreme precautions to minimize disruption of utilities. Make prompt and full restitution for repairs by others for all disruptions caused by operations required to perform the Work.
4. Comply with all requirements of utility organizations involved.

E. Failure to Repair

1. Any emergency arising from the interruption of electric, telephone, gas, water, or sewer service due to the activities of the Contractor, shall be repaired by the Contractor as quickly as is possible.
2. If and when, in the opinion of the Owner, the Contractor is not initiating repair work as expeditiously as possible upon notification to do so, the Owner, may at his own option, make the necessary repairs using his own forces or those of others. The cost of such repairs shall be subtracted from the payments due to the Contractor.

F. Disturbance of Bounds

1. Replace all bounds disturbed during the construction operation, at no additional cost to the Owner. The bounds shall be relocated by a land surveyor approved by the Engineer and registered in the State that the Work is to be done.

1.09 WORK TO CONFORM

- A. During its progress and on its completion, the Work shall conform to the lines, levels, and grades indicated on the Drawings or given by the Engineer and shall be built in strict accordance with the Contract Documents and the directions given from time to time by the Engineer.
- B. All work done without instructions having been given therefore by the Engineer, without proper lines or levels, or performed during the absence of the Engineer, will not be estimated or paid for except when such work is authorized by the Engineer in writing. Work so done may be ordered uncovered or taken down, removed, and replaced at the Contractor's expense.

1.10 PLANNING AND PROGRESS SCHEDULES

- A. Before starting the Work and from time to time during its progress, as the Engineer may request, the Contractor shall submit to the Engineer a written description of the methods he plans to use in doing the Work and the various steps he intends to take.
- B. Within 14 calendar days after the date of formal execution of the AGREEMENT, the Contractor shall prepare and submit to the Engineer (a) a written schedule fixing the dates on which additional drawings, if any, will be needed by the Contractor and (b) a written schedule fixing the respective dates for the start and completion of various parts of the Work. Each such schedule shall be subject to review from time to time during the progress of the Work.

1.11 PRECAUTIONS DURING ADVERSE WEATHER

- A. During adverse weather and against the possibility thereof, take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required by the manufacturer of the material or equipment to be installed, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.
- B. During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging, or drying will result. Protected spaces shall be artificially heated by suitable means that will result in a moist or dry atmosphere according to the particular requirements of the work being protected. Ingredients for concrete and mortar shall be sufficiently heated so that the mixture will be warm throughout when used.

1.12 TEMPORARY HEAT

- A. If temporary heat is required for the protection of the Work, provide and install suitable heating apparatus, provide adequate and proper fuel, and shall maintain heat as required.
- B. Temporary heating apparatus shall be installed and operated in such manner that finished work will not be damaged.

1.13 ELECTRICAL ENERGY

- A. Make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for the proper completion of the Work and during its entire progress. Provide and pay for all temporary wiring, switches, connections, and meters.

- B. Provide sufficient electric lighting so that all work may be done in a workmanlike manner when there is not sufficient daylight.

1.14 CERTIFICATES OF CONFORMANCE

- A. Furnish to the Engineer, in the manner as directed and prior to actual installation, notarized certificates of conformance for all materials to be furnished under this Contract. The notarized certificates of conformance shall state that the material to be furnished meets or exceeds all requirements specified under the Contract Documents. When so directed, the manufacturer's notarized certificates of conformance, certifying that the materials meet the requirements specified shall accompany each shipment of material. Unless otherwise specifically specified and/or directed by the Engineer, all testing of materials required under this Contract shall be provided by the Contractor at no additional expense to the Owner.

1.15 PATENTS

- A. Pay, at no additional expense to the Owner, all applicable royalties and license fees associated with the materials and construction methods to be used under this Contract. Defend all suits or claims for infringements of any patent rights, and save the Owner and Engineer harmless from loss on account thereof, except that the Owner shall be responsible for any such loss when a particular process, design, or product of a particular manufacturer (s) is specifically specified with no option to the Contractor. However, if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner.
- B. Refer to Specification Section 1.07, Patents, regarding the Contractor's responsibilities for any patent rights associated with the materials and construction methods to be used under this Contract.

1.16 "OR EQUAL" CLAUSE

- A. Whenever a material or article required is specified or shown on the drawings by using the name of the proprietary product of a particular manufacturer or vendor, any material or article which will perform adequately, in the Engineer's sole judgment and/or opinion, the duties imposed by the general design may be considered equal and satisfactory providing the material or article so proposed is of equal substance. It shall not be purchased or installed without his written approval. In all cases new material shall be used in the project.
- B. If more than one brand, name of material, device, or piece of equipment is shown or specified, each should be regarded as the equal of the other. Any other brand, make of material, device or equipment, which in the opinion of the OWNER and/or ENGINEER, is the recognized equal of that specified (considering quality, workmanship, and economy of operation), and is suitable for the purpose intended, may be accepted.

C. ENGINEER will be allowed a reasonable time within which to evaluate submittals for Substitute Items. ENGINEER will be the sole judge of acceptability. No “Or Equal” or Substitute Item will be ordered, installed or utilized without ENGINEER’s prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR’s expense a special performance guarantee or other surety with respect to any “or equal” or substitute. ENGINEER will record time required by ENGINEER and ENGINEER’s Consultants in evaluating substitutes proposed or submitted by CONTRACTOR and in making changes to the Contract Documents. Whether or not ENGINEER accepts a Substitute Item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER’s Consultants for evaluating each such proposed Substitute Item.

1.17 ADDITIONAL OR SUBSTITUTE BONDS

A. If at any time the Owner, for justifiable cause, shall be or become dissatisfied with any Surety or Sureties than upon the performance or payment bonds, the Contractor shall, within five (5) calendar days after notice from the Owner so to do, substitute an acceptable bond (or bonds) in such form and sum and signed by such other Surety or Sureties as may be acceptable to the Owner. The Contractor shall pay the premiums on such bonds with no additional expense to the Owner. No further payments shall be deemed due nor will be made until the new Surety or Sureties shall have furnished such as acceptable bond to the Owner.

1.18 SEPARATE CONTRACTS

A. The Owner reserves the right to let other contracts in connection with the construction of the contemplated work of this project or contiguous projects of the Owner. The Contractor, therefore, will afford any such other contractors reasonable opportunity for the introductions and storage of their materials and the execution of their work, will properly connect and coordinate his work with theirs, and will not commit or permit any act which will interfere with the performance of their work.

B. Coordinate operations with those of other contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work.

C. It is essential that all parties interested in the project cooperate to the end that the entire project will be brought to a successful conclusion as rapidly as possible, but the Owner cannot guarantee that no interference or delay will be caused thereby. Interference and delay resulting from such cooperation shall not be basis of claims against the Owner.

1.19 PAYROLLS OF CONTRACTOR AND SUBCONTRACTORS

- A. The Contractor and each of his Subcontractors shall prepare his payrolls on forms prescribed and in accordance with instructions to be furnished by the Owner. Within seven (7) days after the regular payment date of the payroll, the Contractor shall deliver to the Owner, with copies to the Engineer, a certified legible copy or copies of each such payroll. Each such payroll shall contain the statement required by the Federal Regulations issued pursuant to the "Anti-Kickback Statute", (48 Stat. 948; 18 U.S.C. 874; 40 U.S.C. 276C).
- B. Carrying any person on his payrolls not employed by him will not be permitted. Carrying employees of a subcontractor on his payrolls will not be permitted, but such employees must be carried on the payrolls of the employing subcontractor.
- C. Each Contractor or Subcontractor shall preserve his weekly payroll records for a period of three (3) years from the date of completion of the Contract. The payroll records shall set out accurately and completely the name, occupational classification, and hourly wage rate of each employee, hours worked by him during the payroll period and full weekly wages earned by him, and deductions made from such weekly wages and the actual weekly wages paid to him. Such payroll records shall be made available at all times for inspection by the Owner or his authorized representatives, the Engineer or by agents of the United States Department of Labor.

1.20 PAYMENTS BY CONTRACTOR

- A. Pay for all traffic control, safety, transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered. Reimbursable costs for services rendered, as specified in the Contract Documents, shall not be incorporated into partial payment estimates until such time that the Contractor submits to the Engineer actual paid invoices from those in which services were rendered.

1.21 "DIG SAFE" LAW

- A. Comply with the Rhode Island General Law, Chapter 39-1.2, "Excavation Near Underground Utility Facilities" which became effective on July 1, 1984.
- B. Before commencing with the construction of any work, identify any water main, gas main, telephone duct, electric duct, and/or other utility present which is or could be in conflict with the proposed work.
- C. Relocation of the affected utilities shall be done as directed by the Owner and in accordance with the requirements of the utility company.
- D. The attention of the Contractor is directed to the fact that certain utility companies may not fall under the provisions of "DIG SAFE". Individual utility company

notifications by the Contractor shall be necessary to insure proper notification and protection of all existing utilities affected by this Contract.

1.22 FIRE PREVENTION AND PROTECTION

- A. State and municipal rules and regulations with respect to fire prevention, fire-resistant construction and fire protection shall be strictly adhered to and all work and facilities necessary therefore shall be provided and maintained by the Contractor in an approved manner.
- B. Provide fire protection equipment such as water tanks, hoses, pumps, extinguishers, and other materials, and apparatus, for the protection of the contract work, and adjacent property. Trained personnel experiences in the operation of all fire protection equipment and apparatus shall be available on the site whenever work is in progress, and at such other times as may be necessary for the safety of the public and the work.

1.23 DUST CONTROL

- A. Exercise every precaution and means to prevent and control dust arising out of all construction operations from becoming a nuisance to abutting property owners or surrounding neighborhoods. Pavements adjoining pipe trench shall be kept clean of excess materials wherever and whenever directed by the Engineer. Repeated daily dust control treatment shall be provided to satisfactorily prevent the spread of dust until permanent pavement repairs are made and until earth stockpiles have been removed, and all construction operations that might cause dust have been completed. No extra payment will be made for dust control measures, compensation shall be considered to be included in the prices stipulated for the appropriate items as listed in the Bid.

1.24 DISPOSAL OF DEBRIS

- A. The materials from the cleaning and demolition, and those used in the construction of the Work throughout the project, shall be deposited in such a manner so as to not endanger persons or the Work, and so that free access may be had at any time to all hydrants, gates and existing equipment in the vicinity of the work. The materials shall be kept trimmed-up so as to be of as little inconvenience as possible to the public travel and plant operations. All excavated materials not approved for backfill and fill, all surplus material, and all rock and boulders resulting from the excavations, shall be removed and satisfactorily disposed of off the site by the Contractor, at no additional expense to the Owner.
- B. The materials being removed during the cleaning process shall be deposited in such a manner as to not endanger the public, plant personnel or persons performing the work. Such debris deposits may be of such nature, high in biological organic contents, or chemically aggressive that they will require proper disposal in a safe, health risk free, environment. Contact the Owner and Engineer and all agencies

having jurisdiction thereof, for approval of debris disposal methods and locations of disposal, prior to disposing of any or all debris removed from cleaning methods. All debris shall be removed and satisfactorily disposed of off the work site, at no additional expense to the Owner.

1.25 DISPOSAL OF “SPECIAL WASTES”

- A. It is brought to the Contractor’s attention that there are certain materials, which may be encountered during the prosecution of the work, which the Rhode Island Department of Environmental Management (RIDEM) considers Special Wastes. While these materials are not considered “hazardous wastes”, they must be disposed in accordance with specific regulations.

1.26 NIGHT, SATURDAY, SUNDAY AND HOLIDAY WORK

- A. No work shall be done at night or on Saturdays, or Sundays or holidays without the prior written approval of the Owner and Engineer.

1.27 LENGTH OF WORK DAY

- A. The Owner retains the right to restrict the Contractor to an eight-hour workday. Such restrictions shall not be the basis for damages or claims against the Owner.
- B. The Contractor's attentions is also directed to the fact that should it be deemed necessary to perform various items of work during off-peak flow or traffic hours, early morning or late night hours, then he shall notify the Engineer a minimum of 24 hours in advance as to his intentions and reasons for the change in work hours. The Contractor shall be responsible for properly contacting and informing all involved parties of such a change in work hours. The Contractor shall not be entitled to any additional compensation from the Owner for any expenses that may be incurred by change of working hours and/or scheduling.

1.28 HURRICANE PROTECTION

- A. Should hurricane warnings be issued, the Contractor shall take every practicable precaution to minimize danger to persons, to the work and to adjacent property. These precautions shall include closing all openings; removing all loose materials, tools and/or equipment from exposed locations; and removing or securing scaffolding and other temporary work.

1.29 REDUCTION IN SCOPE OF WORK

- A. The Owner reserves the right to decrease the scope of the work to be done under this Contract and to omit any work should the Owner deem it to be in the public interest to do so. To this end, the Owner reserves the right to reduce the quantity of any items or omit all of any as set forth in the BID, either prior to executing the contract or at any time during the progress of the work. The Owner further reserves the right, at

anytime during the progress of the work, to restore all or part of any items previously omitted or reduced. Exercise by the Owner of the above rights shall not constitute any ground or basis of claim for damages or for anticipated profits on the work omitted.

END OF SECTION

SECTION 00800

SUPPLEMENTARY CONDITIONS

- 1.01 General
- 1.02 Limits of Normal Excavation
- 1.03 Bolts, Anchor Bolts, and Nuts
- 1.04 Concrete Inserts
- 1.05 Sleeves
- 1.06 Cutting and Patching
- 1.07 Foundations, Installations and Grouting
- 1.08 Services of Manufacturer's Representative
- 1.09 Operating Instructions and Parts List
- 1.10 Lubricants
- 1.11 Special Tools
- 1.12 Equipment Drive Guards
- 1.13 Protection Against Electrolysis
- 1.14 Covering Excavated Trench
- 1.15 Maintaining Trench Excavations
- 1.16 Disruption of Storm Drains
- 1.17 Precaution Against Hydraulic Uplift During Construction
- 1.18 Blasting
- 1.19 Nameplates
- 1.20 Special Safety Precautions
- 1.21 Land, Easements and Rights-of-Way
- 1.22 Cleaning Finished Work

1.01 GENERAL

A. These Supplementary Conditions are requirements which amend or supplement the General Conditions specified elsewhere.

B. The duties and obligations imposed by these Supplementary Conditions 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.

C. Assertion of any claim for any additional compensation or damages on account of and/or the fulfillment of these Supplementary Conditions will not be allowed.

1.02 LIMITS OF NORMAL EXCAVATION

A. In determining the quantities of excavation to which unit prices shall apply, the limits of normal width and depth of excavation shall be as described below, unless other limits are indicated in the Contract Documents.

B. For pipes in trench, the normal width of the trench shall be measured between vertical planes

which are a distance apart equal to the sum of 18 inches plus 1-1/3 times the nominal inside diameter of the pipe. If the width so computed is less than 3.0 feet, a width of 3.0 feet shall be taken as the normal width for payment. The normal depth shall be measured to a distance of 0.5 feet below the bottom of the pipe in earth and 0.5 feet in rock, unless there be a cradle underneath the pipe, in which case the normal depth shall be measured to the underside of the cradle. The trench width for the cradle shall be assumed to be that specified above for pipes in the trench.

C. For concrete placed directly against undisturbed earth, the normal width and depth of the excavation for such concrete shall be measured to the neat lines of the concrete as indicated on the Drawings or as ordered.

D. For concrete placed against rock surfaces resulting from rock excavation, the normal width and depth of the excavation shall be measured to 4 inches outside the neat lines of the concrete as indicated on the Drawings or as ordered.

E. For other structures, except manholes as noted below, the normal width shall be measured between vertical planes 1.0 feet outside the neat lines of the several parts of the structure, except that the width at any elevation shall be measured as not less than the width at a lower elevation. The normal depth shall be measured to the underside of that part of the structure for which the excavation is made.

F. No additional width or depth of trenches excavated in earth or rock shall be allowed at standard circular manholes. They pay limit for rock removed outside proposed manholes shall commence one foot (1.0) outside the widest dimension of the structure or shall be the maximum connecting trench width, whichever is greater.

G. Wherever bell holes are required for jointing pipe, they shall be provided without additional compensation over and above that resulting from measurements as above described.

1.03 BOLTS, ANCHOR BOLTS AND NUTS

A. Furnish bolts, anchor bolts, nuts, washers, plates and bolt sleeves required by equipment to be installed under this Contract in accordance herewith.

Anchor bolts shall have suitable washers and, where so required, their nuts shall be hexagonal.

B. Anchor bolts, nuts, washers, plates, and bolt sleeves shall be galvanized unless otherwise indicated or specified.

C. Expansion bolts shall have malleable iron and lead composition elements of the required number of units and size.

D. Unless otherwise specified, stud, tap, and machine bolts, and nuts shall conform to the requirements of ASTM Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to ANSI Standard B1.1-1974 for Unified Inch Screw Threads (UN and UNR Thread Form).

E. Bolts, anchor bolts, nuts and washers, specified to be galvanized, shall be zinc coated, after being threaded, by the hot-dip process in conformity with the ASTM Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip, Designation A123, or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153, as is appropriate.

F. Bolts, anchor bolts, nuts, and washers specified to be stainless steel shall be Type 316 stainless steel unless otherwise indicated or specified.

G. Anchor bolts and expansion bolts shall be set accurately. If anchor bolts are set before the concrete has been placed, they shall be carefully held in suitable templates of acceptable design. Where indicated on the Drawings, specified, or required, anchor bolts shall be provided with square plates at least 4 inches by 4 inches by 3/8 inches or shall have square heads and washers and be set in the concrete forms with suitable pipe sleeves, or both. If anchor or expansion bolts are set after the concrete has been placed, all necessary drilling and grouting or caulking shall be done by the Contractor and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the drilling and caulking.

1.04 CONCRETE INSERTS

A. Concrete inserts for hangers shall be designed to support safely, in the concrete that is used, the maximum load that can be imposed by the hangers

used in the inserts. Inserts for hangers shall be of a type which will permit adjustment of the hangers both horizontally (in one plane) and vertically and locking of the hanger head or nut. All inserts shall be galvanized.

1.05 SLEEVES

A. Unless otherwise indicated on the Drawings or specified, openings for the passage of pipes through floors and walls shall be formed of sleeves of standard-weight, galvanized steel pipe. The sleeves shall be of ample diameter to pass the pipe and its insulation, if any, and to permit such expansion as may occur. Sleeves shall be of sufficient length to be flush at the walls and the bottom of slabs and to project 1 inch above the finished floor surface. Threaded nipples shall not be used as sleeves.

B. Sleeves in exterior walls below ground or in walls to have liquids on one or both sides shall have a 2 inch annular fin of 1/8 inch plate welded with a continuous weld completely around the sleeve at about mid-length. Sleeves shall be galvanized after the fins are attached.

C. All sleeves shall be set accurately before the concrete is placed or shall be built in accurately as the masonry is being built.

1.06 CUTTING AND PATCHING

A. The Contractor shall leave all chases or openings for the installation of his own or any other contractor's or subcontractor's work, or shall cut the same in existing work, and shall see that all sleeves or forms are at the Work and properly set in ample time to prevent delays. He shall see that all such chases, openings, and sleeves are located accurately and are of proper size and shape and shall consult with the Engineer and the contractors and subcontractors concerned in reference to this work.

B. In case of his failure to leave or cut all such openings or have all such sleeves provided and set in proper time, he shall cut them or set them afterwards at his own expense, but in so doing he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the written consent of the Engineer.

C. The Contractor shall carefully fit around, close up, repair, patch, and point around the work specified herein to the satisfaction of the Engineer.

D. All of this work shall be done by careful workmen competent to do such work and with the proper small hand tools. Power tools shall not be used except where, in the opinion of the Engineer, the type of tool proposed can be used without damage to any work or structures and without inconvenience or interference with the operation of any facilities. The Engineer's concurrence with the type of tools shall not in any way relieve or diminish the responsibility of the Contractor for such damage, inconvenience, or interference resulting from the use of such tools.

E. The Contractor shall not cut or alter the work of any subcontractors or any other contractor, nor permit any of his subcontractors to cut or alter the work of any other contractor, or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered or with the written consent of the Engineer. All cutting and patching or repairing made necessary by the negligence, carelessness, or incompetence of the Contractor or any of his subcontractors shall be done by or at the expense of the Contractor and shall be the full responsibility of the Contractor.

1.07 FOUNDATIONS, INSTALLATION AND GROUTING

A. Furnish materials and construct suitable concrete foundation for all equipment installed under this Contract, even though such foundations may not be indicated on the Drawings. The tops of foundations shall be at such elevations as will permit grouting as specified below.

B. Equipment shall be installed by skilled mechanics and in accordance with the instruction of the manufacturer.

C. In setting pumps, motors, and other items of equipment customarily grouted, make an allowance of at least 1-in. for grout under the equipment bases. Shims used to level and adjust the bases shall be steel. Shims may be left embedded in the grout, in which case they shall be installed neatly and so as to be as inconspicuous as possible in the completed work. Unless otherwise permitted, all grout shall be a suitable nonshrink grout.

D. Grout shall be mixed and placed in accordance with the recommendations of the manufacturer. Where practicable, the grout shall be placed through the grout holes in the base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so

constructed as to provide a suitable chamber around the top edge of the finished foundation.

E. Where such procedure is impracticable, the method of placing grout shall be as permitted by the Engineer. After the grout has hardened sufficiently, all forms, hoppers, and excess grout shall be removed, and all exposed grout surfaces shall be patched in an approved manner, if necessary, given a burlap-rubbed finish, and painted with at least two coats of an acceptable paint.

1.08 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Arrange for the services of qualified factory service representatives from the companies manufacturing or supplying equipment and/or materials to be used or installed in the work as specified, to perform the following duties.

B. After installation of the listed equipment has been completed and the equipment is presumably ready for operation, but before others operate it, the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include but shall not be limited to, the following points as applicable:

1. Soundness (without cracked or otherwise damaged parts).
 2. Completeness in all details, as specified.
 3. Correctness of setting, alignment, and relative arrangement of various parts.
 4. Adequacy and correctness of packing, sealing and lubricants.
- C. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.

D. On completion of his work, the manufacturer's or supplier's representative shall submit in triplicate to the Engineer a complete signed report of the result of his inspection, operation, adjustments, and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that specifically states "the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void".

E. After the Engineer has reviewed the reports from the manufacturer's representatives, the Contractor shall make all arrangements to have the manufacturer's representatives present when the field acceptance tests are made by the Engineer without additional cost to the Owner.

1.09 OPERATING INSTRUCTIONS AND PARTS LISTS

A. Where reference is made in the Technical Specifications to operating instructions and spare parts lists, furnish, for each piece of equipment, six complete sets giving the information listed below:

1. Clear and concise instructions for the operation, adjustment, and lubrication and other maintenance of the equipment. These instructions shall include a complete lubrication chart.

2. List of all parts for the equipment, with catalog numbers and other data necessary for ordering replacement parts.

B. Such instructions and parts lists shall be annotated to indicate only the specific equipment furnished. References to other sizes and types or models of similar equipment shall be deleted or neatly lined out.

C. Such operating instructions and parts lists shall be delivered to the Engineer at the same time that the equipment to which they pertain is delivered to the site.

1.10 LUBRICANTS

A. During testing and prior to acceptance, Furnish all lubricants necessary for the proper lubrication of all equipment furnished under this Contract.

1.11 SPECIAL TOOLS

A. For each type of equipment furnished provide a complete set of all special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation, maintenance, and disassembly of such equipment. Tools shall be high-grade, smooth, forged, alloy, tool steel. Grease guns shall be lever type.

B. Special tools are considered to be those tools which because of their limited use are not normally available, but which are necessary for the particular equipment.

C. Special tools shall be delivered at the same time as the equipment to which they pertain. Properly store and safeguard such special tools until

completion of the work, at which time they shall be formally transmitted and delivered to the Owner.

1.12 EQUIPMENT DRIVE GUARDS

A. All equipment driven by open shafts, belts, chains, or gears shall be provided with acceptable all-metal guards enclosing the drive mechanism. Guards shall be constructed of galvanized sheet steel or galvanized woven wire or expanded metal set in a frame of galvanized steel members. Guards shall be secured in position by steel braces or straps that will permit easy removal for servicing the equipment. The guards shall conform in all respects to all applicable safety codes and regulations.

1.13 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or by other acceptable materials.

1.14 COVERING EXCAVATED TRENCH

A. In addition to the requirements in Section 00700 titled Interference with and Protection of Streets. Cover all open excavations when construction operations are suspended at the end of the day, or in excavated trenches where work is not actually in progress. Cover shall be capable of withstanding AASHTO H20-S16 loading. This cover shall consist of steel plates or some other satisfactory cover of adequate size and strength suitably held in place to keep all traffic out of excavations, all as verified in writing by the Contractor. The cover shall be laid over the excavation until it is backfilled.

1.15 MAINTAINING TRENCH EXCAVATIONS

A. The length of trench opened at any time, from point where ground is being broken to completed backfill, and also the amount of space in streets or public and private lands occupied by equipment, trench, and supplies, shall not exceed the length of space considered reasonably necessary and expedient by the Engineer. In determining the length of open trench or spaces for equipment, materials, supplies and other necessities, the Engineer will consider: the nature of the lands or streets where work is being done; types and methods of construction and equipment being used; inconvenience to the public or to private parties; possible dangers; and other

proper matters. All work must be constructed with a minimum inconvenience and danger to the public and all other parties concerned.

B. Whenever any trench obstructs pedestrian and vehicular traffic in or to any public street, private driveway or property entrance, or on private property, take such means as may be necessary to maintain pedestrian and vehicular traffic and access. Until such time as the work may have attained sufficient strength to support backfill, or if for any other reason it is not expedient to backfill the trench immediately, construct and maintain suitable plank crossing and bridges to carry essential traffic in or to the street, driveway or property in question, as specified or directed.

C. Suitable signs, lights, and such items required by Police Authorities to direct traffic, shall be furnished and maintained by the Contractor at his own expense.

D. Keep streets and premises free from unnecessary obstructions, debris and all other materials. The Engineer may, at any time, order all equipment, materials, surplus from excavations, debris and all other materials lying outside that length of working space, promptly removed. Should the Contractor fail to remove such material within 24 hours after notice to remove the same, the Owner may cause any part or all of such materials to be removed by such persons as he may employ, at the Contractor's expense; and may deduct the costs thereof from payments which may be or may become, due to the Contractor under the Contract. In special cases, where public safety urgently demands it, the Owner may cause such materials to be removed at the Contractor's expense without prior notice.

1.16 DISRUPTION OF STORM DRAINS

A. Portions of the Work may be located in areas that are serviced by storm drains. Take extreme precaution to minimize disruption of the drains, and repair and/or make restitution for repairs by others for all disruptions caused by the construction operations.

1.17 PRECAUTION AGAINST HYDRAULIC UPLIFT DURING CONSTRUCTION

A. Protect all structures against hydraulic uplift until such structures have beneficially completed.

1.18 BLASTING AND PRE-CONSTRUCTION BLASTING SURVEY

A. Blasting will not be permitted.

1.19 NAMEPLATES

A. With the exceptions mentioned below, each piece of equipment shall be provided with a substantial nameplate of noncorrodible metal, securely fastened in place and clearly and permanently inscribed with the manufacturer's name, model or type designation, serial number, principal rated capacities, electrical or other power characteristics, and similar information as appropriate. Coordinate nameplate text requirements with Engineer prior to fabrication. Nameplates shall be securely mounted in a readily visible location approved by the Engineer. Equipment Specification sections may contain additional information regarding nameplates.

B. This requirement shall not apply to standard manually operated hydrants or to gate, globe, check, and plug valves.

C. Each process valve shall be provided with a substantial tag of noncorrodible metal securely fastened in place and inscribed with an identification number in conformance with the Valve Identification Schedule indicated on the drawings or furnished later by the Engineer.

1.20 SPECIAL SAFETY PRECAUTIONS

A. Contractor to note that the atmospheres in sewage pumping station wet wells, where wastewater is open to the air, are classified as hazardous Class 1, Division 1, Group D by the NEC. Use appropriate equipment and provide adequate ventilation and safety equipment.

1.21 LAND, EASEMENTS, AND RIGHTS-OF-WAY

A. As indicated, a portion of the work may be located within easements and/or rights-of-way, obtained or which will be obtained by the Owner, through private property. On all other lands, the Contractor has no rights unless he obtains them from the proper parties as specified in Section 00700, Occupying Private Land.

B. Prior to issuance of the Notice to Proceed, the Owner shall obtain all land, easements and rights-of-way necessary for carrying out and for the completion of the work to be performed pursuant to

the Contract Documents, unless otherwise mutually agreed.

C. The Owner shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

D. The Contractor shall provide at his own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities or for storage of materials.

E. If however, lands, easements or rights-of-way cannot be obtained before work on the project begins, the Contractor shall begin his work upon such land, easements or rights-of-way as have been previously acquired by the Owner, and no claims for damages whatsoever will be allowed by reason of its inability to procure the lands, easements, or rights-of-way for the said work, the Contractor shall not be entitled to make or assert a claim for damages by reason of the said delay, or to withdraw from the Contract except by consent of the Owner. Time for completion of work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to set forth in writing.

1.22 CLEANING FINISHED WORK

A. After the work is completed, the pipes, manholes and structures shall be carefully cleaned free of debris and dirt, broken masonry, and mortar, and left in first class condition, ready to use. All temporary or excess materials shall be disposed of off-site and the work left broom clean, to the satisfaction of the Engineer.

END OF SECTION

DIVISION 01

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work covered by the Contract, listing of Owner, Project location, Engineer, the Contractor's use of the premises and Owner's occupancy requirements.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work includes, but is not necessarily limited to:

- Headworks Facility
 - Installation of a new influent channel fine screen unit
 - Installation of a new washer / compactor unit for screenings
 - Electrical work associated with the new equipment
 - Instrumentation and Control equipment
 - Demolition of existing seal water system and associated equipment
 - Construction and operation of a temporary bypass system
 - HVAC improvements
 - Fire alarm improvements
- Oakland Pump Station
 - Demolition of two (2) existing wastewater pumps, piping, valves, and appurtenances
 - Installation of two (2) **25-hp** wastewater pumps, piping, valves, and appurtenances
 - Remove existing generator and underground storage tank
 - Installation of new generator with integral fuel storage tank
 - Electrical associated with the new equipment
 - Construction and operation of a temporary bypass system
 - Wet well modifications as shown and specified

1.03 OWNER

A. Town of Burrillville, Rhode Island

Burrillville Sewer Commission
141 Clear River Drive
Burrillville, RI 02830
Telephone: (401) 568-6296
Contact: Michael Emond, Superintendent

1.04 PROJECT LOCATION

- A. Burrillville, RI – Refer to Cover Sheet of Plans for project locations.

1.05 ENGINEER

- A. BETA Group, Inc.
701 George Washington Highway
Lincoln, Rhode Island 02865
Telephone: 401-333-2382
Fax: 401-333-9225
Contact: Alan Gunnison, P.E.

1.06 WORK SEQUENCE

- A. In order that Work may be conducted with minimum inconvenience to the public and, work under this Contract may be coordinated with other work which may be under construction or contemplated, and that work under the Contract may conform to conditions which it has been undertaken or conditions attached to a right-of-way or particular location for this work, the Engineer may determine the point or points and time or times when portions of work will commence or be carried on and may issue orders pertaining to the work sequence, relative to the rate of progress on several portions of the work.
- B. Refer to Section 01810 – Maintenance of Operations and Sequence of Construction for additional requirements.

1.07 CONTRACTOR USE OF PREMISES

- A. The Contractor's use of premises shall be within the limits shown on the Drawings and as defined in Section 00500 – Contract Agreement, for the performance of the Work.
- B. The Contractor shall maintain access and utilities to the existing wastewater treatment and pumping station facilities at all times.
- C. The Contractor shall assume full responsibility for security of all materials and equipment on the site, including those of his subcontractor's.
- D. If directed by the Owner, the Contractor shall move any stored items that interfere with operations of the Owner.
- E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.08 OWNER OCCUPANCY REQUIREMENTS

- A. The existing wastewater treatment facility must remain in full service at all times, throughout the duration of the project. Contractor shall conduct his operations in accordance with

Sections 01810 – Maintenance of Operations and Sequence of Construction and 02149 - Maintaining Existing Flow.

B. The Owner requires safe and unhindered access to be maintained to all operating treatment processes and structures for the purpose of operating and maintaining the treatment facility.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01015

SPECIAL CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Supplementary requirements governing schedule, traffic control, work in state roads, environmental assessment and pavement work.

B. Related sections

1. Section 00700 – General Conditions
2. Section 00800 – Supplementary Conditions

1.02 SEQUENCE OF WORK

A. Headworks Wet Well Cleaning

1. The cleaning of the existing headworks wet wells must be completed while temporary bypass of the influent sewer is operating.
2. All residual wastewater and accumulated debris shall be removed from the wet well as specified.
3. The interior of the wet well shall be power washed and residual water shall be removed to allow the Engineer to inspect the interior of both wet wells
4. **The temporary influent sewer bypass shall not be taken offline until the new screening equipment is installed and ready for testing.**
5. The manual bar rack shall also be in place prior to taking the temporary influent sewer bypass offline.

1.03 DEWATERING OF WET WELL DEBRIS

A. Dewatering of Debris

1. Solids and debris removed from the existing wet well is to be dewatered to a minimum **20-percent solids** with no free liquid.
2. Materials denied disposal due to free liquid shall be returned to the WWTF site and dewatered at no additional cost to the owner.

1.04 TEMPORARY HEADWORKS VENTILATION

A. Temporary Ventilation

1. If HVAC work is conducted while the headworks is actively receiving influent wastewater flow, then the following must be provided:
 - a. Ventilation within the headworks must be maintained during construction. The Contractor shall provide temporary ventilation of the space while completing HVAC improvements.
 - b. A temporary ventilation system must be in place and operational prior to taking the existing ventilation system offline. The temporary ventilation system must be capable of providing the following:
 - 1) The headworks shall be ventilated at 12 air changes per hour (3,800 CFM).

1.05 CORROSION TESTING OAKLAND PUMP STATION

A. Cost associated with corrosion testing at the Oakland pump station shall be paid through the allowance included as Bid Item 2.5. See Specification 01020 Allowances for requirements.

B. Corrosion Testing Consultant

1. Corrosion testing and reporting shall be completed by Corrosion Probe, Inc of Centerbrook, Connecticut or approved equal.

C. Corrosion Testing Requirements

1. Perform careful visual inspection of interior surfaces of the drywell. Look for in-leakage of groundwater. Documentation will consist of written observations and annotated digital photographs.
2. Examine the condition of the interior protective coating system visually and with a dry film thickness gauge
3. Take pit depth measurements using a pit gauge where breaches in the interior coating have resulted in significant internal corrosion
4. Perform random ultrasonic testing to identify areas of external corrosion and measure remaining thickness of the shell and floor. Thickness data will be compared with original thickness values.
5. Take structure-to-soil potential measurements, using a copper-copper sulfate reference electrode buried in the soil around the drywell. These measurements will reveal if the steel structure is actively corroding externally and whether the original cathodic protection system is providing any protection to the structure.
6. If the cathodic protection system anodes are accessible, measure the current output of each.
7. Prepare and submit a formal, written report containing details of the inspections and testing performed and associated results (including photographs); discussion of significant findings; details of the engineering evaluation; conclusions regarding condition and whether the drywell is corroding externally; and recommendations for any necessary repairs, and for future protection from external corrosion.

END OF SECTION

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SECTION 01020

ALLOWANCES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Contingencies and their respective value which have been established in the BID as an estimated lump sum to facilitate comparison of bids only.

B. Related Sections

1. Section 00300 - Bid Forms
2. Section 01025 - Measurement and Payment

1.02 ALLOWANCES

A. Corrosion Testing Oakland Pump Station - Bid Item No. 2.5.

1. Provide the corrosion testing as specified in Section 01015 1.05 or as directed by the Engineer.
2. Coordinate all work with the approved testing company. Coordinate with the Engineer for providing access to the site at the appropriate time to prevent any delay in the work specified to be done under these Contract Documents.

1.03 PAYMENT PROCEDURES

- A. Under these items, the Contractor shall be reimbursed for charges for the allowances required and authorized by the Owner and Engineer, as detailed in Section 01025 - Measurement and Payment.
- B. The lump-sum price for allowances is established in Section 00300 - Bid Forms as an estimated figure to facilitate comparison of bids only. The actual amount to be paid under this item shall constitute full compensation for services rendered.
- C. The lump-sum price for this item shall NOT include any costs associated with services rendered for routine utility markings, repair damages incurred as a result of the Contractor's operations, relocations of utilities done at the Contractor's request and/or convenience, or any other unauthorized services rendered by utility companies. The purpose of this item is strictly for the Contractor's reimbursement for those services authorized by the Owner or Engineer prior to the work being performed.

- D. The Contractor will be paid based on the actual PAID invoiced amount from the authority in question as approved by the Engineer. If the total cost for such charges is greater or less than the allowance amount stated under this item of the BID, a debit or credit of the difference in cost shall be to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials as required and ordered by the Engineer shall conform to the Contract Documents.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation, relocation, or additional work, shall be performed in accordance with the Contract Documents.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

Measurement and payment criteria applicable to the Work performed under a unit price and/or lump sum payment method of Items listed in the BID.

B. RELATED SECTIONS

1. Section 00300 - Bid
2. Section 00500 – Agreement
3. Section 01020 – Allowances
4. Section 01026 – Schedule of Values

1.02 UNIT QUANTITIES SPECIFIED

- A. Quantities and measurements indicated in SECTION 00300 are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Engineer shall determine payment.
- B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit price contracted.

1.03 MEASUREMENTS OF QUANTITIES

- A. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- B. Measurement by Area: Measured by square dimension using mean length and width or radius.
- C. Linear Measurement: Measured by linear dimension, along the horizontal projection of the centerline or mean chord.
- D. At appropriate points in this text, specifications are given with respect to measuring or estimating certain quantities and the sums due for the same. Except as otherwise provided, the Engineer shall determine the appropriate method for measuring and computing each quantity, and for estimating the sums due for the various kinds of work and material, using such methods, tools and degrees of precision as are suitable for the particular measurement, Item or computation. When so requested by the Engineer, assistance in measuring or determining quantities, shall be provided by furnishing the help of unskilled laborers on the site, by furnishing copies of invoices, or by other means.

- E. For estimating quantities in which the computations of areas by analytic and geometric methods would be laborious, as determined by the Engineer, it is stipulated and agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of such areas and may be used for this purpose.

1.04 UNIT PRICES

- A. Payment will be computed on the basis of the unit price bid in SECTION 00300 for each Item and the quantity of units completed. Unit prices are to include cost of all necessary materials, labor, equipment, overhead, profit and other applicable costs. (See Par. 1.06, this Section.)

1.05 LUMP SUM PRICES

- A. Payment will be computed on the basis of the percentage of work completed on each Item in the contract BID as determined by the Engineer. Lump sum prices are to include the cost of all necessary materials, labor, equipment, overhead, profit and other applicable costs.

1.06 PRICES INCLUDE

- A. The prices stated in the Proposal include full compensation not only for furnishing all the labor, equipment and material needed for, and for performing the work and building the structures contemplated by, the Contract, but also for assuming all risks of any kind for expenses arising by reason of the nature of the soil, ground water, or the action of the elements; for draining, damming, pumping or otherwise handling and removing, without damage to the work or to other parties, and without needless nuisance, all water or sewage from whatever source which might affect the work or its progress, or be encountered in excavations made for the work; for maintaining existing flows and bypass pumping; for all signs, fencing, lighting, watching, guarding, temporary surfacing, bridging, snow removal, etc., necessary to maintain and protect travel on streets, walks and private ways; for making all provisions necessary to maintain and protect buildings, fences, poles, trees, structures, pipes, ducts and other public or private property affected or endangered by the work; for the repair or replacement of such things if injured by neglect of such provisions for removing all surplus or rejected materials as may be directed; for replacing, repairing and maintaining the surfaces of streets, highways, public and private lands if and where disturbed by work performed under the Contract or by negligence in the performance of work under the Contract; for obtaining all permits and licenses and complying with the requirements thereof, including the cost of furnishing any security needed in connection therewith; for any and all expense on account of the use of any patented device or process; for protection against inclement or cold weather; for all expenses incurred by or on account of the suspension; interruption or discontinuance of work; for the cost of the surety bond and adequate insurance; for all taxes, fees, union dues, etc., for which the Contractor may be or become liable, arising out of his operations incidental to the Contract; for providing equipment on the site and off site; for providing a field office and its appurtenances and for all general and incidental expenses; for tools, implements and equipment required to build and put into good working order all work contemplated by the Contract; for maintaining and

guaranteeing the same as provided; and for fulfilling all obligations assumed by the Contractor under the Contract and its related documents.

- B. The Owner shall pay and the Contractor shall receive the prices stipulated in the BID made a part hereof as full compensation for everything performed and for all risks and obligations undertaken by the Contractor under and as required by the Contract.

1.07 PAYMENT

- A. In general, payment will be made for all Contract work satisfactorily completed through the end of the previous month. The payment will include any additional work which has been completed and approved and change order work agreed upon by the Owner and Contractor which has been completed and approved (See SECTION 00500).
- B. Each application for payment will indicate the total of a minimum percent retainage as defined in SECTION 00500, held by the Owner on the total of all work completed under the contract and approved for payment to-date.
- C. Monthly applications for payment may also indicate reduction or increase of the total Contract price when an approved change order results in a net reduction or net increase in the cost and quantity of work to be performed under the Contract.
- D. Special billings and charges against the Contract as credit or payment to the Owner, that are not for change order work, may be subtracted from monies due on any monthly application for payment but shall not serve to reduce the total Contract price.
- E. For all equipment and systems provided in Division 11, Division 15, and Division 16:
 - a. Five (5) percent of the equipment/system cost will be withheld until the operations and maintenance manual has been approved and all copies have been turned over to the Owner.
 - b. Five (5) percent of the equipment/system cost will be withheld until the spare parts and lubricants have been turned over to the Owner.
 - c. Five (5) percent of the equipment/system cost will be withheld until the manufacturer's representative has certified the equipment, assisted with the start-up and completed the training.
 - d. Five (5) percent of the equipment/system cost will be withheld until the testing has been completed and the test results have been submitted and approved.

1.08 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

BID ITEMS

BID ITEM NO. 1.1 WWTF HEADWORKS IMPROVEMENTS

- A. Payment of the lump-sum price bid in the Bid Form for Item No. 1.1 shall constitute full compensation for all labor, material, tools, equipment and incidentals necessary for

constructing **WWTF Headworks Improvements**, complete, as indicated on the drawings and as specified, including but not limited to mobilization and demobilization; coordination with Town officials, all required demolition, construction of new screens, new washer/compactor, new manual bar rack, fire alarm system improvements, HVAC improvements; furnishing, installing, testing, and maintenance of the bypass system; phasing work to maintain treatment plant operations; protection of all existing structures and utilities; the removal and disposal of existing equipment, supports; equipment pads; startup; and testing complete as shown on the Drawings and as specified herein.

- B. Item shall also constitute compensation for protection of all existing structures and utilities, all concrete work, architectural, civil site, structural, mechanical, electrical, instrumentation, and all associated appurtenant work, as indicated on the Drawings and as specified, including all incidental work not specifically included for payment under other Items.
- C. The lump sum price shall also include cleaning, demolition and disposal of existing materials and equipment as indicated on the drawings.
- D. Payment of the lump sum bid in the Bid Form shall be full compensation for furnishing all labor, materials, equipment, and incidentals required, to perform the Work, in its entirety as shown on the Drawings as specified. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

BID ITEM NO. 1.2 CLEAN EXISTING WET WELLS

- A. Payment of the per day bid price in the Bid Form for Item No. 1.2 shall constitute full compensation for all labor, material, tools, equipment, and incidentals necessary for dewatering of residual wastewater from the wet well, removal of accumulated solids and debris, pressure washing of concrete substrate, complete as shown on the Drawings and as specified herein.
- B. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

BID ITEM NO. 1.3 DEWATERING OF WET WELL DEBRIS

- A. Payment of the per ton bid price in the Bid Form for Item No. 1.3 shall constitute full compensation for all labor, material, tools, equipment, and incidentals necessary for dewatering of solids and debris removed from each wet well under Bid Item No. 1.2, complete as shown on the Drawings and as specified herein.
- B. Payment shall be provided based on the actual ton of material disposed under Bid Item 1.4 based on weight slips from the approved disposal facility.
- C. Removed solids and debris shall be dewatered to a minimum of 20-percent solids with no free liquid remaining.
- D. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

BID ITEM NO. 1.4 DISPOSAL OF DEWATERED WET WELL DEBRIS

- A. Payment of the per ton bid price in the Bid Form for Item No. 1.4 shall constitute full compensation for all trucking, disposal fees, laboratory testing, labor, material, tools,

equipment, and incidentals necessary for disposal of solids and debris removed from each wet well under Bid Item No. 1.2, complete as shown on the Drawings and as specified herein.

- B. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

BID ITEM NO. 2.1 CONSTRUCT OAKLAND PUMP STATION IMPROVEMENTS

- A. Payment of the lump-sum price bid in the Bid Form for Item No. 2.1 shall constitute full compensation for all labor, material, tools, equipment and incidentals necessary for constructing **Oakland Pump Station Improvements**, complete, as indicated on the drawings and as specified, including but not limited to mobilization and demobilization; coordination with Town officials, all required demolition, removal of underground storage tank, construction of sewer bypass connection, new pumps, new emergency generator, wet well improvements, flood proofing measures, HVAC improvements; phasing work to maintain pump station operations; furnishing, installing, testing, and maintenance of the bypass system; protection of all existing structures and utilities; the removal and disposal of existing equipment, supports; equipment pads; startup; and testing complete as shown on the Drawings and as specified herein.
- B. Item shall also constitute compensation for protection of all existing structures and utilities, all concrete work, architectural, civil site, structural, mechanical, electrical, instrumentation, and all associated appurtenant work, as indicated on the Drawings and as specified, including all incidental work not specifically included for payment under other Items.
- C. The lump sum price shall also include cleaning, demolition and disposal of existing materials and equipment as indicated on the drawings. Payment of the lump sum bid in the Bid Form shall be full compensation for furnishing all labor, materials, equipment, and incidentals required, to perform the Work, in its entirety as shown on the Drawings as specified. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

BID ITEM NO. 2.2 PUMPING, REMOVAL, HANDLING, AND DISPOSAL OF LIQUID VIRGIN FUEL

- A. Payment of the per gallon bid price in the Bid Form for Item No. 2.2 shall constitute full compensation for all trucking, disposal fees, laboratory testing, labor, material, tools, equipment, and incidentals necessary for disposal of liquid virgin fuel removed from existing underground storage tank under Bid Item No. 2.1, complete as shown on the Drawings and as specified herein.
- B. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

BID ITEM NO. 2.3 PUMPING, REMOVAL, HANDLING, AND DISPOSAL OF LIQUID FUEL RESIDUALS

- A. Payment of the per gallon bid price in the Bid Form for Item No. 2.3 shall constitute full compensation for all trucking, disposal fees, laboratory testing, labor, material, tools, equipment, and incidentals necessary for disposal of liquid fuel residuals removed from

existing underground storage tank under Bid Item No. 2.1, complete as shown on the Drawings and as specified herein.

- B. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

**BID ITEM NO. 2.4 EXCAVATION, REMOVAL, TRANSPORTATION, AND DISPOSAL OF
PETROLEUM IMPACTED SOIL**

- A. Payment of the per ton bid price in the Bid Form for Item No. 2.4 shall constitute full compensation for all trucking, disposal fees, laboratory testing, labor, material, tools, equipment, and incidentals necessary for disposal of petroleum impacted soil removed from the underground storage tank excavation under Bid Item No. 2.1, complete as shown on the Drawings and as specified herein.
- B. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.

ALTERNATE BID ITEMS

BID ITEM NO. A-1 ELECTRIC HOIST AND TROLLEY:

- A. Payment of the lump-sum price bid in the Bid Form for Items No. A-1 shall constitute full compensation for all labor, material, tools, equipment and incidentals necessary for providing and installing the **Electric Hoist and Trolley**, complete, as indicated on the drawings and as specified, including but not limited to mobilization and demobilization; coordination with Town officials, all required demolition, new electric hoist and trolley; protection of all existing structures and utilities; the removal and disposal of existing equipment, supports; startup; and testing complete as shown on the Drawings and as specified herein.
- B. Item shall also constitute compensation for protection of all existing structures and utilities, all concrete work, architectural, structural, mechanical, electrical, instrumentation, and all associated appurtenant work, as indicated on the Drawings and as specified in the Bidding and Contract Requirements and Divisions 1 through 16.
- C. Payment of the lump sum bid in the Bid Form shall be full compensation for furnishing all labor, materials, equipment, and incidentals required, to perform the Work, in its entirety as shown on the Drawings as specified. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.
- D. . For all equipment and systems provided in Division 14, and Division 16 associated with the Electric Hoist and Trolley:
- Five (5) percent of the equipment/system cost will be withheld until the operations and maintenance manual has been approved and all copies have been turned over to the Owner.
 - Five (5) percent of the equipment/system cost will be withheld until the spare parts and lubricants have been turned over to the Owner.
 - Five (5) percent of the equipment/system cost will be withheld until the manufacturer's representative has certified the equipment, assisted with the start-up and completed the training.
 - Five (5) percent of the equipment/system cost will be withheld until the testing has been completed and the test results have been submitted and approved.

BID ITEM NO. A-2 VERTICAL CONVEYOR AND DISCHARGE PLATFORM

- A. Payment of the lump-sum price bid in the Bid Form for Items No. A-2 shall constitute full compensation for all labor, material, tools, equipment and incidentals necessary for constructing **Vertical Conveyor and Discharge Platform**, complete, as indicated on the drawings and as specified, including but not limited to mobilization and demobilization; coordination with Town officials, all required demolition, new discharge platform, new vertical conveyor, electrical, I&C integration, supports; equipment pads; startup; and testing complete as shown on the Drawings and as specified herein.
- B. Item shall also constitute compensation for protection of all existing structures and utilities, all concrete work, architectural, structural, mechanical, electrical,

instrumentation, and all associated appurtenant work, as indicated on the Drawings and as specified in the Bidding and Contract Requirements and Divisions 1 through 16.

- C. Payment of the lump sum bid in the Bid Form shall be full compensation for furnishing all labor, materials, equipment, and incidentals required, to perform the Work, in its entirety as shown on the Drawings as specified. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.
- D. For all equipment and systems provided in Division 5, Division 11, Divisions 13, Division 14, Division 15, and Division 16 associated with the Vertical Conveyor and Discharge Platform:
- Five (5) percent of the equipment/system cost will be withheld until the operations and maintenance manual has been approved and all copies have been turned over to the Owner.
 - Five (5) percent of the equipment/system cost will be withheld until the spare parts and lubricants have been turned over to the Owner.
 - Five (5) percent of the equipment/system cost will be withheld until the manufacturer's representative has certified the equipment, assisted with the start-up and completed the training.
 - Five (5) percent of the equipment/system cost will be withheld until the testing has been completed and the test results have been submitted and approved.

BID ITEM NO. A-3 PUMP ROOM PIPING REPLACEMENT

- A. Payment of the lump-sum price bid in the Bid Form for Items No. A-3 shall constitute full compensation for all labor, material, tools, equipment and incidentals necessary for constructing pump room piping replacement, complete, as indicated on the drawings and as specified, including but not limited to mobilization and demobilization; coordination with Town officials, all required demolition & disposal, new piping, fittings, & appurtenances, flow meter, electrical, I&C integration; pipe supports; pressure testing complete as shown on the Drawings and as specified herein.
- B. Item shall also constitute compensation for protection of all existing structures and utilities, all concrete work, architectural, structural, mechanical, electrical, instrumentation, and all associated appurtenant work, as indicated on the Drawings and as specified in the Bidding and Contract Requirements and Divisions 1 through 16.
- C. Payment of the lump sum bid in the Bid Form shall be full compensation for furnishing all labor, materials, equipment, and incidentals required, to perform the Work, in its entirety as shown on the Drawings as specified. Payment shall fully compensate the Contractor for any incidental work which is not specified or shown but which is evidently required to complete the work.
- D. For all equipment and systems provided in Division 13, Division 15, and Division 16 associated with the Pump Room Piping Replacement.

- Five (5) percent of the equipment/system cost will be withheld until the operations and maintenance manual has been approved and all copies have been turned over to the Owner.
- Five (5) percent of the equipment/system cost will be withheld until the spare parts and lubricants have been turned over to the Owner.
- Five (5) percent of the equipment/system cost will be withheld until the manufacturer's representative has certified the equipment, assisted with the start-up and completed the training.
- Five (5) percent of the equipment/system cost will be withheld until the testing has been completed and the test results have been submitted and approved.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION NOT USED

END OF SECTION

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SECTION 01026

SCHEDULE OF VALUES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for breakdown of lump sum bid.

B. Related Sections

1. Section 01300 - Submittals

1.02 BREAKDOWN OF LUMP SUM BID

A. Within 20 business days of the date of the executed Contract, a list detailing the breakdown of the lump sums bid by the appropriate Divisions of these Specifications shall be submitted for review and concurrence by the Engineer. This list will be used by the Engineer as a guide in preparing estimates for payment. The list shall be an accurate representation of costs required to complete the Work in accordance with the Contract Documents.

B. A schedule of the monthly value of work done based on the Progress Schedule submitted under Section 01300 - Submittals shall be submitted within 20 business days of the date of the executed Contract. The schedule shall show the total sum of work done for each month of the projected construction period and shall be updated monthly to reflect the actual amount requisitioned for payment.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01035

MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Procedures for making modifications to the Contract by change orders or other means.

B. Related Sections

1. Document 00500 - Agreement

1.02 CHANGE ORDERS

- A. In general Change Orders will be issued for modification of Contract documents which will incorporate changes in the Contract requirements, including additions or deletions in the Work; for unforeseen field conditions which will necessitate changes in the Work; changes in code provisions or other requirements of federal, state or local authority requiring changes in the Work; changes in the availability of products or for incorporating new products into the work and for changes directed by the Engineer for the benefit of the Owner.
- B. Authority to execute Change Orders shall be that of the Engineer and not of the Contractor. Changes Orders will, in general, originate by a "Change Order Proposal Request" or by issuance of a "Construction Change Authorization".
- C. Unless authorized by the Engineer, no work shall be performed that is involved in the change until a formal Change Order is issued.
- D. To initiate a Change Order, the Engineer will forward a Change Order proposal request describing the proposed changes and if required, include additional or revised drawings and specifications soliciting a formal quotation of cost and time to complete the proposed Change Order work. Upon reaching mutual agreement on the cost and time, the Engineer will sign his approval of the Change Order and submit it to the Contractor for his full signature of acceptance.

1.03 FIELD ORDERS

- A. The Engineer may, to avoid costly removal of, or alterations to, present on-going work, issue a Work Directive Change authorizing the Contractor to proceed, subject to later negotiation of the price of the change.

1.04 PRICE AGREEMENTS

- A. Prices agreed upon to cover the Change Orders may be either by mutual acceptance of a lump sum or by unit prices as stated in the Contract bid proposal or actual direct cost plus a percentage for overhead, profit and other expenses consistent with Section 00500 – Contract Agreement.
- B. Work done by a subcontractor entitles the General Contractor a percentage of the sum of the actual direct cost, not including the subcontractor's overhead and profit, consistent with Section 00500 – Contract Agreement.
- C. Method for computing the cost of the change shall be based on the net additional increase. No overhead and profit shall be deducted from prices for changes deleting work.
- D. The Change Order form document shall indicate the net adjustment (+/-) to the total Contract price as a result thereof including extension or reduction of time when applicable.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01040

COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for coordinating the various parts of Work under this Contract.

1.02 REQUIREMENTS

- A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical, instrumentation and electrical work, which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- G. Coordinate work with all utility companies necessary for completion of work under this contract.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION NOT USED

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements and limitations for cutting, coring and patching of Work.

B. Related Sections

1. Section 01300-Submittals

1.02 SUBMITTALS

A. In accordance with Section 01300 submit written request in advance of cutting or alteration which affects the following:

1. Structural integrity of any element of Project.
2. Integrity of weather-exposed or moisture-resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate contractor.

B. Include in request:

1. Identification of Project.
2. Location and description of affected work.
3. Necessity for cutting or alteration.
4. Description of proposed work, and products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate contractor.
7. Written permission of affected separate contractor.
8. Date and time work will be executed.

C. Should conditions of the Work, or schedule, indicate a required change of materials or methods for cutting and patching, notify the Engineer and secure his written permission and the required Change Order prior to proceeding.

1.03 RELATED SECTIONS

- A. Section 15050 – Pipe Sleeves

PART 2 PRODUCTS

2.01 MATERIALS

- A. For replacement of items removed, use materials complying with pertinent sections of these specifications.
- B. Sealing materials to be used to seal annular space between cored hole in walls and related pipes to be in accordance with Section 15050.
- C. Sealing cored holes in sewer manholes to be with a resilient seal similar to Kor-N-Seal made by National Pollution Control Systems, Inc., Nashua, NH or similar product, as indicated on the Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site Verification of Conditions
 1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, patching, and backfilling.
 2. After uncovering the work, inspect conditions affecting installation of new work.
 3. If uncovered conditions are not as anticipated, immediately notify the Engineer.
 4. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Protection
 1. Provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.
 2. Perform cutting and demolition by methods which will prevent damage to portions of the Work.
- B. Surface Preparation
 1. Provide proper surfaces to receive installation of repair and new work.

3.03 INSTALLATION

- A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the Work.
- B. Execute cutting, fitting, and patching (including excavation and fill) to complete work.
- C. Installation of materials shall be in accordance with manufacturers instructions.
- D. Installations, repair or replacement of items provided under this Contract shall be in accordance with the Contract Documents.

3.04 FIELD QUALITY CONTROL

- A. In addition to other requirements specified, upon the Engineer's request uncover work to provide for inspection by the Engineer of covered work, and remove samples of installed materials for testing.
- B. Do not cut or alter work performed under separate contracts without the Engineer's written permission.

3.05 ADJUSTING

- A. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.

END OF SECTION

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SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Survey work and other field engineering responsibilities of the Contractor.

1.02 REQUIREMENTS

- A. The Contractor shall be responsible for layout of the work and the establishing of lines and grades.
- B. Establish elevations, lines, levels, reference marks, batter boards, etc., required during the progress of the Work. Verify such marks by instrument to confirm accuracy.
- C. Locate and protect survey control and reference points.
- D. Make, check, and be responsible for all measurements and dimensions necessary for the proper construction of the Work.
- E. The Engineer will be permitted to check the lines, elevations, reference marks, batter boards, etc., set by the Contractor. The Contractor shall correct any errors found in lines, elevations, reference marks, batter boards, etc.. Such a check shall not be construed as approval of the Contractor's work and shall not relieve or diminish the responsibility of the Contractor for the accurate construction and completion of the Work.
- F. Control datum for survey as shown on Drawings.

1.03 QUALITY ASSURANCE

- A. Qualifications
- B. Qualifications
 - 1. Employ a Civil Engineer or Land Surveyor registered within the State of Rhode Island, acceptable to the Engineer.
- C. Certifications

1. Submit certificate signed by the Contractor's Engineer or Land Surveyor stating elevations and locations of the Work are in conformance with the Contract Documents.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01060

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building codes, Mechanical codes, and Electrical codes, Regulations, Permits and Fees applicable to the project.

1.02 PERMITS BY CONTRACTOR

- A. The Contractor shall secure all necessary permits from the state, city or town authorities having jurisdiction, for digging of trenches in the streets or highways and all other building and construction operations requiring permits.
- B. As a minimum the following permits are required:
 - 1. Building Permit – Town of Burrillville
 - 2. RIPDES Permit and Water Quality Certification through RIDEM Division of Water Resources, for discharge from dewatering operations.

1.03 PERMITS BY OWNER

- A. The Owner has obtained or will obtain and pay all fees for the permits listed here:
 - 1. Order of Approval – RIDEM Division of Water Resources

1.04 CODES

- A. The Contractor shall conform to the requirements of and pay all fees imposed by local and State Building Authorities having jurisdiction over the Work. The Contractor is responsible to conform to all building, mechanical, electrical and plumbing code requirements.
- B. The Contractor shall conform to the latest requirements of the following codes:
 - 1. Federal, State and Municipal Laws
 - 2. Rhode Island State Building Codes, National Building Code Regulation SBC-1
 - 3. Rhode Island State Building Codes, Plumbing Code Regulation SBC-3
 - 4. Rhode Island State Building Codes, Mechanical Code Regulation SBC-4
 - 5. Rhode Island State Building Codes, Electrical Code Regulation SBC-5

6. Any prevailing rules and regulations pertaining to adequate protection and/or guarding of any moving parts or otherwise hazardous locations.

1.04 FEES

- A. The cost of all permits secured by the Contractor shall be borne by him and shall be considered as having been included in the price or prices stated in the Bid. Copies of all required permits shall be filed with the Engineer prior to starting work for which a permit is required.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01067

STATE OF RHODE ISLAND AND FEDERAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.02. RHODE ISLAND SALES AND USE TAX
- 1.03. HISTORICAL ARTICLES
- 1.04. PREVAILING MINIMUM WAGE RATES
- 1.05. EXCERPTS FROM RHODE ISLAND LAWS
- 1.06. REQUIREMENTS FOR MINORITY BUSINESS ENTERPRISE,
EQUAL OPPORTUNITY AND NONDISCRIMINATION
- 1.07. EPA REQUIREMENTS FOR DISADVANTAGED BUSINESS ENTERPRISE
- 1.08. ATTACHMENTS

1.02 RHODE ISLAND SALES AND USE TAX

- A. Materials and equipment purchased for installation under this Contract are exempt from the Rhode Island Sales Tax. The Contractor shall file for exemption on behalf of the Owner, with the State of Rhode Island Department of Taxation as required by law. The exemption from the Sales Tax shall be taken into account by the Contractor during bidding.

1.03 HISTORICAL ARTICLES

- A. During the life of this Contract, the Contractor is herewith required to immediately notify the following organizations in the event that any articles such as "charcoal," "bone," "shell," "cultural objects - fire cracked stones or stone flaking material" or any other such related items of historical significance are discovered.
 - 1. Owner
 - 2. Local Historical Society
 - 3. Rhode Island Historical Commissioner
 - 4. Engineer

1.04 PREVAILING MINIMUM WAGE RATES

- A. Local prevailing minimum wage rates apply to this project. It is the responsibility of the Contractor before bid openings to request, if necessary, any additional information on local prevailing Wage Rates for those tradespeople who are not covered by the applicable local Wage Decision, but who may be employed for the proposed work under this Contract.

- B. A schedule of prevailing minimum wage rates, issued by the State of Rhode Island Department of Labor for the Work under this Contract, are contained herein under “ATTACHMENT B” provided at the end of this Specification Section.
- C. The attention of the Contractor is also directed to “ATTACHMENT A” of this Specification Section in regards to the requirements for certified payrolls. The Contractor shall routinely prepare and submit as a part of the required certified payrolls the “PRIME CONTRACTOR’S OVERALL PAYROLL CERTIFICATION” form provided under “ATTACHMENT A”.

1.05 EXCERPTS FROM RHODE ISLAND LAWS

- A. The Contractor and each of his subcontractors shall especially note his obligations to comply with the following statues or excerpts therefrom and any current revisions thereof contained in the General Laws of Rhode Island.
- B. These laws reflect changes made through the end of the 1992 legislative session. While every attempt at accuracy has been made, these are not certified true copies of these laws. The responsibility for compliance with all applicable provisions of Rhode Island laws relating to bidding, award, and performance of public works contracts is the Contractor’s. Certified true and complete copies of any Rhode Island laws and regulations may be obtained from the Office of the Rhode Island Secretary of State.

R.I.G.L.

Title, Chapter, Section EXCERPT

5-6-2 WORK FOR WHICH LICENSE REQUIRED

"No person, firm, or corporation shall enter into, engage in, or work at the business of installing wire, conduits, apparatus, fixtures and other appliances for carrying or using electricity for light, heat or other purpose, unless such person, firm or corporation shall have received a license and a certificate therefore, issued by the State Board of Examiners of Electricians."

28-26-6 LICENSE REQUIRED FOR OPERATION OF HOISTING
MACHINERY - PUBLIC CONTRACTS

"No persons shall operate or be in direct charge of a hoisting or excavation gasoline, steam, diesel, electric or compressed air hoist, shovel, crane, excavator, of five horsepower or more without obtaining a license to do so as provided in this chapter. No user or agent of use of any such described steam, gasoline, diesel, electric or compressed air hoisting machinery shall permit it to be operated unless it is operated by a duly licensed person as hereinafter provided by this chapter.

Every contract in the construction of public works by the State, or by any City of Town, or by persons contracting therewith for such construction, shall contain a clause embodying the provisions of this section."

Chapter 116

From Chapter 116 of the General Laws of Rhode Island, 1938, relative to the conditions precedent, etc., to carrying on business within this State by foreign corporations:

"The certificate and power of attorney mentioned in the General Corporation Law, properly filled out, subscribed and sworn to, and accompanied by a certified copy of the Charter, articles of association or other similar organization papers, together with all amendments thereto, must be filed in the office of the Secretary of State by all foreign corporations intending to carry on business within this State, or for a foreign corporation to enforce in the courts of this State any contract made within the State."

Detailed information regarding Chapter 116 of the General Laws of Rhode Island, 1938, relative to the conditions precedent, etc., to carrying on business within this State for foreign corporations may be obtained from the Secretary of State, State House, Smith Street, Providence, Rhode Island.

Title 37 (chapters as provided at the end of this Specification Section.)

1.06 REQUIREMENTS FOR MINORITY BUSINESS ENTERPRISE, EQUAL OPPORTUNITY AND NONDISCRIMINATION

- A. Contracts for work under the bid (proposal) will obligate the contractors and subcontractors not to discriminate in employment practices.
- B. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, handicap, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed and the employees are treated during employment without regard to their race, color, religion, sex, age, handicap, or national origin. Such actions shall include, but not be limited to, the following: employment, upgrading, demotions, or transfers; recruitment or recruitment advertising, selection for training including apprenticeship; and participation in recreational and educational activities. The Contractor agrees to post in conspicuous places available to employees and applicants for employment, notice to be provided, setting forth the provisions of this non-discrimination clause. The Contractor will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this Contract so that such provisions will be binding upon each subcontractor and upon subcontractors for standard commercial supplies or raw materials.

- C. The Contractor shall keep such records and submit such reports concerning the racial and ethnic origin of applicants for employment and employees as the Owner may require as consistent with Federal and State law.
- D. The Contractor agrees to comply with such rules, regulations, or guidelines as the State of Rhode Island may issue to implement these requirements. The Contractor further warrants that it will comply with Title VI of the Civil rights Act of 1964, 42 U.S.C. 200d to d4.
- E. Contractors shall comply with the provisions of the General Laws of Rhode Island and attention is called to Title 37, Chapter 13, Section 1-16, relative to the payment of wages, obligations and charges by Contractors on public works projects. Non-resident Contractors are subject to Section 44-1-6 of the RI General Laws, as amended, regarding OUT-OF-STATE CONTRACTORS.
- F. The Contractor will be required to comply with Equal Opportunity Requirements and to abide by the prevailing wage rates for Public Works Projects for all employees on the job. It is the responsibility of contractors to inform themselves as to the local labor conditions, overtime compensation, health and welfare contributions, labor supply and prospective changes or adjustment of wage rates. Information is available at the Department of Labor.
- G. The attention of the Contractor is directed to the fact that this Contract is subject to both Federal and State requirements regarding Minority Business Enterprises (MBE) and Woman's Business Enterprises (WBE) participation. The Contractor hereby agrees to ensure compliance with all Federal and State MBE/WBE requirements to provide maximum opportunity for such participation.
- H. The Contractor's attention is directed to the following Federal and State requirements contained herein under "ATTACHMENT A" provided at the end of this Specification Section.
- I. The Contractor further agrees to ensure that minority business enterprises as defined in RIGL Section 37-14.1-3, shall have the maximum opportunity to participate in the performance of subcontracts performed under this Contract. The Contractor will take reasonable steps in accordance with regulations promulgated under Chapter 37-14.1 of the RIGL to ensure that minority business enterprises have the maximum opportunity to compete for and perform subcontracts under this Contract. DEPARTMENT OF ADMINISTRATION RI STATE EQUAL OPPORTUNITY OFFICE GENERAL CONTRACT COMPLIANCE CERTIFICATE AND AGREEMENT, Pages 1 through 6, are provided at the end of this Specification.

1.07 EPA REQUIREMENTS FOR DISADVANTAGED BUSINESS ENTERPRISE (DBE)

- A. Contractor shall comply with all Environmental Protection Agency (EPA) requirements for Disadvantaged Business Enterprise (DBE).

1.08 ATTACHMENTS

A. Attachments referenced by this Specification follow this Section.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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ATTACHMENT A

State Revolving Fund (SRF) Program – Contract Specifications Package

Project Sign Specifications

**USEPA Memorandum – Prohibition on Certain Telecommunication and
Video Surveillance Services or Equipment in the SRF Programs**

Davis-Bacon Prevailing Wage Requirements

Prevailing Wage Decision (Rates)

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Rhode Island Department of Environmental Management
Office of Water Resources

Clean Water State Revolving Fund Program
Contract Specifications Package

A. Federal

- 1) Equal Employment Opportunity and Affirmative Action (Executive Order 11246)
 - i) OFCCP fact sheet.
 - ii) Equal Opportunity Clause and the Standard Federal Equal Employment Specifications.
 - iii) Notice of Non-Discrimination in Employment.
- 2) Non-discrimination in employment notice.
- 3) Assurance of compliance with Title VI of the Civil Rights Act of 1964 and Section 13 of the FWPCA Amendments of 1972 (EPA form 4700-1).
- 4) Affirmative steps for soliciting MBE/WBE (40 CFR 31.36(e))
- 5) Preservation of Open Competition and Government Neutrality Towards Government Contractors' Labor Relations on Federal and Federally Funded Construction Projects (Executive Order 13202)

Applicable cross-cutting Federal authorities for projects funded through SRF programs are made available at http://water.epa.gov/grants_funding/dwsrf/xcuts.cfm. Additional information is provided in the United States Environmental Protection Agency's cross-cutting handbook available at <http://www.epa.gov/owm/cwfinance/cwsrf/enhance/DocFiles/Other%20Docs/CrosscutterHandbook.pdf>.

B. State of Rhode Island

- 1) RIGL 37-2.1, Domestic Steel
- 2) RIGL 37-12, Contractors Bonds
- 3) RIGL 37-12.1, Substitution of Security for Retained Earnings of Architects and Engineers.
- 4) RIGL 37-13, Labor and Payment of Debts by Contractors
 - i) Prevailing Wage Rates
- 5) RIGL 37-14.1, Minority Business Enterprise
 - i) Regulations Governing Participation by Minority Business Enterprises in State Funded and Directed Public Construction Projects, Construction Contracts and Procurement Contracts Goods and Services.
- 6) RIGL 37-16, Public Works Arbitration
- 7) RIGL 45-55, Award of Municipal Contracts

NOTE: This package is prepared by RIDEM as a service of the CWSRF program. While every attempt at accuracy has been made, these are not certified true copies of the laws presented. **The responsibility for compliance with all applicable provisions of Federal and State laws and regulations relating to the bidding, award, and performance of contracts is the applicant's and the bidder's.** Certified true and complete copies of any Rhode Island laws and regulations may be obtained from the Office of the Secretary of State.

Employment Standards Administration Office of Federal Contract Compliance Programs

Fact Sheet EXECUTIVE ORDER 11246

EEO and Affirmative Action Guidelines for Federal Contractors Regarding Race, Color, Gender, Religion, and National Origin.

BASIC PROVISIONS

Since 1965, the U.S. Department of Labor's Office of Federal Contract Compliance Programs (OFCCP) has been committed to ensuring that Government contractors comply with the equal employment opportunity (EEO) and the affirmative action provisions of their contracts.

OFCCP administers and enforces Executive Order 11246, as amended, which prohibits federal contractors and federally-assisted construction contractors and subcontractors, who do over \$10,000 in Government business in one year from discriminating in employment decisions on the basis of race, color, religion, sex, or national origin.

The Executive Order also requires Government contractors to take affirmative action to insure that equal opportunity is provided in all aspects of their employment.

AFFIRMATIVE ACTION REQUIREMENTS

Each Government contractor with 50 or more employees and \$50,000 or more in government contracts is required to develop a written affirmative action program (AAP) for each of its establishments.

A written affirmative action program helps the contractor identify and analyze potential problems in the participation and utilization of women and minorities in the contractor's workforce.

If there are problems, the contractor will specify in its AAP the specific procedures it will follow and the good faith efforts it will make to provide equal employment opportunity.

Expanded efforts in outreach, recruitment, training and other areas are some of the affirmative steps contractors can take to help members of the protected groups compete for jobs on equal footing with other applicants and employees.

Affirmative action is not preferential treatment. It does not mean that unqualified persons should be hired or promoted over other people. What affirmative action does mean is that positive steps must be taken to ensure equal employment opportunity for traditionally disadvantaged groups.

ENFORCEMENT AND COMPLIANCE

Compliance Reviews

OFCCP conducts compliance reviews to investigate the employment practices of Government contractors. During a compliance review, a compliance officer examines the contractor's affirmative action program; checks personnel, payroll, and other employment records; interviews employees and company officials; and investigates virtually all aspects of employment in the company.

The investigator also checks to see whether the contractor is making special efforts to achieve equal opportunity through affirmative action. If problems are discovered, OFCCP will recommend corrective action and suggest ways to achieve equal employment opportunity.

Complaint Investigations

Individuals may file complaints if they believe they have been discriminated against by federal contractors or subcontractors. Complaints also may be filed by organizations on behalf of the person or persons affected.

Complaints must be filed within 180 days from the date of the alleged discrimination, although filing time can be extended for a good reason.

If a complaint filed under Executive Order 11246 involves discrimination against only one person, OFCCP will normally refer it to the EEOC. Cases involving groups of people or indicating patterns of discrimination are generally investigated and resolved by OFCCP. Complaints may be filed directly with any of OFCCP's regional or district offices throughout the country, or with OFCCP in Washington, D.C.

Compliance Assistance

To help contractors understand their contractual obligations for EEO and affirmative action, OFCCP provides technical assistance. District office staff offers guidance to contractors on how to develop an affirmative program through company seminars, training programs held in conjunction with industry liaison groups, and one-on-one consultations on affirmative action practices and procedures.

Enforcing Contract Compliance

When a compliance review discloses problems, OFCCP attempts to work with the contractor, often entering into a conciliation agreement. A conciliation agreement may include back pay, job offers, seniority credit, promotions or other forms of relief for victims of discrimination. It may also involve new training programs, special recruitment efforts, or other affirmative action measures.

When conciliation efforts are unsuccessful, OFCCP refers the case to the Office of the Solicitor for enforcement through administrative enforcement proceedings. A contractor cited for violating EEO and affirmative action requirements may have a formal hearing before an administrative law judge.

If conciliation is not reached before or after the hearing, sanctions may be imposed. For example, a contractor could lose its government contracts or subcontracts or be debarred, i.e., declared ineligible for any future government contracts.

Further Information

For more information about contract compliance, filing complaints, or compliance assistance, contact any of OFCCP's regional or district offices. All offices are listed in telephone directories under U.S. Department of Labor, Employment Standards Administration, Office of Federal Contract Compliance Programs.

EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION

Executive Order 11246

(Excerpts from 41 CFR 60 Parts 1 and 4)

41 CFR 60-1.4 - Equal opportunity clause

(b) Federally assisted construction contracts. Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause:

The applicant hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following *equal opportunity clause*:

During the performance of this contract, the contractor agrees as follows:

- (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- (2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.
- (3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- (5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- (7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing

such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

(c) Subcontracts. Each nonexempt prime contractor or subcontractor shall include the equal opportunity clause in each of its nonexempt subcontracts.

(d) Incorporation by reference. The equal opportunity clause may be incorporated by reference in all Government contracts and subcontracts, including Government bills of lading, transportation requests, contracts for deposit of Government funds, and contracts for issuing and paying U.S. savings bonds and notes, and such other contracts and subcontracts as the Director may designate.

(e) Incorporation by operation of the order. By operation of the order, the equal opportunity clause shall be considered to be a part of every contract and subcontract required by the order and the regulations in this part to include such a clause whether or not it is physically incorporated in such contracts and whether or not the contract between the agency and the contractor is written.

(f) Adaptation of language. Such necessary changes in language may be made in the equal opportunity clause as shall be appropriate to identify properly the parties and their undertakings.

41 CFR 60-4.3 - Equal opportunity clauses

(a) The equal opportunity clause published at 41 CFR 60-1.4(a) of this chapter is required to be included in, and is part of, all nonexempt Federal contracts and subcontracts, including construction contracts and subcontracts. The equal opportunity clause published at 41 CFR 60-1.4(b) is required to be included in, and is a part of, all nonexempt federally assisted construction contracts and subcontracts. In addition to the clauses described above, all Federal contracting officers, all applicants and all non-construction contractors, as applicable, shall include the specifications set forth in this section in all Federal and federally assisted construction contracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to 60-4.6 of this part and in construction subcontracts in excess of \$10,000 necessary in whole or in part to the performance of non-construction Federal contracts and subcontracts covered under the Executive order.

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - d. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
 - g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
 - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

- i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
 - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
 - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance
9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to

achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

(b) The notice set forth in 41 CFR 60-4.2 and the specifications set forth in 41 CFR 60-4.3 replace the New Form for Federal Equal Employment Opportunity Bid Conditions for Federal and Federally Assisted Construction published at 41 FR 32482 and commonly known as the Model Federal EEO Bid Conditions, and the New Form shall not be used after the regulations in 41 CFR Part 60-4 become effective.

[43 FR 49254, Oct. 20, 1978; 43 FR 51401, Nov. 3, 1978, as amended at 45 FR 65978, Oct. 3, 1980]

NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS

NON-DISCRIMINATION IN EMPLOYMENT

TO: _____
(Name of Union or Organization of Workers)

The undersigned currently holds contract(s) with _____
(Name of Applicant)

involving funds or credit of the U.S. Government of (a) subcontract(s) with a prime contractor holding such contract(s).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with Executive Order 11246, dated September 24, 1965, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, age, handicap, veteran status, color, creed, or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

**HIRING, PLACEMENT, UPGRADING, TRANSFER, OR DEMOTION,
RECRUITMENT, ADVERTISING, OR SOLICITATION FOR
EMPLOYMENT TRAINING DURING EMPLOYMENT, RATES OF PAY
OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING
INCLUDING APPRENTICESHIP, LAYOFF, OR TERMINATION.**

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontract(s) and Executive Order 11246.

COPIES OF THIS NOTICE WILL BE POSTED BY THE UNDERSIGNED IN CONSPICUOUS PLACES AVAILABLE TO EMPLOYEES OR APPLICANTS FOR EMPLOYMENT.

(Contractor or Subcontractor)

(Date)

CONTRACTING WITH SMALL AND MINORITY FIRMS, WOMEN'S BUSINESS ENTERPRISE

40 CFR 31.36(e)

40 CFR 31.36(e) – Contracting with small and minority firms, women's business enterprise and labor surplus area firms.

(1) The grantee and sub-grantee will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible.

(2) Affirmative steps shall include:

- (i) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (ii) Assuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
- (iii) Dividing the total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
- (iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
- (v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce; and
- (vi) Requiring the prime contractor, if subcontracts are to be let, to take affirmative steps listed in paragraphs (e)(2)(i) through (v) of this section.

EXECUTIVE ORDER

PRESERVATION OF OPEN COMPETITION AND GOVERNMENT NEUTRALITY TOWARDS GOVERNMENT CONTRACTORS' LABOR RELATIONS ON FEDERAL AND FEDERALLY FUNDED CONSTRUCTION PROJECTS

By the authority vested in me as President by the Constitution and laws of the United States of America, including the Federal Property and Administrative Services Act, 40 U.S.C. 471 et seq., and in order to (1) promote and ensure open competition on Federal and federally funded or assisted construction projects; (2) maintain Government neutrality towards Government contractors' labor relations on Federal and federally funded or assisted construction projects; (3) reduce construction costs to the Federal Government and to the taxpayers; (4) expand job opportunities, especially for small and disadvantaged businesses; and (5) prevent discrimination against Government contractors or their employees based upon labor affiliation or lack thereof; thereby promoting the economical, nondiscriminatory, and efficient administration and completion of Federal and federally funded or assisted construction projects, it is hereby ordered that:

Section 1. To the extent permitted by law, any executive agency awarding any construction contract after the date of this order, or obligating funds pursuant to such a contract, shall ensure that neither the awarding Government authority nor any construction manager acting on behalf of the Government shall, in its bid specifications, project agreements, or other controlling documents:

- (a) Require or prohibit bidders, offerors, contractors, or subcontractors to enter into or adhere to agreements with one or more labor organizations, on the same or other related construction project(s); or
- (b) Otherwise discriminate against bidders, offerors, contractors, or subcontractors for becoming or refusing to become or remain signatories or otherwise to adhere to agreements with one or more labor organizations, on the same or other related construction project(s).
- (c) Nothing in this section shall prohibit contractors or subcontractors from voluntarily entering into agreements described in subsection (a).

Sec. 2. Contracts awarded before the date of this order, and subcontracts awarded pursuant to such contracts, whenever awarded, shall not be governed by this order.

Sec. 3. To the extent permitted by law, any executive agency issuing grants, providing financial assistance, or entering into cooperative agreements for construction projects, shall ensure that neither the bid specifications, project agreements, nor other controlling documents for construction contracts awarded after the date of this order by recipients of grants or financial assistance or by parties to cooperative agreements, nor those of any construction manager acting on their behalf, shall contain any of the requirements or prohibitions set forth in section 1(a) or (b) of this order.

Sec. 4. In the event that an awarding authority, a recipient of grants or financial assistance, a party to a cooperative agreement, or a construction manager acting on behalf of the foregoing, performs in a manner contrary to the provisions of sections 1 or 3 of this order, the executive agency awarding the contract, grant, or assistance shall take such action, consistent with law and regulation, as the agency determines may be appropriate.

Sec. 5. (a) The head of an executive agency may exempt a particular project, contract, subcontract, grant, or cooperative agreement from the requirements of any or all of the provisions of sections 1 and 3 of this order, if the agency head finds that special circumstances require an exemption in order to avert an imminent threat to public health or safety or to serve the national security.

(b) A finding of "special circumstances" under section 5(a) may not be based on the possibility or presence of a labor dispute concerning the use of contractors or subcontractors who are nonsignatories to, or otherwise do not adhere to, agreements with one or more labor organizations, or concerning employees on the project who are not members of or affiliated with a labor organization.

Sec. 6. (a) The term "construction contract" as used in this order means any contract for the construction, rehabilitation, alteration, conversion, extension, or repair of buildings, highways, or other improvements to real property.

(b) The term "executive agency" as used in this order shall have the same meaning it has in 5 U.S.C. 105, excluding the General Accounting Office.

(c) The term "labor organization" as used in this order shall have the same meaning it has in 42 U.S.C. 2000e(d).

Sec. 7. With respect to Federal contracts, within 60 days of the issuance of this order, the Federal Acquisition Regulatory Council shall take whatever action is required to amend the Federal Acquisition Regulation in order to implement the provisions of this order.

Sec. 8. As it relates to project agreements, Executive Order 12836 of February 1, 1993, which, among other things, revoked Executive Order 12818 of October 23, 1992, is revoked.

Sec. 9. The Presidential Memorandum of June 5, 1997, entitled "Use of Project Labor Agreements for Federal Construction Projects" (the "Memorandum"), is also revoked.

Sec. 10. The heads of executive departments and agencies shall revoke expeditiously any orders, rules, regulations, guidelines, or policies implementing or enforcing the Memorandum or Executive Order 12836 of February 1, 1993, as it relates to project agreements, to the extent consistent with law.

Sec. 11. This order is intended only to improve the internal management of the executive branch and is not intended to, nor does it, create any right to administrative or judicial review, or any right, whether substantive or procedural, enforce-able by any party against the United States, its agencies or instrumentalities, its officers or employees, or any other person.

GEORGE W. BUSH

THE WHITE HOUSE, February 17, 2001.

TITLE 37

CHAPTER 2.1 DOMESTIC STEEL

Section

37-2.1-1.	Short Title
37-2.1-2.	Purpose
37-2.1-3.	Purchase of steel and steel products
37-2.1-4.	Payment
37-2.1-5.	Definitions

37-2.1-1. Short title.

This chapter shall be known and may be cited as the "Steel Products Procurement Act".

37-2.1-2. Purpose.

- (a) This chapter shall be deemed to be an exercise of the police powers of the state for the protection of the health, safety, and general welfare of the people of the state.
- (b) It is hereby determined by the general assembly of Rhode Island and declared as a matter of legislative findings that:
 - (1) The United States is one of the leading countries in the production and use of steel and its allied products;
 - (2) The use of steel products constitutes a major industry of the United States and, as such, provides the jobs and family incomes of millions of persons in the United States;
 - (3) The taxes paid to Rhode Island and the United States by employers and employees engaged in the production and sale of steel products are one of the largest single sources of public revenues in this country;
 - (4) It has, for many years, been the policy of the state to aid and support the development and expansion of industry in the United States in order to foster the economic well-being of the state and its people; and
 - (5) The economy, general welfare, and national security of the United States, are inseparably related to the preservation and development of the steel industry in the United States.
- (c) The general assembly therefore declares it to be the policy of the state that all public officers and agencies should, at all times, aid and promote the development of the steel industry of the United States in order to stimulate and improve the economic well-being of the state and its people.

37-2.1-3. Purchase of steel and steel products.

- (a) Every public agency shall require that every contract document for the construction, reconstruction, alteration, repair, improvement, or maintenance of public works contain a provision that, if any steel products are to be used or supplied in the performance of the contract, only steel products as herein defined shall be used or supplied in the performance of the contract or any subcontracts thereunder.
- (b) This section shall not apply in any case where the head of the public agency, in writing, determines that steel products as herein defined are not produced in, or readily available in the United States or that such steel products shall not exceed fifteen percent (15%) of the costs of any other steel products obtainable nationally or internationally.

37-2.1-4. Payment.

No public agency shall authorize, provide for, or make any payments to any person under any contract containing the provision required by 37-2.1-3 unless the public agency is satisfied that such person has fully complied with that provision. Any such payments made to any person by any public agency which should not have been made, as a result of this section, shall be recoverable directly from the contractor or subcontractor who did not comply with 37-2.1-3 by either such public agency or the attorney general upon suit filed in the court of any county.

37-2.1-5. Definitions.

The following words and phrases when used in this chapter shall have, unless the context clearly indicates otherwise, the meanings given to them in this section:

- (a) "Person" means natural persons as well as corporations, partnerships, business units, and associations;
- (b) "Public agency" means (1) the state and its departments, boards, commissions and agencies, (2) cities, towns, school districts, and any other governmental unit or district, (3) any and all other public bodies, authorities, officers, agencies, or instrumentalities, whether exercising a governmental or proprietary function;
- (c) "Public works" means steel to construct, frame or reinforce any public structure, building, highway, waterway, street, bridge, transit system, airport, or other betterment, work or improvement, whether of a permanent or temporary nature, and whether for governmental or proprietary use;
- (d) "Steel products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly processed, or processed by a combination of two or more of such operations, from steel made in the United States by the open hearth, basic oxygen, electric furnace, Bessemer, or other steel making process;
- (e) "United States" means the United States of America and includes all territory, continental or insular, subject to the jurisdiction of the United States.

TITLE 37

CHAPTER 12 CONTRACTORS' BONDS

Sections

- 37-12-1. Contractors required to give bond – Terms and conditions.
- 37-12-2. Rights of persons furnishing labor and materials.
- 37-12-3. Remedies of creditors and state – Priority of claims.
- 37-12-4. Intervention by creditor in suit brought by state.
- 37-12-5. Time limitation on creditors' actions.
- 37-12-6. Intervention in suit brought by creditor – Consolidation of suits.
- 37-12-7. Notice of Pendency of Suit
- 37-12-8. Certified copies of documents.
- 37-12-9. Payment into court by surety – Discharge.
- 37-12-10. Retainers relating to contracts for public works or sewer or water main construction.
- 37-12-11. Substitution of securities for retained earnings.

§ 37-12-1 Contractors required to give bond – Terms and conditions. – Every person (which word for the purposes of this chapter shall include a copartnership, a number of persons engaged in a joint enterprise, or a corporation), before being awarded a contract by the department of transportation or by the department of administration, as the case may be, and every person awarded such a contract as a general contractor or construction or project manager for the construction, improvement, completion, or repair of any public road or portion thereof or of any bridge in which the contract price shall be in excess of fifty thousand dollars (\$ 50,000), or for a contract for the construction, improvement, completion, or repair of any public building, or portion thereof, shall be required to furnish to the respective department a bond of that person to the state, with good and sufficient surety or sureties (hereafter in this chapter referred to as surety), acceptable to the respective department, in a sum not less than fifty percent (50%) and not more than one hundred percent (100%) of the contract price, conditioned that the contractor, principal in the bond, the person's executors, administrators, or successors, shall in all things, well and truly keep and perform the covenants, conditions, and agreements in the contract, and in any alterations thereof made as therein provided, on the person's part to be kept and performed, at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the state, the respective department, and all of its officers, agents, and employees, as therein stipulated, and shall also promptly pay for all such labor performed or furnished and for all such materials and equipment furnished, (which as to equipment shall mean payment of the reasonable rental value, as determined by the respective department, of its use during the period of its use), as shall be used in the carrying on of the work covered by the contract, or shall see that they are promptly paid for, whether or not the labor is directly performed for or furnished to the contractor or is even directly performed upon the work covered by the contract, and whether or not the materials are furnished to the contractor or become component parts of the work, and whether or not the equipment is furnished to the contractor or even directly used upon the work. The bond shall contain the provisions that it is subject to all such rights and powers of the respective department and such other provisions as are set forth in the contract and the plans, specifications, and proposal incorporated by reference in the contract, and that no extension of the time of performance of the contract or delay in the completion of the work thereunder or any alterations thereof, made as therein provided, shall invalidate the bond or release the liability of the surety thereunder. Waiver of the bonding requirements of this section is expressly prohibited.

37-12-2. Rights of persons furnishing labor and materials.

Every person who shall have performed labor and every person who shall have furnished or supplied labor, material, or equipment in the prosecution of the work provided for in the contract, in respect of which a payment bond is furnished under § 37-12-1, and who has not been paid in full therefor before the expiration of a period of ninety (90) days after the day on which the last of the labor was performed or furnished by him or her, or material or equipment furnished or supplied by him or her for which a claim is made, shall have the right to sue on the payment bond for the amount, or the balance thereof, unpaid at the time of institution of the suit and to prosecute the action to final execution and judgment for the sum or sums justly due him or her; provided, however, that any person having direct contractual relationship with a subcontractor but no contractual relationship express or implied with the contractor

furnishing the payment bond shall have a right of action upon the payment bond upon giving written notice to the contractor within ninety (90) days from the date on which the person furnished or performed the last of the labor, or furnished or supplied the last of the material or equipment for which the claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the labor was furnished or performed or the material or equipment was furnished or supplied. The notice shall be served by mailing the same by certified mail, postage prepaid, in an envelope addressed to the contractor at any place he or she maintains an office, conducts his or her business, or his or her residence.

37-12-3. Remedies of creditors and state - Priority of claims.

The remedy on the bond shall be by a civil action brought in the superior court for the counties of Providence and Bristol and in any suit brought on the bond the rights of the state shall be prior to those of all creditors. The rights of persons who shall have performed labor as aforesaid shall be prior to the rights of all other creditors, and there shall be no priorities among laborers or among other creditors under the bond. The state, either after having recovered a judgment against the contractor on the contract or without having recovered a judgment, may bring a suit on the bond against the contractor and surety on the bond, and may join as parties defendant in the suit any persons claiming to have rights under the bond as creditors; and, if it has not brought such a suit, it may at any time before a final and conclusive decree, intervene and become a party in any suit brought, as hereafter provided in this chapter, by any person claiming to be a creditor under the bond.

37-12-4. Intervention by creditor in suit brought by state.

Any person claiming to be a creditor under the bond may at any time intervene and become a party in any pending suit brought as aforesaid by the state on the bond, and by so intervening may have the rights to the person adjudicated in the suit.

37-12-5. Time limitation on creditors' actions.

No suit instituted under § 37-12-2 shall be commenced after the expiration of two (2) years, or under the maximum time limit as contained within any labor or material payment bond required under § 37-12-1, whichever period is longer, after the day on which the last of the labor was furnished or performed or material or equipment was furnished or supplied by any person claiming under the section.

37-12-6. Intervention in suit brought by creditor - Consolidation of suits.

When a suit has been so brought on the bond by a person claiming to be a creditor under the bond and is pending, any other person claiming to be a creditor under the bond may intervene and become a party in the first suit thus brought and pending and by so intervening may have the rights of the other person adjudicated in the suit. If two (2) or more of the suits be filed in the court on the same day, the one in which the larger sum shall be claimed shall be regarded as the earlier suit. All suits brought upon the bond as provided in this chapter shall be consolidated together by the court and heard as one suit.

37-12-7. Notice of pendency of suit.

In any suit brought under the provisions of this chapter such personal notice of the pendency of the suit as the court may order shall be given to all such known creditors and persons claiming to be creditors under the bond as shall not have entered their appearances in the suit and, in addition to the notice, notice of the pendency of the suit shall be given by publication in some newspaper published in this state of general circulation in the city or town or every city or town in which the work covered by the contract was carried on, once a week for three (3) successive weeks, in such form as the court may order. The court, however, may dispense with the notices if satisfied that sufficient notices shall have been given in some other suit brought under the provisions of this chapter.

37-12-8. Certified copies of documents.

Any person claiming to be a creditor under the bond and having filed a claim with the respective department, in accordance with the requirements of § 37-12-2, shall have the right, at any time when the person could under this chapter file a suit or intervene in a pending suit, to require the respective department to furnish to the person certified copies of the contract, proposal, plans specifications, and bond.

37-12-9. Payment into court by surety - Discharge.

The surety on the bond may pay into the registry of the court, for distribution among those who may be or become entitled thereto under the decree of the court, the penal sum named in the bond less any amount which the surety

may have paid to the state in satisfaction of the liability of the surety to the state under the bond, and then shall be entitled to be discharged from all further liability under the bond.

37-12-10. Retainers relating to contracts for public works or sewer or water main construction.

(a) Upon substantial completion of the work required by a contract aggregating in amount less than five hundred thousand dollars (\$ 500,000) with any municipality, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair, or improvement of sewers and water mains, or any public works project defined in § 37-13-1, the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the contract price unless otherwise agreed to by the parties. Upon substantial completion of the work required by a contract aggregating in an amount of five hundred thousand dollars (\$ 500,000) or greater with any municipality, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair, or improvement of sewers and water mains, or any public works project defined in § 37-13-1, the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the contract price. In the case of periodic payments with respect to contracts less than the aggregate amount of five hundred thousand dollars (\$ 500,000), the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the approved amount of any periodic payment unless otherwise agreed to by the parties. In the case of periodic payments with respect to contracts in the aggregate amount of five hundred thousand dollars (\$ 500,000) or greater, the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the approved amount of any periodic payment.

(b) The retainage shall be paid to any contractor or subcontractor within ninety (90) days of the date the work is accepted by the awarding authority unless a dispute exists with respect to the work. If payment is not made within ninety (90) days for any reason other than a dispute, which, if resolved and it is not the fault of the contractor, interest shall be assessed at the rate of ten percent (10%) per annum on all money which is to be paid to the contractor or subcontractor.

(c) The retainage shall be paid to any contractor or subcontractor within ninety (90) days of the date his or her work is completed and accepted by the awarding authority. If payment is not made, interest shall be assessed at the rate of ten percent (10%) per annum.

(d) There shall also be deducted and retained from the contract price an additional sum sufficient to pay the estimated cost of municipal police traffic control on any public works project. Municipalities shall directly pay the officers working traffic details and shall bill and be reimbursed by the withholding authority for which the contract is being performed every thirty (30) days until the project is complete.

(e) Notwithstanding the foregoing, with respect to projects located within the town of Warren, the withholding authority shall hold an amount from the contract price which shall be reasonably sufficient to pay the estimated cost of municipal police traffic control. The withholding authority shall pay to the town of Warren within seventy-two (72) hours of written demand the actual costs of police traffic control associated with said project on an ongoing basis.

37-12-11. Substitution of securities for retained earnings.

(a) Where any public works contract as defined by § 37-13-1 provides for the retention of earned estimates by the state of Rhode Island, the contractor may, from time to time, withdraw the whole or any portion of the amount retained for payments to the contractor pursuant to the terms of the contract, upon depositing with the general treasurer either; (1) United States treasury bonds, United States treasury notes, United States treasury certificates of indebtedness, or United States treasury bills; (2) Bonds or notes of the state of Rhode Island ; or (3) Bonds of any political subdivision in the state of Rhode Island.

(b) No amount shall be withdrawn in excess of the market value of the securities at the time of deposit or of the par value of the securities, whichever is lower. The general treasurer shall, on a regular basis, collect all interest or income on the obligations so deposited and shall pay the interest or income, when and as collected, to the contractor who deposited the obligations. If the deposit is in the form of coupon bonds, the general treasurer shall deliver each coupon as it matures to the contractor. Any amount deducted by the state, or by any public department or official thereof, pursuant to the terms of the contract, from the retained payments otherwise due the contractor, shall be

deducted, first from that portion of the retained payments for which no security has been substituted, then from the proceeds of any deposited security. In the latter case, the contractor shall be entitled to receive interest, coupons, or income only from those securities which remain after the amount has been deducted. The securities so deposited shall be properly endorsed by the contractor in such manner so as to enable the general treasurer to carry out the provisions of this section.

TITLE 37

CHAPTER 12.1 SUBSTITUTION OF SECURITY FOR RETAINED EARNINGS OF ARCHITECTS AND ENGINEERS

Sections

- 37-12.1-1. Definition of Terms.
- 37-12.1-2. Substitution of security for retained earnings by designers.
- 37-12.1-3. Deduction from retained earnings.
- 37-12.1-4. Endorsement on securities.
- 37-12.1-5. Applicability.

37-12.1-1. Definition of terms.

Terms used in this chapter shall be construed as follows:

- (a) "Designers", means any person, firm or corporation duly authorized pursuant to the laws of this state to engage in the practice of architecture and/or engineering within this state.
- (b) "Public works contract" means a contract to perform design or planning services by a designer with the state or any agency or governmental subdivisions thereof.
- (c) "Retained earnings" means any moneys or earned estimates withheld from a designer pursuant to the terms of a public works contract.

37-12.1-2. Substitution of security for retained earnings by designers.

(a) Where any public works contract provides for the holding of retained earnings from a designer, the designer may from time to time withdraw the whole or any portion of the amount retained upon either depositing with the general treasurer:

- (1) United States treasury bonds, United States treasury notes, United States treasury certificates of indebtedness, or United States treasury bills;
- (2) Bonds or notes of the state of Rhode Island; or
- (3) Bonds of any political subdivision of the state of Rhode Island.

(b) With respect to the deposit of securities, the general treasurer shall, on a regular basis, collect all interest or income on the securities so deposited and shall pay the interest or income when and as collected to the designer depositing the securities. If the security is in the form of coupon bonds, the general treasurer shall deliver each coupon as it matures to the designer.

37-12.1-3. Deduction from retained earnings.

In the event that pursuant to the terms of the public works contract it is necessary to deduct any sum from retained earnings, the state or governmental unit or agency thereof shall first apply such deduction against sums not withdrawn and thereafter from the proceeds of the sale of any securities deposited or from the income earned on such securities, whichever is applicable.

37-12.1-4. Endorsement on securities.

All securities deposited with the general treasurer pursuant to this chapter shall be properly endorsed by the designer in such manner as to enable the general treasurer to carry out the provisions of this chapter.

37-12.1-5. Applicability.

This chapter shall apply to all retained earnings held pursuant to any public works contract as of [June 16, 1991].

TITLE 37

CHAPTER 13 LABOR AND PAYMENT OF DEBTS BY CONTRACTORS

Sections

- 37-13-1. "Public Works" defined
- 37-13-2. "Contractor" defined – information required.
- 37-13-3. Contractors subject to provisions – Weekly payment of employees.
 - 37-13-3.1 State public works contract apprenticeship requirements
- 37-13-4. Provisions applicable to public works contracts – List of Subcontractors.
- 37-13-5. Payment for trucking or materials furnished – Withholding of sums due.
- 37-12-6. Ascertainment of prevailing rate of wages and other payments – Specification of rate in call for bids and in contract.
- 37-13-7. Specification in contract of amount and frequency of payment and wages.
- 37-13-8. Investigation and determination of prevailing wages – Filing of schedule.
- 37-13-9. Statutory provisions included in contracts.
- 37-13-10. Overtime compensation.
- 37-13-11. Posting of prevailing wage rates.
- 37-13-12. Wage records of contractors.
 - 37-13-12.1. Obstruction of enforcement.
 - 37-13-12.2. Subpoena powers.
 - 37-13-12.3. Compelling obedience to subpoenas.
 - 37-13-12.4. Penalty for violations.
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37-13-1. "Public works" defined.

"Public works" as used in this chapter shall mean any public work consisting of grading, clearing, demolition, improvement, completion, repair, alteration, or construction of any public road or any bridge, or portion thereof, or any public building or portion thereof, or any heavy construction, or any public works projects of any nature or kind whatsoever.

37-13-2. "Contractor" defined - Information required.

The term "contractor" as used in this chapter shall mean the bidder whose bid has been accepted by an authorized agency or awarding authority as the bidder possessing the skills, ability, and integrity necessary to the faithful performance of the contract or work, and who shall certify that he or she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the contract or work. Essential information in regard to qualifications shall be submitted in such form to the awarding authority and the director of labor and training as the director of labor and training shall require. The authorized agency or awarding authority shall reserve the right to reject all bids, if it be in the public interest to do so.

37-13-3. Contractors subject to provisions - Weekly payment of employees.

All contractors, who have been awarded contracts for public works by an awarding agency or authority of the state or of any city, town, committee, or by any person or persons therein, in which state or municipal funds are used and of which the contract price shall be in excess of one thousand dollars (\$1,000) whether payable at the time of the signing of the contract or at a later date, and their subcontractors, on such public works shall pay their employees at weekly intervals and shall comply with the provisions set forth in 37-13-4 - 37-13-14, inclusive, and 37-13-16.

37-13-3.1. State public works contract apprenticeship requirements.

Notwithstanding any laws to the contrary, all general contractors and subcontractors who perform work on any public works contract awarded by the state after passage of this act and valued at one million dollars (\$ 1,000,000) or more shall employ apprentices required for the performance of the awarded contract. The number of apprentices shall comply with the apprentice to journeyman ratio for each trade approved by the apprenticeship council of the department of labor and training.

37-13-4. Provisions applicable to public works contracts - Lists of subcontractors.

All public works shall be done by contract, subject to the same provisions of law relating thereto and to the letting thereof, which are applicable to similar contracts of the awarding authority or authorized agency, hereinafter called the "proper authority," in the general location where the work is to be performed and which are not contrary to the provisions of 37-13-1 - 37-13-14, and 37-13-16. Each contractor after the award of a contract for public works shall submit to the proper authority a list of his or her subcontractors of any part or all of the work. The list shall be submitted in such manner or form as the proper authority shall uniformly require from contractors in all public works.

37-13-5. Payment for trucking or materials furnished - Withholding of sums due.

A contractor or subcontractor on public works authorized by a proper authority shall pay any obligation or charge for trucking and material which have been furnished for the use of the contractor or subcontractor, in connection with the public works being performed by him or her, within ninety (90) days after the obligation or charge is incurred or the trucking service has been performed or the material has been delivered to the site of the work, whichever is later. When it is brought to the notice of the proper authority in a city or town, or the proper authority in the state having supervision of the contract, that the obligation or charge has not been paid by the contractor or subcontractor, the proper authority may deduct and hold for a period not exceeding sixty (60) days, from sums of money due to the contractor or subcontractor, the equivalent amount of such sums certified by a trucker or material man creditor as due him or her, as provided in this section, and which the proper authority determines is reasonable for trucking performed or materials furnished for the public works.

37-13-6. Ascertainment of prevailing rate of wages and other payments - Specification of rate in call for bids and in contract.

Before awarding any contract for public works to be done, the proper authority shall ascertain from the director of labor and training the general prevailing rate of the regular, holiday, and overtime wages paid and the general prevailing payments on behalf of employees only, to lawful welfare, pension, vacation, apprentice training, and educational funds (payments to the funds must constitute an ordinary business expense deduction for federal income tax purposes by contractors) in the city, town, village, or other appropriate political subdivision of the state in which the work is to be performed, for each craft, mechanic, teamster, laborer, or type of worker needed to execute the contract for the public works. The proper authority shall, also, specify in the call for bids for the contract and in the contract itself the general prevailing rate of the regular, holiday, and overtime wages paid and the payments on behalf of employees only, to the welfare, pension, vacation, apprentice training, and education funds existing in the locality for each craft, mechanic, teamster, laborer, or type of worker needed to execute the contract or work.

37-13-7. Specification in contract of amount and frequency of payment of wages.

(a) Every call for bids for every contract in excess of one thousand dollars (\$ 1,000), to which the state of Rhode Island or any political subdivision thereof or any public agency or quasi-public agency is a party, for construction, alteration, and/or repair, including painting and decorating, of public buildings or public works of the state of Rhode Island or any political subdivision thereof, or any public agency or quasi-public agency and which requires or involves the employment of employees, shall contain a provision stating the minimum wages to be paid various types of employees which shall be based upon the wages that will be determined by the director of labor and training to be prevailing for the corresponding types of employees employed on projects of a character similar to the contract work in the city, town, village, or other appropriate political subdivision of the state of Rhode Island in which the work is to be performed. Every contract shall contain a stipulation that the contractor or his or her subcontractor shall pay all the employees employed directly upon the site of the work, unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment computed at wage rates not less than those stated in the call for bids, regardless of any contractual relationships which may be alleged to exist between the contractor or subcontractor and the employees, and that the scale of wages to be paid shall be posted by the contractor in a prominent and easily accessible place at the site of the work; and the further stipulation that there may be withheld from the contractor so much of the accrued payments as may be considered necessary to pay to the employees employed by the contractor, or any subcontractor on the work, the difference between the rates of wages required by the contract to be paid the employees on the work and the rates of wages received by the employees and not refunded to the contractor, subcontractors, or their agents.

(b) The terms "wages" , "scale of wages" , "wage rates" , "minimum wages" , and "prevailing wages" shall include:

(1) The basic hourly rate of pay; and

(2) The amount of:

(A) The rate of contribution made by a contractor or subcontractor to a trustee or to a third person pursuant to a fund, plan, or program; and

(B) The rate of costs to the contractor or subcontractor which may be reasonably anticipated in providing benefits to employees pursuant to an enforceable commitment to carry out a financially responsible plan or program which was communicated in writing to the employees affected, for medical or hospital care, pensions on retirement or death, compensation for injuries or illness resulting from occupational activity, or insurance to provide any of the foregoing, for unemployment benefits, life insurance, disability and sickness insurance, or accident insurance, for vacation and holiday pay, for defraying costs of apprenticeship or other similar programs, or for other bona fide fringe benefits, but only where the contractor or subcontractor is not required by other federal, state, or local law to provide any of the benefits ; provided, that the obligation of a contractor or subcontractor to make payment in accordance with the prevailing wage determinations of the director of labor and training insofar as this chapter of this title and other acts incorporating this chapter of this title by reference are concerned may be discharged by the making of payments in cash, by the making of contributions of a type referred to in subsection (b)(2), or by the assumption of an enforceable commitment to bear the costs of a plan or program of a type referred to in this subdivision, or any combination thereof, where the aggregate of any payments, contributions, and costs is not less than the rate of pay described in subsection (b)(1) plus the amount referred to in subsection (b)(2).

(c) The term "employees" , as used in this section, shall include employees of contractors or subcontractors performing jobs on various types of public works including mechanics, apprentices, teamsters, chauffeurs, and laborers engaged in the transportation of gravel or fill to the site of public works, the removal and/or delivery of gravel or fill or ready-mix concrete, sand, bituminous stone, or asphalt flowable fill from the site of public works, or the transportation or removal of gravel or fill from one location to another on the site of public works, and the employment of the employees shall be subject to the provisions of subsections (a) and (b) .

(d) The terms "public agency" and "quasi-public agency" shall include, but not be limited to, the Rhode Island industrial recreational building authority, the Rhode Island economic development corporation, the Rhode Island airport corporation, the Rhode Island industrial facilities corporation, the Rhode Island refunding bond authority, the Rhode Island housing and mortgage finance corporation, the Rhode Island resource recovery corporation, the Rhode Island public transit authority, the Rhode Island student loan authority, the water resources board corporate, the Rhode Island health and education building corporation, the Rhode Island higher education assistance authority, the Rhode Island turnpike and bridge authority, the Narragansett Bay water quality management district commission,

Rhode Island telecommunications authority, the convention center authority, the board of governors for higher education, the board of regents for elementary and secondary education, the capital center commission, the housing resources commission, the Quonset Point-Davisville management corporation, the Rhode Island children's crusade for higher education, the Rhode Island depositors economic protection corporation, the Rhode Island lottery commission, the Rhode Island partnership for science and technology, the Rhode Island public building authority, and the Rhode Island underground storage tank board.

37-13-8. Investigation and determination of prevailing wages - Filing of schedule.

The director of labor and training shall investigate and determine the prevailing wages and payments made to or on behalf of employees, as set forth in § 37-13-7, paid in the trade or occupation in the city, town, village, or other appropriate political subdivision of the state and keep a schedule on file in his or her office of the customary prevailing rate of wages and payments made to or on behalf of the employees which shall be open to public inspection. In making a determination, the director of labor may adopt and use such appropriate and applicable prevailing wage rate determinations as have been made by the secretary of labor of the United States of America in accordance with the Davis-Bacon Act, as amended, 40 U.S.C. § 276a; provided, however, that each contractor awarded a public works contract after July 1, 2007 shall contact the department of labor and training on or before July first of each year, for the duration of such contract to ascertain the prevailing wage rate of wages on a hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done each year and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee every July first.

37-13-9. Statutory provisions included in contracts.

A copy of 37-13-5, 37-13-6, and 37-13-7 shall be inserted in all contracts for public works awarded by the state or any city or town, committee, an authorized agency or awarding authority thereof, or any person or persons in their behalf in which state or municipal funds are used if the contract price be in excess of one thousand dollars (\$1,000).

37-13-10. Overtime compensation.

Labor performed under the provisions of 37-13-1 - 37-13-16, inclusive, during the period of forty (40) hours in any one week and during the period of eight (8) hours in any one day, shall be considered a legal week's work or a legal day's work, as the case may be, and any number of hours of employment in any one week greater than the number of forty (40) hours or in any one day greater than the number of eight (8) hours shall be compensated at the prevailing rate of wages for overtime employment; provided, however, when the director of labor and training has determined in the investigation provided for in 37-13-7 and 37-13-8 that there is a prevailing practice in a city, town, or other appropriate political subdivision to pay an overtime rate of wages for work of any craft, mechanic, teamster, laborer, or type of worker needed to execute the work other than hours worked in any one week greater than the number of forty (40) or in hours worked in any one day greater than the number of eight (8), then the prevailing practice shall determine the legal workday and the legal workweek in the city or town for the work and the prevailing rate of overtime wages shall be paid for such work in excess of that legal workday or week, as the case may be.

37-13-11. Posting of prevailing wage rates.

Each contractor awarded a contract for public works with a contract price in excess of one thousand dollars (\$ 1,000), and each subcontractor who performs work on those public works, shall post in conspicuous places on the project, where covered workers are employed, posters which contain the current, prevailing rate of wages and the current, prevailing rate of payments to the funds required to be paid for each craft or type of worker employed to execute the contract as set forth in §§ 37-13-6 and 37-13- 7, and the rights and remedies of any employee described in § 37-13-17 for nonpayment of any wages earned pursuant to this chapter. Posters shall be furnished to contractors and subcontractors by the director of labor and training, who shall determine the size and context thereof from time to time, at the time a contract is awarded. A contractor or subcontractor who fails to comply with the provisions of this section shall be deemed guilty of a misdemeanor and shall pay to the director of labor and training one hundred dollars (\$ 100) for each calendar day of noncompliance as determined by him or her. Contracts set forth in this section shall not be awarded by the state, any city, town, or any agency thereof until the director of labor and training has prepared and delivered the posters to the division of purchases, if the state or any agency thereof is the proper authority, or to the city, town, or an agency thereof, if it is the proper authority, and the contractor to whom the contract is to be awarded.

37-13-12. Wage records of contractors.

Each contractor awarded a contract with a contract price in excess of one thousand dollars (\$1,000) for public works, and each subcontractor who performs work on those public works, shall keep an accurate record showing the name, occupation, and actual wages paid to each worker employed by him or her and the payments to all the employee funds specified in sections 37-13-6 and 37-13-7 by him or her in connection with the contract or work. The director and his or her authorized representatives shall have the right to enter any place of employment at all reasonable hours for the purpose of inspecting the wage records and seeing that all provisions of this chapter are complied with.

37-13-12.1. Obstruction of enforcement.

Any effort of any employer to obstruct the director and his or her authorized representatives in the performance of their duties shall be deemed a violation of this chapter and punishable as such.

37-13-12.2. Subpoena powers.

The director and his or her authorized representatives shall have power to administer oaths and examine witnesses under oath, issue subpoenas, subpoenas duces tecum, compel the attendance of witnesses, and the production of papers, books, accounts, records, payrolls, documents, and testimony, and to take depositions and affidavits in any proceeding before the director.

37-13-12.3. Compelling obedience to subpoenas.

In case of failure of any person to comply with any subpoena lawfully issued, or subpoena duces tecum, or on the refusal of any witness to testify to any matter regarding which he may be lawfully interrogated, it shall be the duty of the superior court, or any judge thereof, on application by the director, to compel obedience by proceedings in the nature of those for contempt.

37-13-12.4. Penalty for violations.

Except as otherwise provided in this chapter, any employer who shall violate or fail to comply with any of the provisions of this chapter shall be guilty of a misdemeanor and shall be punished by a fine of not less than five hundred dollars (\$ 500) nor more than one thousand dollars (\$ 1,000) for each separate offense, or by imprisonment for not less than ten (10) nor more than ninety (90) days, or by both fine and imprisonment. Each day of failure to pay wages due an employee at the time specified in this chapter shall constitute a separate and distinct violation.

37-13-13. Furnishing payroll record to director of labor.

(a) Every contractor and subcontractor awarded a contract for public works as defined by this chapter shall furnish a certified copy of his or her payroll records of his or her employees employed upon the project to the director of labor and training on a monthly basis for the preceding month's work.

(b)The director of labor and training may promulgate reasonable rules and regulations to enforce the provisions of this section.

(c) Any contractor or subcontractor who fails to comply with the provisions of this section shall be deemed guilty of a misdemeanor and shall pay to the director of labor and training five hundred dollars (\$ 500) for each calendar day of noncompliance as determined by the director of labor and training. Any of those revenues shall be deposited as general revenues. Any person, firm, or corporation found to have willfully made a false or fraudulent representation in connection with reporting their certified payroll records shall be required to pay a civil penalty to the department of labor and training in an amount of no less than one thousand dollars (\$ 1,000) and not greater than three thousand dollars (\$ 3,000) per representation. For purposes of this subsection "willfully" shall mean representations that are known to be false, or representations made with deliberate ignorance or reckless disregard for their truth or falsity.

37-13-13.1. Audits of wage records of out of state contractors and subcontractors.

Out of state contractors or subcontractors who perform work on public works in this state authorize the director of labor and training to conduct wage and hour audits of their payroll records pursuant to the provisions of chapter 14 of title 28.

37-13-14. Contractor's bond.

The state or any city, town, agency, or committee therein awarding contracts for public works shall require the contractor awarded a contract with a contract price in excess of fifty thousand dollars (\$ 50,000) for public works to file with the proper authority good and sufficient bond with surety furnished by any surety company authorized to do business in the state, conditioned upon the faithful performance of the contract and upon the payment for labor performed and material furnished in connection therewith, a bond to contain the terms and conditions set forth in chapter 12 of this title, and to be subject to the provisions of that chapter. Waiver of the bonding requirements of this section is expressly prohibited.

37-13-14.1. Enforcement - Hearings.

(a) Before issuing an order or determination, the director of labor and training shall order a hearing thereon at a time and place to be specified, and shall give notice thereof, together with a copy of the complaint or the purpose thereof, or a statement of the facts disclosed upon investigation, which notice shall be served personally or by mail on any person, firm, or corporation affected thereby. The person, firm, or corporation shall have an opportunity to be heard in respect to the matters complained of at the time and place specified in the notice, which time shall be not less than five (5) days from the service of the notice personally or by mail. The hearing shall be held within ten (10) days from the order of hearing. The hearing shall be conducted by the director of labor and training or his or her designee. The hearing officer in the hearing shall be deemed to be acting in a judicial capacity, and shall have the right to issue subpoenas, administer oaths, and examine witnesses. The enforcement of a subpoena issued under this section shall be regulated by Rhode Island civil practice law and rules. The hearing shall be expeditiously conducted and upon such hearing the hearing officer shall determine the issues raised thereon and shall make a determination and enter an order within ten (10) days of the close of the hearing, and forthwith serve a copy of the order, with a notice of the filing thereof, upon the parties to the proceeding, personally or by mail. The order shall dismiss the charges or direct payment of wages or supplements found to be due, including interest at the rate of twelve percentum (12%) per annum from the date of the underpayment to the date of payment, and may direct payment of reasonable attorney's fees and costs to the complaining party.

(b) In addition to directing payment of wages or supplements including interest found to be due, the order shall also require payment of a further sum as a civil penalty in an amount up to three times the total amount found to be due. Further, if the amount of salary owed to an employee pursuant to this chapter but not paid to the employee in violation of thereof exceeds five thousand dollars (\$ 5,000), it shall constitute a misdemeanor and shall be referred to the office of the attorney general. The misdemeanor shall be punishable for a period of not more than one year in prison and/or fined not more than one thousand dollars (\$ 1,000). In assessing the amount of the penalty, due consideration shall be given to the size of the employer's business, the good faith of the employer, the gravity of the violation, the history of previous violations and the failure to comply with recordkeeping or other nonwage requirements. The surety of the person, firm, or corporation found to be in violation of the provisions of this chapter shall be bound to pay any penalties assessed on such person, firm, or corporation. The penalty shall be paid to the department of labor and training for deposit in the state treasury; provided, however, it is hereby provided that the general treasurer shall establish a dedicated "prevailing wages enforcement fund" for the purpose of depositing the penalties paid as provided herein. There is hereby appropriated to the annual budget of the department of labor and training the amount of the fund collected annually under this section, to be used at the direction of the director of labor and training for the sole purpose of enforcing prevailing wage rates as provided in this chapter.

(c) For the purposes of this chapter, each day or part thereof of violation of any provision of this chapter by a person, firm, or corporation, whether the violation is continuous or intermittent, shall constitute a separate and succeeding violation.

(d) In addition to the above, any person, firm, or corporation found in violation of any of the provisions of this chapter by the director of labor and training, an awarding authority, or the hearing officer, shall be ineligible to bid on or be awarded work by an awarding authority or perform any such work for a period of no less than eighteen (18) months and no more than thirty-six (36) months from the date of the order entered by the hearing officer. Once a person, firm, or corporation is found to be in violation of this chapter, all pending bids with any awarding authority shall be revoked, and any bid awarded by an awarding authority prior to the commencement of the work shall also be revoked.

(e) In addition to the above, any person, firm, or corporation found to have committed two (2) or more willful violations in any period of eighteen (18) months of any of the provisions of this chapter by the hearing officer, which violations are not arising from the same incident, shall be ineligible to bid on or be awarded work by an

awarding authority or perform any work for a period of sixty (60) months from the date of the second violation.

(f) The order of the hearing officer shall remain in full force and effect unless stayed by order of the superior court.

(g) The director of labor and training , awarding authority, or hearing officer shall notify the bonding company of any person, firm, or corporation suspected of violating any section of this chapter. The notice shall be mailed certified mail, and shall enumerate the alleged violations being investigated.

(h) In addition to the above, any person, firm, or corporation found to have willfully made a false or fraudulent representation on certified payroll records shall be referred to the office of the attorney general. The false or fraudulent representation shall be considered a misdemeanor and shall be punishable for a period of not more than one year in prison and/or fined one thousand dollars (\$ 1,000). Further, any person, firm, or corporation found to have willfully made a false or fraudulent representation on certified payroll records shall be required to pay a civil penalty to the department of labor and training in an amount of no less than two thousand dollars (\$ 2,000) and not greater than fifteen thousand dollars (\$ 15,000) per representation.

37-13-15. Review.

(a) There is hereby created an appeals board which shall be comprised of three (3) members who shall be appointed by the governor; provided, however, that each member of the appeals board shall have at least five (5) years experience with prevailing wage rates as they apply to the construction industry. The members of such appeals board shall serve without compensation. The members of the appeals board shall be appointed for terms of three (3) years except that of the three (3) members originally appointed by each of the appointing authorities; one (1) shall be appointed for a term of one (1) year, one (1) shall be appointed for a term of two (2) years and one (1) for a term of three (3) years.

(b) Any person aggrieved by any action taken by the director of labor and training or his or her designated hearing officer under the authority of this chapter, or by the failure or refusal of the director of labor and training to take any action authorized by this chapter, may obtain a review thereof for the purpose of obtaining relief from the action or lack of action by filing a petition for administrative review and relief, to the appeals board as provided herein. The petition for administrative review shall be filed within twenty (20) days of the action taken by the director of labor and training or designated hearing officer: The petition for administrative review shall be heard within ten (10) days of the date of filing. An aggrieved person under this section shall include:

- (1) Any person who is required to pay wages to his or her employees or make payments to a fund on behalf of his or her employees, as provided in this chapter;
- (2) Any person who is required to be paid wages for his or her labor or on whose behalf payments are required to be paid to funds, as provided by this chapter;
- (3) The lawful collective bargaining representative of a person defined in subdivision (2) above;
- (4) A trade association of which a person defined in subdivision (1) above is a member;
- (5) A proper authority as defined in this chapter;
- (6) A contractor who submitted a bid for work to be or which has been awarded under the provisions of this chapter or a trade association of which he or her is a member, and
- (7) A labor organization which has one or more written collective bargaining agreements with one or more employers or a trade association which sets forth the hours, wages, and working conditions of a craft, mechanic, teamster, or type of worker needed to execute the work, as provided in this chapter to the extent that it would be affected by the action or the failure to act of the director of labor and training or the hearing officer.

(c) Any aggrieved person as defined herein may obtain a review of a decision of the appeals board by filing a petition in the superior court in Providence county pursuant to the provisions of the administrative procedures act, praying for review and relief and the petition shall follow the course of and be subject to the procedures for causes filed in the court.

(d) The director is hereby empowered to enforce his or her decision and/or the decision of the appeals board in the superior court for the county of Providence.

37-13-16. Termination of work on failure to pay agreed wages - Completion of work.

Every contract within the scope of this chapter shall contain the further provision that in the event it is found by the director of labor and training that any employee employed by the contractor or any subcontractor directly on the site of the work covered by the contract has been or is being paid a rate of wages less than the rate of wages required by the contract to be paid as aforesaid, the awarding party may, by written notice to the contractor or subcontractor, terminate his or her right as the case may be, to proceed with the work, or such part of the work as to which there has been a failure to pay the required wages, and shall prosecute the work to completion by contract or otherwise, and the contractor and his or her sureties shall be liable to the awarding party for any excess costs occasioned the awarding authority thereby.

37-13-17. Private right of action to collect wages or benefits

(a) An employee or former employee, or any organization representing such an employee or former employee, of a contractor or subcontractor may bring a civil action for a violation of § 37-13-7 for appropriate injunctive relief, or actual damages, or both within three (3) years after the occurrence of the alleged violation. An action commenced pursuant to this section, may be brought in the superior court for the county where the alleged violation occurred, the county where the complainant resides, or the county where the person against whom in the civil complaint is filed resides or has their principal place of business. Any contractor or subcontractor who violates the provisions of § 37-13-7 shall be liable to the affected employee or employees in the amount of unpaid wages or benefits, plus interest. A civil action filed in court under this section may be instituted instead of, but not in addition to the director of labor and training enforcement procedures authorized by § 37-13-14.1, provided the civil action is filed prior to the date the director of labor and training issues notice of an administrative hearing.

(b) An employer's responsibility and liability is solely for its own employees.

(c) An action instituted pursuant to this section may be brought by one or more employees or former employees on behalf of himself/herself or themselves and other employees similarly situated, except that no employee shall be a party plaintiff to any such action unless he/she gives his/her consent in writing to become such a party and such consent is filed in the court in which such action is brought.

(d) In an action filed under this section in which the plaintiff prevails, the court shall, in addition to any judgment awarded to the plaintiff, require reasonable attorneys' fees and the costs of the action to be paid by the defendant.

(e) The court in an action filed under this section shall award affected employees or former employees liquidated damages in an amount equal to two (2) times the amount of unpaid wages or benefits owed. Unpaid fringe benefit contributions owed pursuant to this section in any form shall be paid to the appropriate benefit fund, however, in the absence of an appropriate fund the benefit shall be paid directly to the individual.

(f) The filing of a civil action under this section shall not preclude the director of labor and training from referring a matter to the attorney general as provided in § 37-13-14.1(b), from prohibiting a contractor or subcontractor from bidding on or otherwise participating in contracts as provided in § 37-13-14.1(d), (e) and (h), or from prohibiting termination of work on failure to pay agreed wages pursuant to § 37-13-16.

(g) Any person, firm, or corporation found to have willfully made a false or fraudulent representation in connection with wage obligations owed on a contract shall be required to pay a civil penalty to the department of labor and training in an amount of no less than one thousand dollars (\$ 1,000) and not greater than three thousand dollars (\$ 3,000) per representation. Such penalties shall be recoverable in civil actions filed pursuant to this section. For purposes of this subsection "willfully" shall mean representations that are known to be false, or representations made with deliberate ignorance or reckless disregard for their truth or falsity.

(h) An employer shall not discharge, threaten, or otherwise discriminate against an employee, or former employee, regarding compensation terms, conditions, locations or privileges of employment because the employee or former employee, or a person or organization acting on his or her behalf: (1) Reports or makes a complaint under this section; or otherwise asserts his or her rights under this section; and/or (2) Participates in any investigation, hearing or inquiry held by the director of labor and training under § 37-13-14.1. In the event a contractor or subcontractor retaliates or discriminates against an employee in violation of this section, the affected employee may file an action in any court of competent jurisdiction and the court shall order reinstatement and/or restitution of the affected employee, as appropriate, with back pay to the date of the violation, and an additional amount in liquidated damages equal to two (2) times the amount of back pay and reasonable attorneys' fees and costs.

(i) If any one or more subsections of this section shall for any reason be adjudged unconstitutional or otherwise invalid, the judgment shall not affect, impair, or invalidate the remaining subsections.

PREVAILING WAGE RATES

(Appropriate wage rate to be inserted by bidder in specifications)

For a copy of the appropriate wage rate, contact:

**R.I. Department of Labor
Division of Labor Standards
610 Manton Avenue
Providence, RI 02909**

TITLE 37

CHAPTER 14.1 MINORITY BUSINESS ENTERPRISE

Sections

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37-14.1-1. Purpose.

The purpose of this chapter is to carry out the state's policy of supporting the fullest possible participation of firms owned and controlled by minorities and women (MBE's), in state funded and state directed public construction programs and projects and in state purchases of goods and services. This includes assisting MBE's throughout the life of contracts in which they participate.

37-14.1-2. Applicability.

This chapter shall apply to any and all state purchasing, including, but not limited to the procurement of goods and services and construction projects or contracts funded in whole or in part by state funds, or funds which, in accordance with a federal grant or otherwise, the state expends or administers or in which the state is a signatory to the construction contract.

37-14.1-3. Definitions.

- (a) "Affirmative action" means taking specific steps to eliminate discrimination and its effects, to ensure nondiscriminatory results and practices in the future, and to involve minority business enterprises fully in contracts and programs funded by the state.
- (b) "Compliance" means the condition existing when a contractor has met and implemented the requirements of this chapter.
- (c) "Contract" means a mutually binding legal relationship or any modification thereof obligating the seller to furnish supplies or services, including construction, and the buyer to pay for them. For purposes of this chapter, a lease is a contract.
- (d) "Contractor" means one who participates, through a contract or subcontract, in any procurement or program covered by this chapter, and includes lessees and material suppliers.
- (e) "Minority" means a person who is a citizen or lawful permanent resident of the United States and who is:
 - (1) Black (a person having origins in any of the black racial groups of Africa);
 - (2) Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
 - (3) Portuguese (a person of Portuguese, Brazilian, or other Portuguese culture or origin, regardless of race);
 - (4) Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands);
 - (5) American Indian and Alaskan Native (a person having origins in any of the original peoples of North America.); or
 - (6) Members of other groups, or other individuals, found to be economically and socially disadvantaged by the Small Business Administration under section 8(a) of the Small Business Act, as amended [15 U.S.C. 637(a)].
- (f) "Minority business enterprise" or "MBE" means a small business concern, as defined pursuant to section 3 of the federal Small Business Act [15 U.S.C. 632] and implementing regulations, which is owned and controlled by one or more minorities or women. For the purposes of this chapter, owned and controlled means a business.

- (1) Which is at least fifty-one percent (51%) owned by one or more minorities or women or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by one or more minorities or women; and
- (2) Whose management and daily business operations are controlled by one or more such individuals.

(g) "MBE coordinator" means the official designated to have overall responsibility for promotion of minority business enterprise in his or her departmental element.

(h) "Noncompliance" means the condition existing when a recipient or contractor has failed to implement the requirements of this chapter.

37-14.1-4. Policy.

It is the policy of the state of Rhode Island that minority business enterprises (MBE's) shall have the maximum opportunity to participate in the performance of procurements and projects outlined in 37-14.1-2.

37-14.1-5. Discrimination prohibited.

No person shall be excluded from participation in, denied the benefits of, or otherwise discriminated against in connection with the award and performance of any project covered by this chapter, on the grounds of race, color, national origin, or sex.

37-14.1-6. Minority business enterprise participation.

Minority business enterprises shall be included in all procurements and construction projects under this chapter and shall be awarded a minimum of ten percent (10%) of the dollar value of the entire procurement or project. The director of the department of administration is further authorized to establish by rules and regulation formulas for giving minority business enterprises a preference in contract and subcontract awards.

37-14.1-7. Establishment of criteria and guidelines.

The director of the department of administration shall establish, by rule and regulations adopted in accordance with chapter 35 of title 42, standards which shall determine whether a construction project is covered by this chapter, compliance formulas, procedures for implementation, and procedures for enforcement which are not inconsistent with 49 CFR 23 of the federal regulations. As to Rhode Island department of transportation contracts, the director of administration may delegate this authority to the director of transportation.

37-14.1-8. Sanctions.

(a) The director of the department of administration shall have the power to impose sanctions upon contractors not in compliance with this chapter and shall include but not be limited to:

- (1) Suspension of payments;
- (2) Termination of the contract;
- (3) Recovery by the state of ten percent (10%) of the contract award price as liquidated damages; and
- (4) Denial of right to participate in future projects for up to three (3) years.

(b) As to Rhode Island department of transportation contracts, the director of the department of administration may delegate this authority to the director of transportation.

**REGULATIONS GOVERNING PARTICIPATION BY MINORITY BUSINESS ENTERPRISES IN STATE
FUNDED AND DIRECTED PUBLIC CONSTRUCTION PROJECTS, CONSTRUCTION CONTRACTS
AND PROCUREMENT CONTRACTS FOR GOODS AND SERVICES**

I. GENERAL

1. Purpose

(a) The purpose of these regulations is to carry out the state's policy of supporting the fullest possible participation of firms owned and controlled by minorities and women (MBEs) in state-funded and directed public construction programs and projects and in state purchases of goods and services. This includes assisting MBEs throughout the life of contracts in which they participate.

(b) These regulations implement, in part, R. I. Gen. Laws, Chapter 37-14.1. These regulations are effective immediately and supersede all Department of Administration regulations issued previously under these authorities insofar as such regulations affect minority business enterprise matters in the State.

2. Applicability

These regulations apply to any construction project, construction contract or procurement contract for goods and services funded in whole or in part by state funds, or funds which, in accordance with federal grant or otherwise, the state expends or administers or in which the state is a signatory. Quasi-independent state agencies, such as the Rhode Island Public Buildings Authority, the Narragansett Bay Commission and the Rhode Island Port Authority, are subject to the requirements outlined under these regulations. With respect to Department of Transportation contracts, The Director of Transportation may promulgate regulations consistent with R. I. Gen. Laws Sections 37-14.1-8 and 37-14.1-9, thereby exempting Department of Transportation contracts from the requirements of these regulations.

3. Definition

The terms "building" or "work" means construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work. The terms include, without limitation, buildings, structures, and improvement of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, railways, airports, terminals, docks, piers, wharves, ways lighthouses, buoys, jetties, breakwaters, levees, and canals; dredging, shoring, scaffolding, drilling, blasting, excavating, clearing and landscaping. Unless conducted in connection with and at the site of such a building or work as described in the foregoing sentence, the manufacture or furnishing of materials, articles, supplies, or equipment (whether or not a Federal or State agency acquires title to such materials, articles, supplies, or equipment during the course of the manufacture or furnishing, or owns the materials from which they are manufactured or furnished) is not a "building" or "work" within the meaning of these regulations.

"Compliance" means the conditions existing when a prime contractor has met and implemented the requirements of these regulations.

"Construction" means all types of on-site work done on a particular building or work, including, without limitation, altering, remodeling, painting and decorating, the transporting of materials and supplies to or from the building or work by the employees of the construction contractor or construction subcontractor, and the manufacturing or furnishing of materials, articles, supplies, or equipment on the site of the building or work, by persons employed at the site by the contractor or subcontractor.

"Construction Project" means a contract or group of contracts for construction work that a prime contractor has agreed to perform, whether directly or through the use of subcontractors.

"Contract" means a mutually binding legal relationship or any modification thereof obligating the seller to furnish supplies or services, including construction, and the buyer to pay for them. For purposes of these regulations, a lease is a contract.

"Contractor" means one who participates, through a contract or subcontract, in any program covered by these regulations and includes lessees.

"Director" means the Director of the Department of Administration or any person whom he/she has designated to act for him/her.

"Goods" means materials or supplies of any kind provided by a vendor, his agents or employees.

"Services" means professional or non-professional activities requiring mental or physical labor to be performed by the contractor, vendor, his agents or employees.

"Minority" means a person who is a citizen or lawful permanent resident of the United States and who is:

- (a) Black (a person having origins in any of the black racial groups of Africa);
- (b) Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race);
- (c) Portuguese (a person of Portuguese, Brazilian or other Portuguese culture or origin, regardless of race);
- (d) Asian American (a person having origins in any of the original peoples of the Far East, South East Asia, the Indian Subcontinent, or the Pacific Islands);
- (e) American Indian and Alaskan Native (a person having origins in any of the original peoples of North America); or
- (f) Members of other groups or other individuals found to be economically and socially disadvantaged by the Small Business Administration under Section 8(a) of the Small Business Act, as amended (15 U.S.C. 637 (a)).

"Minority Business Enterprise" or "MBE" means a small business concern as defined pursuant to Section 3 of the Federal Small Business Act and implementing regulations, which is owned and controlled by one (1) or more minorities or women and which has been certified as a Minority Business Enterprise under these regulations by the Rhode Island Department of Administration. For the purposes of these regulations, an owned and controlled business means one:

- (a) which is at least 51% owned by one (1) or more minorities or women or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by one (1) or more minorities or women; and
- (b) whose management and daily business operations are controlled by one (1) or more such individuals.

"MBE Coordinator" means the official designated to have overall responsibility for promotion of minority business enterprises within each department and agency for each contract covered by these regulations. He or she shall be appointed not later than the time the Request for Proposal for each contract is submitted.

"Non-compliance" means the condition existing when a contractor has failed to implement the requirements of these regulations.

"Prime Contractor" means the contractor that is charged with total construction on a contract or group of contracts, portions of which are, or will be subcontracted to their parties.

"Specialty Contractor" means a contractor charged with total construction on a contract or group of contracts, portions of which will not be subcontracted to third parties.

"Vendor" means the party with which the State contracts to provide goods or services.

4. Policy

These regulations shall be construed in accordance with the policy of the State of Rhode Island that minority business enterprises (MBEs) shall have the maximum opportunity to participate in the performance of projects or provision of goods or services outlined hereunder.

5. Construction Contracts

(a) MBE Liaison Officer

The chief executive officer of each prime contractor shall designate an MBE Liaison Officer who will coordinate with the MBE Coordinator from the Department of Administration or other state department or agency responsible for monitoring the contract.

(b) Ten Percent (10%) Requirement

(i) Each Department shall structure its procedures for procuring construction contracts to attempt to achieve the result that a minimum of ten (10%) percent of the total dollar value of these procurements is made directly or indirectly from MBEs. This result shall be achieved through one of the two methods described in paragraphs 5(b) (ii) or 5 (b) (iii) below.

(ii) Prime Contractor Method. Each prime contractor shall ensure that a minimum of ten percent (10%) of the dollar value of work to be performed on a construction project will be performed by MBEs. The prime contractor must meet or exceed this requirement or demonstrate that it could not meet this requirement despite its good-faith efforts. A prime contractor that is an MBE will satisfy the ten percent (10%) requirement by ensuring that a least ten percent (10%) of the dollar volume of work performed under the contract is performed by its employees.

(iii) Construction Contracts not involving the use of prime contractors. In lieu of using the prime contractor method described in paragraph 5(b) (ii) above, a Department may meet the ten percent (10%) requirement under these regulations by ensuring that ten percent (10%) of the dollar value of construction contracts in the aggregate for each fiscal year is awarded to MBEs. MBEs may be solicited directly to accomplish this requirement.

(iv) The ten percent (10%) requirements set forth under these regulations can be satisfied concurrently with similar requirements mandated under federal law.

(v) Nothing in these regulations shall be construed to require the award of a contract to an MBE whose bid exceeds the lowest bid by five percent (5%). Nothing in these Regulations shall be construed to require the acceptance of non-conforming goods or services.

(c) Solicitation of Bids

All departments and agencies soliciting requests for proposals for construction projects identified as having subcontracting opportunities must include in the advertisements for the project the following language: "This project is subject to Chapter 37-14.1 of the Rhode Island General Laws, and regulations promulgated thereunder, which require that ten percent of the dollar value of work performed on the project be performed by minority business enterprises."

(ii) MBE Compliance Plan

A prospective prime contractor shall include in its bid on any construction project covered by these regulations, a simple statement acknowledging its obligation to meet the ten percent (10%) requirement under these regulations. After it has been identified as the apparent low bidder, the prime contractor shall, within ten (10) working days, prepare an MBE Compliance Plan and submit it to the Director or his designee for approval. The Plan shall identify by MBE name, subcontract dollar amount and type, each subcontract that the prime contractor projects will be awarded to MBEs over the period of the project.

(d) Approval or Disapproval of MBE Plan

(i) The Director or his designee will review and approve plans that reasonably ensure compliance with the ten percent (10%) requirement.

(ii) Where the prime contractor has proved that for reasons beyond the prime contractor's control, compliance with the ten percent (10%) requirement is impossible, the Director or his designee may approve a plan that ensures compliance with an MBE utilization rate of less than ten percent (10%). To prove impossibility of compliance, there shall be a hearing, which interested parties will be notified of and permitted to attend, during which the contractor shall demonstrate the following:

(1) The prime contractor is making all appropriate efforts, including those listed in paragraph 5 (e) of these regulations, to increase MBE participation in its construction project to the ten percent (10%) level.

(2) Despite the prime contractor's efforts, the prime contractor's plan represents a reasonable expectation for the participation of MBEs in state contracts given the availability of MBEs to work on the contract.

(iii) If the Director or his designee does not approve the plan the prime contractor has submitted, the prime contractor, after consulting with the Director or his designee, shall present a revised plan.

(iv) The Director may condition the approval or establishment of any adjusted requirement on any reasonable future action by the prime contractor.

(v) Each prime contract covered under these regulations shall include the following: "The contractor agrees to ensure that minority business enterprises as defined in R.I. Gen. Laws Section 37-14.1-3, shall have the maximum opportunity to participate in the performance of subcontracts performed under this agreement. The contractor will take all reasonable steps in accordance with regulations promulgated under Chapter 37-14.1 of the Rhode Island General Laws to ensure that minority business enterprises have the maximum opportunity to compete for and perform subcontracts under this agreement."

e. Compliance

(i) Each MBE coordinator will periodically conduct on-site inspections to determine compliance with the provisions of these regulations. The Division of Purchasing, the Director or the MBE Coordinator may require a prime contractor to furnish copies of purchase orders, subcontracts, cancelled checks, and other records that may indicate the number, names, dollar value of MBE subcontracts, dates, and schedule time for performance of work by an MBE subcontractor.

(ii) A prime contractor's failure to have an approved MBE Compliance Plan as required by these regulations constitutes non-compliance with these regulations.

(iii) If a prime contractor fails to meet the requirements outlined in its approved MBE Compliance Plan, it shall explain to the Director, in writing, why the requirements could not be met and why meeting the requirements was beyond the prime contractor's control.

(iv) To determine whether a prime contractor has a good faith reason for failing to meet its requirements, the Director may consider, among other factors:

(1) Whether the prime contractor attended any pre-solicitation or pre-bid meetings that were scheduled by the state contracting authority to inform MBEs of contracting or subcontracting opportunities;

(2) Whether the prime contractor advertised in general circulation, trade association, and minority focus media concerning the subcontracting opportunities;

(3) Whether the prime contractor provided written notice to a reasonable number of specific MBEs that their interest in a contract was being solicited, in sufficient time to allow the MBEs to participate effectively;

- (4) Whether the prime contractor followed up initial solicitations of interest by contacting MBEs to determine with certainty whether the MBEs were interested;
 - (5) Whether the prime contractor selected portions of work to be performed by MBEs in order to increase the likelihood of meeting MBE participation requirements (including, where appropriate, breaking down contracts into economically feasible units to facilitate MBE participation);
 - (6) Whether the prime contractor provided interested MBEs with adequate information about the plans, specifications and requirements of the contract;
 - (7) Whether the prime contractor negotiated in good faith with interested MBEs;
 - (8) Whether the prime contractor made suggestions to interested MBEs to assist them in obtaining bonding, lines of credit, or insurance required by the prime contractor;
 - (9) Whether the prime contractor effectively used the services of available minority community organizations, minority contractors' groups, local, state and Federal minority business assistance offices; and other organizations that provide assistance in the recruitment and placement of MBEs.
- (v) If the prime contractor does not make such an explanation, or if the Director determines that the prime contractor's explanation does not justify its failure to meet the requirements in its approved MBE Plan, the Director may direct the prime contractor to take appropriate remedial action. Failure to take remedial action directed by the Director is noncompliance with these regulations.
- (vi) In the event of non-compliance with these regulations, the Director may take appropriate enforcement action. Such action may include suspension of payments, termination of the contract, recovery by the state of 10% of the contract price as liquidated damages and/or denial of the right to participate in future projects for up to three (3) years.

TITLE 37

CHAPTER 16 PUBLIC WORKS ARBITRATION

Sections

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37-16-1. Short title.

This chapter shall be known as the "Public Works Arbitration Act".

37-16-2. Contract provision for arbitration.

(a) A provision in a written contract executed on or after January 1, 1962, for the construction, alteration, repair, or painting of any public building, sewer, highway, bridge, water treatment or disposal projects one party to which is the state, a city, a town, or an authority, a board, a public corporation, or any similar body created by statute or ordinance or any committee, agency, or subdivision of any of them, to settle by arbitration any dispute or claim arising out of or concerning the performance or interpretation of the contract shall be valid, irrevocable, and enforceable, save upon grounds existing in law or equity for the revocation of the contract.

(b) (1) Every contract for the construction, alteration, repair, painting, or demolition of any public building, sewer, water treatment or disposal project, highway, or bridge one party to which is the state, a city, a town, or an authority, a board, a public corporation, or any similar body created by statute or ordinance or any committee, agency, or subdivision of any of them which has a contract price of ten thousand dollars (\$ 10,000) or more and which is executed on or after July 1, 1967, shall contain a provision for arbitration of disputes and claims arising out of or concerning the performance or interpretation of the contract as follows:

(2) "All claims, disputes, and other matters in question arising out of or relating to this contract or the performance or interpretation thereof shall be submitted to arbitration. Arbitration shall be commenced by a demand in writing made by one party to the contract upon the other within a reasonable time after the dispute, claim, or other matter in question arose but in no event after payment in full of the contract price has been made and accepted. The written demand shall contain a statement of the question to be arbitrated and a detailed statement of each item or matter in

dispute and the name of the arbitrator appointed by that party. The other party to the contract within ten (10) days of the receipt of the written demand shall appoint an arbitrator and give notice in writing thereof to the party who commenced arbitration. The two (2) arbitrators appointed by the parties shall within ten (10) days of the date of the appointment of the second arbitrator select a third arbitrator who shall be designated as chairperson and who immediately shall give written notice to the parties of his or her appointment. The third arbitrator shall select a time, date, and place for hearing and give each party five (5) days notice in writing thereof. The date for hearing shall not be more than fifteen (15) days after the date of appointment of the third arbitrator. The award shall be made promptly by the arbitrators and, unless otherwise agreed by the parties or specified by law, no later than thirty (30) days from the date of closing the hearing, or, if oral hearings have been waived, from the date of the transmittal of the final statements and proofs to the arbitrators. The award shall be in writing and shall be signed by a majority of the arbitrators. It shall be executed in the manner required by law. The arbitrator shall provide a written explanation of the reasoning for the award. In the event the party of whom arbitration is demanded shall fail to appoint his or her arbitrator within the time specified or the two (2) arbitrators appointed by the parties are unable to agree on an appointment of the third arbitrator within the time specified, either party may petition the presiding justice of the superior court to appoint a single arbitrator who shall hear the parties and make an award as provided herein. The petitioner shall give five (5) days notice in writing to the other party before filing his or her petition."

(c) Any dispute involving claims less than one hundred thousand dollars (\$ 100,000) and associated with construction of a highway or bridge as referred to in subsection (b) shall be submitted to arbitration. Any dispute involving claims of one hundred thousand dollars (\$ 100,000) or more and associated with construction of a highway or bridge as referred to in subsection (b) shall only be arbitrated with the consent of the parties. If the parties fail to consent to arbitration and the state of Rhode Island is a party to the dispute, then the claim will proceed in accordance with § 37-13.1-1.

(d) For the purposes of this section, the term "claims" shall not mean the aggregate amount sought under the contract or in the arbitration, but shall refer specifically to each item or matter in dispute for which additional compensation is sought or for each item for which a credit is sought.

(e) Notwithstanding subsection (a) or (b) of this section, if any contract except for highway and bridge contracts provides for an arbitration procedure, and a method of appointment of an arbitrator or arbitrators, that method shall be followed instead of the method provided in subsection (b) of this section.

(f) This section shall apply to all written contracts executed on or after January 1, 1986.

37-16-3. Application to subcontracts.

When a contract described in 37-16-2 is in effect and any party thereto has entered into a subcontract to perform part of the work and/or furnish any materials in connection with the work described in the contract and the terms of the subcontract provide for arbitration of a dispute or claim concerning the performance or interpretation thereof, or the subcontract, expressly or by reference to the terms of the contract, provides that the parties to the subcontract shall comply with the arbitration provisions of the contract, the following shall apply when a request is made or an order of court is entered for arbitration either under the terms of the contract or subcontract.

(a) When arbitration under the contract may adversely affect the interest of a party thereto because of the effect of an award of the arbitrator or arbitrators upon the performance or interpretation of the terms of a subcontract to which he or she is also a party, he or she may require any other party or all other parties to the subcontract to become a party or parties to the arbitration.

(b) When a party to a subcontract makes a demand or an order of court is entered for arbitration under the terms of the subcontract which comply with the provision of this chapter, any party thereto who is also a party to the contract and whose rights under the contract may be adversely affected by the effect of an award of the arbitrator or arbitrators upon the performance or interpretation of the contract, may require any other party to the contract to become a party to the arbitration.

(c) When a party to a contract or to a subcontract is made a party to arbitration by virtue of the provisions of this section, he or she shall have all the rights of a party to arbitration as provided in this chapter except the appointment of an arbitrator. Provided, however, he or she may object to the arbitrators appointed by the parties in which event a single arbitrator shall be appointed as provided in 37-16-2 in the petition of either of the original parties to arbitration. The award of the arbitrator or arbitrators shall be valid and shall be binding on him or her to

the extent that it affects the performance or interpretation of the contract and/or subcontract to which he or she is a party. The award of the arbitrator or arbitrators may be enforced, modified, or vacated as this chapter provides an award made in an arbitration of a contract described in 37-16-2 may be enforced, modified, or vacated.

37-16-4. Stay of legal proceedings pending arbitration.

If any suit or proceedings be brought upon any issue referable to arbitration under contract in writing providing for arbitration, the court in which the suit is pending upon being satisfied that the issue involved in the suit or proceedings is referable to arbitration under the contract, shall on application of one of the parties, stay the trial of the action until arbitration has been held.

37-16-5. Jurisdiction of superior court to enforce arbitration provision and awards.

The entering into a contract in writing providing for arbitration shall be deemed a consent of all parties, including those enumerated in 37-16-2, thereto to the jurisdiction of the superior court of this state to enforce the arbitration provision and any award made pursuant to that provision. A party aggrieved by the failure, neglect, or refusal of another to perform under a contract providing for arbitration, may petition the superior court, or a judge thereof, for an order directing that arbitration proceed in the manner provided for in the contract. Five (5) days' notice in writing of the application shall be served upon the party in default. Service thereof shall be made in the manner specified in the contract, and if no manner specified therein, then in the manner provided by law for personal service of a summons, within or without the state, or substituted service of a summons, or upon satisfactory proof that the party aggrieved has been or will be unable with due diligence to make service in any of the foregoing manners, then notice shall be served in such manner as the court or judge may direct. A judge of the superior court shall hear the parties and upon being satisfied that there is no substantial issue as to the making of the contract or the failure to comply therewith, the court, or the judge thereof, hearing the application, shall make an order directing the parties to proceed to arbitration in accordance with the terms of the contract.

37-16-6. Trial upon evidence of substantial issue.

If evidentiary facts are set forth raising a substantial issue as to the making of the contract or the failure to comply therewith, the court, or the judge thereof, shall proceed immediately to the trial of the issues. Whenever an immediate trial is ordered, the order therefor shall provide that, if the court finds that a written contract providing for arbitration was made, and that there was a failure to comply therewith, the parties shall proceed with the arbitration in accordance with the terms of the contract and the order shall provide that if the court finds that there was no contract or failure to comply with the contract, then the proceeding shall be dismissed.

37-16-7. Method of appointing arbitrators or umpire.

If in the contract providing for arbitration, provision is made for a method of naming or appointing an arbitrator or arbitrators or an umpire, that method shall be followed, but if no method be provided therein, then the parties to the contract shall agree to the method of naming or appointing an arbitrator or arbitrators or an umpire and if the parties shall fail to agree, then the court or the judge thereof upon application of either of the parties after due notice to the other party shall appoint an arbitrator to hear the dispute.

37-16-8. Scheduling and notice of arbitration hearing - Adjournment.

Subject to the terms of the contract, if any are specified therein, the arbitrators selected as prescribed in this chapter must appoint a time and place for the hearing of the matters submitted to them, and must cause notice thereof to be given to each of the parties. They, or a majority of them, may adjourn the hearing from time to time upon the application of either party for good cause shown or upon their own motion, but not beyond the day fixed if a date in the contract, if any, for rendering their award, unless the time so fixed is extended by the written consent of the parties to the contract or their attorney, or the parties have continued with the arbitration without objection to such adjournment.

37-16-9. Power of court to direct prompt hearing.

The court shall have power to direct the arbitrators to proceed promptly with the hearing and determination of the dispute, claim, or matter in question.

37-16-10. Arbitrator's oath - Waiver.

Before hearing any testimony, arbitrators selected as prescribed in this chapter must be sworn, by an officer authorized by law to administer an oath, faithfully and fairly to hear and examine the claim, dispute, or matter in question and to make a just award according to the best of their understanding, unless the oath is waived by the written consent of the parties to the contract or their attorneys or the parties have continued with the arbitration without objection to the failure of the arbitrators to take the oath.

37-16-11. Powers of arbitrators.

The arbitrator or arbitrators selected as prescribed in this chapter, may require any person to attend before them as a witness; and he or she and they have, and each of them has, the same powers with respect to all the proceedings before them which are conferred upon a board or a member of a board authorized by law to hear testimony. All the arbitrators selected as prescribed in this chapter must meet together and hear all the allegations and proofs of the parties; but an award by a majority of them is valid.

37-16-12. Fees.

In any proceeding under this chapter, unless the parties agree as to the arbitrator's or arbitrators' fees, such fees shall be fixed by the court or the judges thereof who shall require the payment equally by both parties of the arbitrators' fees.

37-16-13. Validity of awards.

An award shall be valid and enforceable according to its terms and under the provisions of this chapter, without previous adjudication of the existence of a contract to arbitrate, subject, nevertheless, to the provisions of this section:

- (a) A party who has participated in any of the proceedings before the arbitrator or arbitrators may object to the confirmation of the award only on one or more of the grounds hereinafter specified (provided that he did not continue with the arbitration with notice of the facts or defects upon which his objection is based) because of a failure to comply with 37-16-8 or with 37-16-10 or because of the improper manner of the selection of the arbitrators.
- (b) A party who has not participated in any of the proceedings had before the arbitrator or arbitrators and who has not made or been served with an application to compel arbitration under 37-16-5 may also put in issue the making of the contract or the failure to comply therewith, either by a motion for a stay of the arbitration or in opposition to the confirmation of the award. If a notice shall have been personally served upon such party of an intention to conduct the arbitration pursuant to the provisions of a contract specified in the notice, then the issues specified in this subdivision may be raised only by a motion for a stay of the arbitration, notice of which motion must be served within ten (10) days after the service of the notice of intention to arbitrate. The notice must state in substance that unless within ten (10) days after its service, the party served therewith shall serve a notice of motion to stay the arbitration, he or she shall thereafter be barred from putting in issue the making of the contract or the failure to comply therewith. The arbitration hearing shall be adjourned upon service of the notice pending the determination of the motion. Where the opposing party, either on a motion for a stay or in opposition to the confirmation of an award, sets forth evidentiary facts raising a substantial issue as to the making of the contract or the failure to comply therewith, an immediate trial of the same shall be had. In the event that the party is unsuccessful he or she may, nevertheless, participate in the arbitration if the same is still being carried on.

37-16-14. Arbitration under chapter deemed special proceeding - Jurisdiction of superior court.

Arbitration of a claim, dispute, or matter in question under a contract described in this chapter shall be deemed a special proceeding, of which the superior court for Providence County shall have jurisdiction.

37-16-15. Procedure for hearing of application to court.

Any application to the court, or a judge thereof, hereunder shall be made and heard in the manner provided by law for the making and hearing of motions, except as otherwise herein expressly provided.

37-16-16. Form of award.

To entitle the award to be enforced, as prescribed in this chapter, it must be in writing; and, within the time limited in the contract, if any, subscribed by the arbitrator or arbitrators making it and either filed in the office of the clerk of the court having jurisdiction as provided in 37-16-14 or delivered to one of the parties or his or her attorney.

37-16-17. Court order confirming award.

At any time within one year after the award is made, as prescribed in 37-16-16, any party to the contract by the terms of which arbitration was had, may apply to the court having jurisdiction as provided in 37-16-14 for an order confirming the award. Thereupon the court must grant the order unless the award is vacated, modified, or corrected, as prescribed in 37-16-18 and 37-16-19 or unless the award is unenforceable under the provisions of 37-16-13. Notice of the motion must be served upon the adverse party or parties or his or her or their attorneys, as prescribed by law for service of notice of a motion upon an attorney in an action in the same court.

37-16-18. Court order vacating award.

In any of the following cases, the court must make an order vacating the award, upon the application of any party to the controversy which was arbitrated

- (a) When the award was procured by fraud.
- (b) Where the arbitrator or arbitrators exceeded their powers, or so imperfectly executed them, that a mutual, final, and definite award upon the subject matter submitted was not made.
- (c) If there was no valid contract, and the objection has been raised under the conditions set forth in 37-16-13.

37-16-19. Rehearing after vacation of award.

Where an award is vacated, the court, in its discretion may direct a rehearing either before the same arbitrator or arbitrators or before a new arbitrator or arbitrators to be chosen in the manner provided in the contract for the selection of the original arbitrator or arbitrators or as provided for in 37-16-7 and any provision limiting the time in which the arbitrator or arbitrators may make a decision shall be deemed applicable to the new arbitration and to commence from the date of the court's order.

37-16-20. Court order modifying or correcting award.

In any of the following cases, the court must make an order modifying or correcting the award, upon the application of any party to the contract by the terms of which the arbitration was held.

- (a) Where there was an evident miscalculation of figures or an evident mistake in the description of any persons, thing, or property referred to in the award.
- (b) Where the arbitrator or arbitrators have awarded upon a matter not submitted to them, not affecting the merits of the decision upon the matter submitted.
- (c) Where the award is imperfect in a matter of form not affecting the merits of the controversy, and, if it had been a master's report the defect could have been amended or disregarded by the court.

37-16-21. Notice of motion to vacate, modify, or correct an award.

Notice of a motion to vacate, modify, or correct an award must be served upon all adverse parties, or their attorneys, within sixty (60) days after the award is filed or delivered, as prescribed by law for service of notice of a motion upon an attorney in an action; except that in opposition to a motion to confirm an award, any of the grounds specified in 37-16-18 may be set up. For the purpose of the motion, any judge who might make an order, to stay the proceedings in an action brought in the same court may make an order, to be served with the notice of motion, staying the proceedings of an adverse party or parties to enforce the award.

37-16-22. Entry of judgment - Costs.

Upon the granting of an order confirming, modifying, or correcting an award, judgment may be entered in conformity therewith, except as is otherwise prescribed in this chapter. Costs of the application and of the proceedings subsequent thereto, not exceeding twenty-five dollars (\$25.00) and disbursements, may be awarded by the court in its discretion. If awarded, the amount thereof must be included in the judgment.

37-16-23. Filing of papers after judgment.

(a) Immediately after entering judgment, the clerk must attach together and file the following papers:

- (1) The contract, and each written extension of the time, if any, within which to make the award.
- (2) The award.
- (3) Each notice, affidavit or other paper used upon an application to confirm, modify, or correct the award, and a copy of each order of the court upon the application.
- (4) A copy of the judgment.

(b) The judgment may be docketed as if it was rendered in an action.

37-16-24. Effect of judgment.

The judgment so entered has the same force and effect, in all respects as, and is subject to all the provisions of law relating to a judgment in an action. The judgment may be enforced as if it had been rendered in an action in the court in which it is entered.

37-16-25. Appeals.

An appeal may be taken from an order made in a proceeding under this chapter, or from a judgment entered upon an award. The proceedings upon the appeal, including the judgment thereupon and the enforcement of the judgment, are governed by the provisions of statute and rule regulating appeal in actions as far as they are applicable.

37-16-26. Satisfaction of award.

- (a) An award which requires the payment of a sum of money by a city, town, or the state or any body described in 37-16-2 created or organized by or through the authority of any of them, shall be satisfied to the extent of payment of that sum by payment thereof to the party to whom the award was made by the treasurer or officer exercising the duties of a treasurer thereof from its general funds.
- (b) An award which requires the payment of a sum of money to a city, a town, or the state or any body described in 37-16-2 created or organized by or through the authority of any of them shall be satisfied to the extent of payment of that sum by payment thereof to its treasurer or officer exercising the duties of a treasurer thereof who shall deposit the same in its general funds.

37-16-27. Application to sureties.

- (a) If a contractor principal on a bond furnished to guarantee performance or payment on a construction contract and the claimant are parties to a written contract with a provision to submit to arbitration any controversy thereafter arising under the contract, or subject to arbitration as provided in 37-16-2(b), the arbitration provisions shall apply to the surety for all disputes involving questions of the claimant's right of recovery against the surety. Either the claimant, the contractor principal, or surety may demand arbitration in accordance with the written contract or as provided in 37-16-2(b) if applicable in one arbitration proceeding, provided that the provisions of 37-16-3 shall be applicable to any such demand for arbitration. The arbitration award shall decide all controversies subject to arbitration between the claimant, on the one hand, and the contractor principal and surety on the other hand, including all questions involving liability of the contractor principal and surety on the bond, but a claimant must file suit for recovery against the surety within the time limits set forth in 37-12-2 and 37-12-5. The arbitration shall be in accordance with this chapter and the court shall enter judgment thereon as provided therein.
- (b) The arbitrator or arbitrators, if more than one, shall make findings of fact as to the compliance with the requirements for recovery against the surety, and those findings of fact shall be a part of the award binding on all parties to the arbitration.

TITLE 45

CHAPTER 55 AWARD OF MUNICIPAL CONTRACTS

SECTIONS

- 45-55-1 Legislative findings
- 45-55-2. Method of source selection
- 45-55-3. Purchasing agent - Appointment - Duties.
- 45-55-4. Definitions.
- 45-55-5. Competitive sealed bidding.
- 45-55-5.1. Business exempt.
- 45-55-5.2. Town of North Smithfield - Exemption.
- 45-55-6. Competitive negotiation.
- 45-55-7. Negotiations after unsuccessful competitive sealed bidding
- 45-55-8. Sole source procurement and emergency procurements.
- 45-55-8.1 Qualification based selection of architects and engineers.
- 45-55-9. Small purchases.
- 45-55-10. Cancellation of invitation for bids and requests for proposals.
- 45-55-11. Responsibilities of bidders and offerors
- 45-55-12. Prequalification of contractors - General.
- 45-55-13. Exclusion of state mandated costs.
- 45-55-13.1. Exclusion of multi-cities or towns insurance corporations and cooperative risk management programs.
- 45-55-13.2. Exclusion of multi-cities or towns energy aggregation programs.
- 45-55-13.3. [Exclusion of multi-school district combined purchasing consortia](#)
- 45-55-14. Staff consultants.
- 45-55-15. Severability.
- 45-55-16 Prohibition against the use of lead based paints.

45-55-1. Legislative findings.

It is hereby declared that a need exists to establish a uniform system for the award of contracts by municipalities, utilizing open cooperative bids.

45-55-2. Method of source selection.

Except as otherwise authorized by law, all municipal contracts shall be awarded by:

- (1) Competitive sealed bidding, pursuant to 45-55-5;
- (2) Competitive negotiations, pursuant to 45-55-6;
- (3) Non-competitive negotiations, pursuant to 45-55-7 and 45-55-8;
- (4) Small purchase procedures, pursuant to 45-55-9.
- (5) Qualification based selection (QBS) process for architects/engineers pursuant to 45-55-8.1

45-55-3. Purchasing agent - Appointment - Duties.

Within each city or town or quasi public agency there shall be designated a person or persons to act as purchasing officer to exercise the powers and duties as set forth in this chapter.

45-55-4. Definitions.

The words defined in this section have the following meanings whenever they appear in this chapter, unless the context in which they are used clearly requires a different meaning or a different definition is prescribed for a particular section, group of sections or provision.

(1) "Business" means any corporation, partnership, individual, sole proprietorship, joint stock company, joint venture, or any other legal entity through which business is conducted.

(2) "Change order" means a written order signed by the purchasing agent, or contractor directing or allowing the contractor to make changes which the changes clause of the contract authorizes the purchasing agent or contractor to order without the consent of the contractor or purchasing agent.

(3) "Construction" means the process of building, altering, repairing, improving, or demolishing any public structures or building, or other public improvements of any kind to any public real property. It does not include the routine maintenance or repair of existing structures, buildings, or real property performed by salaried employees of the municipality in the usual course of their job.

(4) "Contract" means all types of agreements, including grants and orders, for the purchase or disposal of supplies, services, construction, or any other item. It includes awards; contracts of a fixed-price, cost, cost-plus-a-fixed-fee, or incentive type; contracts providing for the issuance of job or task orders; leases; letter contracts, purchase orders, and construction management contracts. It also includes supplemental agreements with respect to any of the preceding. "Contract" does not include labor contracts with employees of the municipality.

(5) "Contract modification" means any written alteration in the specifications, delivery point, rate of delivery, contract period, price, quantity, or other contract provisions of any existing contract, whether accomplished by unilateral action in accordance with a contract provision, or by mutual action of the parties to the contract. It includes bilateral actions, as supplemental agreements, and unilateral actions, as change orders, administrative changes, notices of termination, and notices of the exercise of a contract option.

(6) "Contractor" means any person having a contract with a municipality.

(8) "Data" means recorded information, regardless of form or characteristic.

(8) "Designee" means a duly authorized representative of a person holding a superior position.

(9) "Employee" means an individual drawing a salary from a municipality, whether elected or not, and any nonsalaried individual performing personal services for any municipality.

(10) "May" means permissive.

(11) "Municipality" means the individual cities and towns of the state of Rhode Island.

(12) "Negotiation" means contracting by either of the methods described in §§ 45-55-6, 45-55-7, and 45-55-8.

(13) "Person" means any business, individual, organization, or group of individuals.

(14) "Procurement" means the purchasing, buying, renting, leasing, or otherwise obtaining of any supplies, services, or construction. It also includes all functions that pertain to the obtaining of any supply, service, or construction item, including description of requirements, selection and solicitation of sources, preparation and award of contract, and all phases of contract administration.

(15) "Purchasing officer" means the person designated in each municipality or quasi public agency pursuant to section 45-55-3.

(16) "Regulations" means rules and regulations adopted by the individual cities or towns, concerning the implementation of the provisions of this chapter.

(17) "Services" means the rendering, by a contractor, of its time and effort rather than the furnishing of a specific end product, other than reports which are merely incidental to the required performance of services. "Services" does not include labor contracts with employees of governmental agencies.

(18) "Shall" means imperative.

(19) "Supplemental agreement" means any contract modification which is accomplished by the mutual action of the parties.

(20) "Supplies" means all property, including, but not limited to, leases of real property, printing and insurance, except land or permanent interest in land.

45-55-5. Competitive sealed bidding.

(a) Contracts exceeding the amount provided by 45-55-9 shall be awarded by competitive bidding unless they are professional engineering/architectural services pursuant to 45-55-8.1 and it is determined in writing that this method is not practicable. Factors to be considered in determining whether competitive sealed bidding is practicable shall include whether:

- (1) Specifications can be prepared that permit award on the basis of either the lowest qualified bid price or the lowest qualified evaluated bid price; and
 - (2) The available sources, the time and place of performance, and other relevant circumstances as are appropriate for the use of competitive sealed bidding.
- (b) The invitation for bids shall state whether award shall be made on the basis of the lowest bid price or the lowest evaluated or responsive bid price. If the latter basis is used, the objective measurable criteria to be utilized shall be stated in the invitation for bids, if available.
- (c) Adequate public notice of the invitation for bids shall be given a sufficient time prior to the date stated in the notice for the opening of bids. Notice may include publication in a newspaper of general circulation in the state as determined by the purchasing officer for the municipality not less than seven (7) days nor more than twenty-one (21) days before the date set for opening of the bids. The purchasing officer may make a written determination that the twenty-one (21) day limitation needs to be waived. The written determination shall state the reason why the twenty-one (21) day limitation is being waived and shall state the number of days, giving a minimum and maximum, before the date set for the opening of bids when public notice is to be given.
- (4) Bids shall be opened publicly in full view of the public at the time and place designated in the invitation for bids. Each bid, together with the name of the bidder, shall be recorded and an abstract made available for public inspection. Subsequent to the awarding of the bid, all documents pertinent to the awarding of the bid shall be made available and open to public inspection and retained in the bid file.
- (5) The contract shall be awarded with reasonable promptness by written notice to the responsive and responsible bidder whose bid is either the lowest bid price, or lowest evaluated or responsive bid price.
- (6) Correction or withdrawal of bids may be allowed only to the extent permitted by regulations issued by the purchasing officer.

45-55-5.1. Business exempt.

The North Kingstown Bus Contractors Association and the Scituate School Bus Owners Club shall be exempt from the provisions of this chapter.

45-55-5.2. Town of North Smithfield - Exemption.

The town of North Smithfield is exempt from the provisions of this chapter with regard to the contracting for fire and rescue services with the Primrose Volunteer Fire Department and/or North Smithfield Fire Department and/or their respective successors and assigns.

45-55-6. Competitive negotiation.

- (a) When, under regulations adopted by the city or town council, the purchasing agent determines in writing that the use of competitive sealed bidding is not practicable, and except as provided in 45-55-8, 45-55-9, and 45-55-10 a contract may be awarded by competitive negotiation.
- (b) Adequate public notice of the request for proposals shall be given in the same manner as provided in 45-55-5(c).
- (c) Contracts may be competitively negotiated when it is determined, in writing, by the purchasing agent that the bid prices received by competitive sealed bidding either are unreasonable as to all or part of the requirements, or were not independently reached in open competition, and for which:
 - (1) Each competitive bidder has been notified of the intention to negotiate and is given reasonable opportunity to negotiate; and
 - (2) The negotiated price is lower than the lowest rejected bid by any competitive bidder; and
 - (3) The negotiated price is the lowest negotiated price offered by a competitive offeror.
- (d) The request for proposals shall indicate the relative importance of price and other evaluation factors.
- (e) Award shall be made to the responsible offeror whose proposal is determined in writing to be the most advantageous to the municipality taking into consideration price and the evaluation factors set forth in the request for proposals.
- (f) Written or oral discussions shall be conducted with all responsible offerors who submit proposals determined, in writing, to be reasonably susceptible of being selected for award. Discussions shall not disclose any information derived from proposals submitted by competing offerors. Discussions need not be conducted:
 - (1) With respect to prices, where such prices are fixed by law or regulation, except that consideration shall be given to competitive terms and conditions; or
 - (2) Where time of delivery or performance will not permit discussions; or
 - (3) Where it can be clearly demonstrated and documented from the existence of adequate competition or accurate prior cost experience with the particular supply, service, or construction item, that acceptance of an initial offer without discussion would result in fair and reasonable prices, and the request for proposals notifies all offerors of the possibility that award may be made on the basis of the initial offers.

45-55-7. Negotiations after unsuccessful competitive sealed bidding.

- (a) In the event that all bids submitted pursuant to competitive sealed bidding under 45-55-5 result in bid prices in excess of the funds available for the purchase, and the purchasing officer determines in writing:
 - (1) That there are no additional funds available from any source so as to permit an award to the lowest responsive and responsible bidder, and
 - (2) The best interest of the municipality will not permit the delay attendant to a resolicitation under revised specifications, or for revised quantities, under competitive sealed bidding as provided in 45-55-5, then a negotiated award may be made as stated in subsection (b) or (c) of this section.
- (b) Where there is more than one bidder, competitive negotiations pursuant to 45-55-6, shall be conducted with the three (3) (two (2) if there are only two (2)) bidders determined in writing, to be the lowest responsive and responsible bidders to the competitive sealed bid invitation. Competitive negotiations shall be conducted under the following restrictions:
 - (1) If discussions pertaining to the revision of the specifications or quantities are held with any potential offeror, all other potential offerors shall be afforded an opportunity to take part in the discussions; or

(2) A request for proposals, based upon revised specifications or quantities, shall be issued as promptly as possible, shall provide for an expeditious response to the revised requirements, and shall be awarded upon the basis of the lowest bid price, or lowest evaluated bid price submitted by any responsive and responsible offeror.

(c) When after competitive sealed bidding, it is determined in writing, that there is only one responsive and responsible bidder, a noncompetitive negotiated award may be made with such bidder in accordance with 45-55-8.

45-55-8. Sole source procurement and emergency procurements.

(a) A contract may be awarded for a supply, service, or construction item without competition when, under published regulations, the purchasing officer determines, in writing, that there is only one source for the required supply, service, or construction item.

(b) Notwithstanding any other provision of this chapter, the purchasing agent may make or authorize others to make emergency procurements when there exists a threat to public health, welfare, or safety under emergency conditions as defined in regulations or where the procurement will be in the best interest of the city as established by properly promulgated rules and regulations; provided, that such emergency procurements shall be made with such competition as is practicable under the circumstances. A written determination of the basis for the emergency, and for the selection of the particular contractor, shall be included in the contract file.

45-55-8.1. Qualification based selection of architects and engineers.

When the purchasing agent determines that the city or town needs the services of a professional architect or engineer, the purchasing agent shall follow the qualification based selection process for the procurement of architectural and engineering consulting services.

45-55-9. Small purchases.

Procurements, not to exceed an aggregate amount of ten thousand dollars (\$10,000) for construction and five thousand dollars (\$5,000) for all other purchases may be made in accordance with small purchase regulations promulgated by the municipality. These amounts shall be increased or decreased annually hereafter at the same rate as the Boston Regional Consumer Price Index. Procurement requirements shall not be artificially divided so as to constitute a small purchase under this section. A municipality may further reduce the aggregate purchase amount, as provided for in this section by ordinance.

45-55-10. Cancellation of invitation for bids and requests for proposals.

An invitation for bids, a request for proposals, or other solicitation may be canceled, or all bids or proposals rejected, if it is determined, in writing, that such action if taken is not in the best interest of the municipality and approved by the chief purchasing officer.

45-55-11. Responsibilities of bidders and offerors.

(1) A written determination of responsibility of a bidder or offeror shall be made and it shall be made in accordance with regulations issued by the municipality.

A reasonable inquiry to determine the responsibility of a bidder or offeror may be conducted. The failure of a bidder or offeror to promptly supply information in connection with a reasonable inquiry may be grounds for a determination of nonresponsibility with respect to a bidder or offeror.

(2) Except as otherwise provided, by law, information furnished by a bidder or offeror pursuant to this section may not be disclosed outside of the purchasing department administering the contract without prior written consent of the bidder or offeror.

45-55-12. Prequalification of contractors - General.

The municipality may provide for prequalification of suppliers as responsible prospective contractors for particular types of supplies, services, and construction. Municipalities which choose to provide for prequalification of suppliers shall adopt regulations for prequalification in the same manner provided for in the adoption of ordinances in the manner provided for in the legislative or home rule charter of the municipality. Solicitation

mailing lists of potential contractors of supplies, services, and construction shall include but need not be limited to prequalified contractors. Prequalification shall not foreclose a written determination:

- (1) Between the time of the bid opening or receipt of offers and the making of an award, that a prequalified supplier is not responsible; or
- (2) That a supplier who is not prequalified at the time of bid opening or receipt of offers is responsible.

45-55-13. Exclusion of state mandated costs.

The provisions of 45-13-7 through 45-13-10 do not apply to this section.

45-55-13.1. Exclusion of multi-cities or towns insurance corporations and cooperative risk management programs.

The provisions of this chapter shall not apply to entities organized pursuant to section 45-5-20.1. Those entities are exempt from all of the provisions of this chapter .

45-55-13.2. Exclusion of multi-cities or towns energy aggregation programs.

The provisions of this chapter do not apply to entities organized for the purpose of negotiating the purchase of electric power pursuant to § 39-3-1.1, or energy or energy related services. Those entities are exempt from all provisions of this chapter.

45-55-13.3. Exclusion of multi-school district combined purchasing consortia

The provisions of this chapter do not apply to purchases and contracts entered into by those consortia established pursuant to § 16-2-9.2, and such entities shall be exempt from all provisions of this chapter.

45-55-14. Staff consultants.

The procurement of the service of an attorney, physician or dentist by a municipality, is exempt from the provisions of this chapter.

45-55-15. Severability.

If any one or more sections, clauses, sentences or parts of this chapter are for any reason be adjudged unconstitutional or otherwise invalid in any court, that judgment shall not affect, impair or invalidate the remaining provisions of this chapter but shall be confined in its operation to the specific provisions so held unconstitutional or invalid and the inapplicability or invalidity of any section, clause or provisions of this chapter in any one or more instances or circumstances shall not be taken to affect or prejudice in any way its applicability or validity in any other instance.

45-55-16. Prohibition against the use of lead based paints.

When purchasing paint products or contracting or subcontracting for painting, construction, improvement, completion, or repair of any public buildings, public road, public bridge, or public construction, all municipalities, as defined by 45-55-4(11), shall be prohibited from the use of lead based paint.

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Daniel J. McKee
Governor

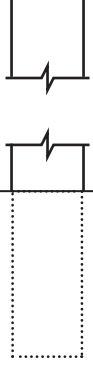
Terrence D. Gray
Acting Director - RI DEM



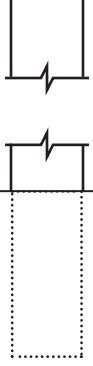
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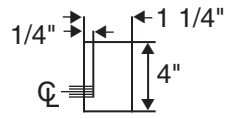
Grade



Provide adequate supports for sign as site conditions may require & keep sign a proper distance above prevailing grade to permit public viewing.



Sign to be extension type high density overlaid plywood or other approved material suitable for signs.





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF WATER

MEMORANDUM

SUBJECT: Prohibition on Certain Telecommunication and Video Surveillance Services or Equipment in the SRF Programs

FROM: Kiri Anderer, P.E., Acting Associate Branch Chief
Infrastructure Branch, OGWDW

Michael Deane, Branch Chief
State Revolving Fund Branch, OWM

TO: SRF Branch Chiefs
Regions 1-10

Effective August 13, 2020, recipients and subrecipients of EPA funded assistance agreements, including borrowers under EPA funded revolving loan funds, must comply with regulations at [2 CFR 200.216](#), *Prohibition on certain telecommunication and video surveillance services or equipment*, implementing section 889 of [Public Law 115-232](#). The regulation prohibits the use of Federal funds to procure (enter into, extend, or renew contracts) or obtain equipment, systems, or services that use “covered telecommunications equipment or services” identified in the regulation as a substantial or essential component of any system, or as critical technology as part of any system. Prohibitions extend to the use of Federal funds by recipients and subrecipients to enter into a contract with an entity that “uses any equipment, system, or service that uses covered telecommunications equipment or services” as a substantial or essential component of any system, or as critical technology as part of any system. Certain equipment, systems, or services, including equipment, systems, or services produced or provided by entities subject to the prohibition are recorded in the [System for Award Management](#) exclusion list.

As described in section 889 of Public Law 115-232, covered telecommunications equipment or services includes:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.

- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Applicability in the State Revolving Fund (SRF) Programs

Clean Water and Drinking Water SRF (CWSRF and DWSRF) programs may not expend equivalency funds for these products on or after August 13, 2020. States must ensure that equivalency assistance agreements include the telecommunications prohibition condition [provided by EPA's Office of Grants and Debarment](#) (OGD) in OGD's most recent EPA General Terms and Conditions. The condition must also be in construction contracts associated with equivalency assistance agreements.

There is no exhaustive list of components and services that fall under the prohibition. State SRF managers and local assistance recipients should exercise due diligence and be particularly mindful of project components with internet or cellular connections. For example, recipients should be mindful of automatic meter reading (AMR) technology and advanced metering infrastructure (AMI), instrumentation control systems (e.g. process control systems, distributed control systems and programmable logic controls), and security cameras and other electronic security measures to ensure that those items are procured from a non-excluded entity. Items included in the prohibition are not eligible SRF costs, and the SRF programs cannot reimburse borrowers for these costs.

The prohibition also applies to the CWSRF administrative funds (if states are billing those costs to the federal CWSRF capitalization grant) and the four DWSRF set-asides. States should be mindful of items such as cell phones, computers, and mobile WiFi routers or hotspots funded by those accounts.

If you have questions on the implementation of this grant condition, please contact Michael Deane at Deane.Michael@epa.gov or Kiri Anderer at Anderer.Kirsten@epa.gov.

DAVIS-BACON PREVAILING WAGE REQUIREMENTS

(a) GENERAL CONTRACT AND SUBCONTRACT PROVISIONS

For 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 shall be inserted in full:

(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.

Wage determinations may be obtained from the U.S. Department of Labor's website, www.dol.gov.

(ii)(A) The Owner, on behalf of the 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 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 Owner 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 Owner 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 action 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 Owner 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 questions, 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 and so advise the State award official or will notify the State award official 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 Owner, 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 Owner, 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 Owner 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 submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly 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 <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the owner 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 Owner.

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

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

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

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

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

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

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the 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 (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract Termination: Debarment

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

(8) Compliance with Davis-Bacon and Related Act Requirements

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

(9) Disputes Concerning Labor Standards

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

(b) CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

For 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, the following clauses set forth in paragraphs (b) (1), (2), (3) and (4) of this section shall be inserted in full. These clauses shall be inserted in addition to the clauses required in Section (a), 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 (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for Unpaid Wages and Liquidated Damages

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

(c) MAINTENANCE OF RECORDS

In addition to the clauses contained in Section (a), 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 §5.1 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. 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 Owner, the State, EPA and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

(d) COMPLIANCE VERIFICATION

(1) The Owner 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 Owner 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.

(2) The Owner 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 Owner 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. Owners 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 . Owners shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(3) The Owner 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 Owner 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 Owner 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 . Owners 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 Owner shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(4) The Owner 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.

(5) Owners 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 <http://www.dol.gov/esa/contacts/whd/america2.htm>.

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"General Decision Number: RI20230001 04/14/2023

Superseded General Decision Number: RI20220001

State: Rhode Island

Construction Types: Building, Heavy (Heavy and Marine) and Highway

Counties: Rhode Island Statewide.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories) HEAVY, HIGHWAY AND MARINE CONSTRUCTION PROJECTS

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

<p>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:</p>	<p>. Executive Order 14026 generally applies to the contract.</p> <p>. The contractor must pay all covered workers at least \$16.20 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 2023.</p>
<p>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:</p>	<p>. Executive Order 13658 generally applies to the contract.</p> <p>. The contractor must pay all covered workers at least \$12.15 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 2023.</p>

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	01/06/2023
1	01/13/2023
2	02/03/2023
3	03/17/2023
4	04/14/2023

ASBE0006-006 06/01/2022

	Rates	Fringes
HAZARDOUS MATERIAL HANDLER (Includes preparation, wetting, stripping, removal scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....	\$ 38.30	25.55

ASBE0006-008 09/01/2021

	Rates	Fringes
Asbestos Worker/Insulator Includes application of all insulating materials, protective coverings, coatings & finishes to all types of mechanical systems.	\$ 45.00	32.89

BOIL0029-001 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 45.87	29.02

BRR0003-001 06/01/2022

	Rates	Fringes
Bricklayer, Stonemason, Pointer, Caulker & Cleaner.....	\$ 46.86	29.14

BRR0003-002 09/01/2022

	Rates	Fringes
Marble Setter, Terrazzo Worker & Tile Setter.....	\$ 46.54	30.34

BRR0003-003 09/01/2022

	Rates	Fringes
Marble, Tile & Terrazzo Finisher.....	\$ 38.78	29.61

CARP0330-001 01/01/2023

	Rates	Fringes
CARPENTER (Includes Soft Floor Layer).....	\$ 41.53	29.35

Diver Tender.....	\$ 42.53	29.35
DIVER.....	\$ 53.88	29.35
Piledriver.....	\$ 41.53	29.35
WELDER.....	\$ 42.53	29.35

FOOTNOTES:

When not diving or tending the diver, the diver and diver tender shall receive the piledriver rate. Diver tenders shall receive \$1.00 per hour above the pile driver rate when tending the diver.

Work on free-standing stacks, concrete silos & public utility electrical power houses, which are over 35 ft. in height when constructed: \$.50 per hour additional.

Work on exterior concrete shear wall gang forms, 45 ft. or more above ground elevation or on setback: \$.50 per hour additional.

The designated piledriver, known as the ""monkey"": \$1.00 per hour additional.

 CARP1121-002 01/02/2023

	Rates	Fringes
MILLWRIGHT.....	\$ 41.54	30.73

 ELEC0099-002 12/05/2022

	Rates	Fringes
ELECTRICIAN.....	\$ 45.86	53.26%
Teledata System Installer.....	\$ 34.40	12.10%+15.31

FOOTNOTES:

Work of a hazardous nature, or where the work height is 30 ft. or more from the floor, except when working OSHA-approved lifts: 20% per hour additional.

Work in tunnels below ground level in combined sewer outfall: 20% per hour additional.

 ELEV0039-001 01/01/2023

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 59.36	37.335+a+b

FOOTNOTES:

a. PAID HOLIDAYS: New Years Day; Memorial Day; Independence Day; Labor Day; Veterans' Day; Thanksgiving Day; the Friday after Thanksgiving Day; and Christmas Day.

b. Employer contributes 8% basic hourly rate for 5 years or more of service of 6% basic hourly rate for 6 months to 5 years of service as vacation pay credit.

 ENGI0057-001 06/01/2022

Rates Fringes

Operating Engineer: (power plants, sewer treatment plants, pumping stations, tunnels, caissons, piers, docks, bridges, wind turbines, subterranean & other marine and heavy construction work)

GROUP 1.....	\$ 43.55	29.25+a
GROUP 2.....	\$ 41.55	29.25+a
GROUP 3.....	\$ 37.17	29.25+a
GROUP 4.....	\$ 34.32	29.25+a
GROUP 5.....	\$ 40.60	29.25+a
GROUP 6.....	\$ 31.40	29.25+a
GROUP 7.....	\$ 25.40	29.25+a
GROUP 8.....	\$ 37.25	29.25+a
GROUP 9.....	\$ 41.17	29.25+a

a. BOOM LENGTHS, INCLUDING JIBS:

- 150 feet and over + \$ 2.00
- 180 feet and over + \$ 3.00
- 210 feet and over + \$ 4.00
- 240 feet and over + \$ 5.00
- 270 feet and over + \$ 7.00
- 300 feet and over + \$ 8.00
- 350 feet and over + \$ 9.00
- 400 feet and over + \$10.00

a. PAID HOLIDAYS:

New Year's Day, President's Day, Memorial Day, July Fourth, Victory Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day, Christmas Day. a: Any employee who works 3 days in the week in which a holiday falls shall be paid for the holiday.

a. FOOTNOTES:

Hazmat work: \$2.00 per hour additional.
 Tunnel/Shaft work: \$5.00 per hour additional.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, lighters, boom trucks and derricks

GROUP 2: Digging machine, Ross Carrier, locomotive, hoist, elevator, bidwell-type machine, shot & water blasting machine, paver, spreader, graders, front end loader (3 yds. and over), vibratory hammer & vacuum truck, roadheaders, forklifts, economobile type equipment, tunnel boring machines, concrete pump and on site concrete plants.

GROUP 3: Oilers on cranes.

GROUP 4: Oiler on crawler backhoe.

GROUP 5: Bulldozer, bobcats, skid steer loader, tractor, scraper, combination loader backhoe, roller, front end loader (less than 3 yds.), street and mobile-powered sweeper (3-yd. capacity), 8-ft. sweeper minimum 65 HP).

GROUP 6: Well-point installation crew.

GROUP 7: Utility Engineers and Signal Persons

GROUP 8: Heater, concrete mixer, stone crusher, welding machine, generator and light plant, gas and electric driven pump and air compressor.

GROUP 9: Boat & tug operator.

ENGI0057-002 05/01/2022

	Rates	Fringes
Power Equipment Operator (highway construction projects; water and sewerline projects which are incidental to highway construction projects; and bridge projects that do not span water)		
GROUP 1.....	\$ 36.70	29.25+a
GROUP 2.....	\$ 31.40	29.25+a
GROUP 3.....	\$ 25.40	29.25+a
GROUP 4.....	\$ 31.98	29.25+a
GROUP 5.....	\$ 35.68	29.25+a
GROUP 6.....	\$ 35.30	29.25+a
GROUP 7.....	\$ 30.95	29.25+a
GROUP 8.....	\$ 32.33	29.25+a
GROUP 9.....	\$ 34.28	29.25+a

a. FOOTNOTE: a. Any employee who works three days in the week in which a holiday falls shall be paid for the holiday.

a. PAID HOLIDAYS: New Year's Day, President's Day, Memorial Day, July Fourth, Victory Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day & Christmas Day.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Digging machine, crane, piledriver, lighter, locomotive, derrick, hoist, boom truck, John Henry's, directional drilling machine, cold planer, reclaimer, paver, spreader, grader, front end loader (3 yds. and over), vacuum truck, test boring machine operator, veemere saw, water blaster, hydro-demolition robot, forklift, economobile, Ross Carrier, concrete pump operator and boats

GROUP 2: Well point installation crew

GROUP 3: Utility engineers and signal persons

GROUP 4: Oiler on cranes

GROUP 5: Combination loader backhoe, front end loader (less than 3 yds.), forklift, bulldozers & scrapers and boats

GROUP 6: Roller, skid steer loaders, street sweeper

GROUP 7: Gas and electric drive heater, concrete mixer, light plant, welding machine, pump & compressor

GROUP 8: Stone crusher

GROUP 9: Mechanic & welder

 ENGI0057-003 06/01/2022

BUILDING CONSTRUCTION

	Rates	Fringes
Power Equipment Operator		
GROUP 1.....	\$ 42.82	29.25+a
GROUP 2.....	\$ 40.82	29.25+a
GROUP 3.....	\$ 40.60	29.25+a
GROUP 4.....	\$ 36.60	29.25+a
GROUP 5.....	\$ 33.75	29.25+a
GROUP 6.....	\$ 39.90	29.25+a
GROUP 7.....	\$ 39.47	29.25+a
GROUP 8.....	\$ 36.79	29.25+a

a. BOOM LENGTHS, INCLUDING JIBS:

150 ft. and over: + \$ 2.00
 180 ft. and over: + \$ 3.00
 210 ft. and over: + \$ 4.00
 240 ft. and over: + \$ 5.00
 270 ft. and over: + \$ 7.00
 300 ft. and over: + \$ 8.00
 350 ft. and over: + \$ 9.00
 400 ft. and over: + \$10.00

a. PAID HOLIDAYS: New Year's Day, President's Day, Memorial Day, July Fourth, Victory Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day & Christmas Day. a: Any employee who works 3 days in the week in which a holiday falls shall be paid for the holiday.

a. FOOTNOTE: Hazmat work: \$2.00 per hour additional.
 Tunnel/Shaft work: \$5.00 per hour additional.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, lighters, boom trucks and derricks.

GROUP 2: Digging machine, Ross carrier, locomotive, hoist, elevator, bidwell-type machine, shot & water blasting machine, paver, spreader, front end loader (3 yds. and over), vibratory hammer and vacuum truck

GROUP 3: Telehandler equipment, forklift, concrete pump & on-site concrete plant

GROUP 4: Fireman & oiler on cranes

GROUP 5: Oiler on crawler backhoe

GROUP 6: Bulldozer, skid steer loaders, bobcats, tractor, grader, scraper, combination loader backhoe, roller, front end loader (less than 3 yds.), street and mobile powered sweeper (3 yds. capacity), 8-ft. sweeper (minimum 65 hp)

GROUP 7: Well point installation crew

GROUP 8: Heater, concrete mixer, stone crusher, welding machine, generator for light plant, gas and electric driven pump & air compressor

 IRON0037-001 09/16/2022

	Rates	Fringes
IRONWORKER.....	\$ 39.01	31.58

 LABO0271-001 05/30/2021

BUILDING CONSTRUCTION

	Rates	Fringes
LABORER		
GROUP 1.....	\$ 33.55	26.15
GROUP 2.....	\$ 33.80	26.15
GROUP 3.....	\$ 34.30	26.15
GROUP 4.....	\$ 34.55	26.15
GROUP 5.....	\$ 35.55	26.15

LABORERS CLASSIFICATIONS

GROUP 1: Laborer, Carpenter Tender, Mason Tender, Cement Finisher Tender, Scaffold Erector, Wrecking Laborer, Asbestos Removal [Non-Mechanical Systems]

GROUP 2: Asphalt Raker, Adzemen, Pipe Trench Bracer, Demolition Burner, Chain Saw Operator, Fence & Guard Rail Erector, Setter of Metal Forms for Roadways, Mortar Mixer, Pipelayer, Riprap & Dry Stonewall Builder, Highway Stone Spreader, Pneumatic Tool Operator, Wagon Drill Operator, Tree Trimmer, Barco-Type Jumping Tamper, Mechanical Grinder Operator

GROUP 3: Pre-Cast Floor & Roof Plank Erectors

GROUP 4: Air Track Operator, Hydraulic & Similar Self-Powered Drill, Block Paver, Rammer, Curb Setter, Powderman & Blaster

GROUP 5: Toxic Waste Remover

 LABO0271-002 05/30/2021

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
LABORER		
COMPRESSED AIR		
Group 1.....	\$ 53.45	24.15
Group 2.....	\$ 50.98	24.15
Group 3.....	\$ 40.50	24.15
FREE AIR		
Group 1.....	\$ 44.05	24.15
Group 2.....	\$ 43.05	24.15
Group 3.....	\$ 40.50	24.15
LABORER		
Group 1.....	\$ 33.55	24.15
Group 2.....	\$ 33.80	24.15
Group 3.....	\$ 34.55	24.15
Group 4.....	\$ 27.05	24.15
Group 5.....	\$ 35.55	24.15
OPEN AIR CAISSON,		

UNDERPINNING WORK AND
BORING CREW

Bottom Man.....	\$ 39.55	24.15
Top Man & Laborer.....	\$ 38.60	24.15
TEST BORING		
Driller.....	\$ 40.00	24.15
Laborer.....	\$ 38.60	24.15

LABORER CLASSIFICATIONS

GROUP 1: Laborer; Carpenter tender; Cement finisher tender; Wrecking laborer; Asbestos removers [non-mechanical systems]; Plant laborer; Driller in quarries

GROUP 2: Adzeperson; Asphalt raker; Barcotype jumping tamper; Chain saw operators; Concrete and power buggy operator; Concrete saw operator; Demolition burner; Fence and guard rail erector; Highway stone spreader; Laser beam operator; Mechanical grinder operator; Mason tender; Mortar mixer; Pneumatic tool operator; Riprap and dry stonewall builder; Scaffold erector; Setter of metal forms for roadways; Wagon drill operator; Wood chipper operator; Pipelayer; Pipe trench bracer

GROUP 3: Air track drill operator; Hydraulic and similar powered drills; Brick paver; Block paver; Rammer and curb setter; Powderperson and blaster

GROUP 4: Flagger & signaler

GROUP 5: Toxic waste remover

LABORER - COMPRESSED AIR CLASSIFICATIONS

GROUP 1: Mucking machine operator, tunnel laborer, brake person, track person, miner, grout person, lock tender, gauge tender, miner: motor person & all others in compressed air

GROUP 2: Change house attendant, powder watchperson, top person on iron

GROUP 3: Hazardous waste work within the ""HOT"" zone

LABORER - FREE AIR CLASSIFICATIONS

GROUP 1: Grout person - pumps, brake person, track person, form mover & stripper (wood & steel), shaft laborer, laborer topside, outside motorperson, miner, conveyor operator, miner welder, heading motorperson, erecting operator, mucking machine operator, nozzle person, rodperson, safety miner, shaft & tunnel, steel & rodperson, mole nipper, concrete worker, form erector (wood, steel and all accessories), cement finisher (this type of work only), top signal person, bottom person (when heading is 50' from shaft), burner, shield operator and TBM operator

GROUP 2: Change house attendant, powder watchperson

GROUP 3: Hazardous waste work within the ""HOT"" zone

PAIN0011-005 06/01/2022

	Rates	Fringes
PAINTER		
Brush and Roller.....	\$ 37.22	23.40
Epoxy, Tanks, Towers, Swing Stage & Structural Steel.....	\$ 39.22	23.40
Spray, Sand & Water Blasting.....	\$ 40.22	23.40
Taper.....	\$ 37.97	23.40
Wall Coverer.....	\$ 37.72	23.40

PAIN0011-006 06/01/2022

	Rates	Fringes
GLAZIER.....	\$ 40.78	23.40

FOOTNOTES:

SWING STAGE: \$1.00 per hour additional.
PAID HOLIDAYS: Labor Day & Christmas Day.

PAIN0011-011 06/01/2022

	Rates	Fringes
Painter (Bridge Work).....	\$ 55.00	23.75

PAIN0035-008 06/01/2011

	Rates	Fringes
Sign Painter.....	\$ 24.79	13.72

PLAS0040-001 06/03/2019

BUILDING CONSTRUCTION

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 36.00	27.15

FOOTNOTE: Cement Mason: Work on free swinging scaffolds under 3 planks width and which is 20 or more feet above ground and any offset structure: \$.30 per hour additional.

PLAS0040-002 07/01/2019

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 32.85	22.20

PLAS0040-003 07/01/2019

	Rates	Fringes
PLASTERER.....	\$ 37.55	27.50

PLUM0051-002 02/27/2023

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 48.89	31.75

 ROOF0033-004 12/01/2022

	Rates	Fringes
ROOFER.....	\$ 42.23	29.67

 * SFRI0669-001 04/01/2023

	Rates	Fringes
SPRINKLER FITTER.....	\$ 47.55	32.27

 SHEE0017-002 12/01/2020

	Rates	Fringes
Sheet Metal Worker.....	\$ 38.58	36.73

 TEAM0251-001 05/01/2022

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
TRUCK DRIVER		
GROUP 1.....	\$ 28.46	32.10+A+B+C
GROUP 2.....	\$ 28.61	\$ 32.10+A+B+C
GROUP 3.....	\$ 28.66	\$ 32.10+A+B+C
GROUP 4.....	\$ 28.71	\$ 32.10+A+B+C
GROUP 5.....	\$ 28.81	\$ 32.10+A+B+C
GROUP 6.....	\$ 29.21	\$ 32.10+A+B+C
GROUP 7.....	\$ 29.41	\$ 32.10+A+B+C
GROUP 8.....	\$ 28.91	\$ 32.10+A+B+C
GROUP 9.....	\$ 29.16	\$ 32.10+A+B+C
GROUP 10.....	\$ 28.96	\$ 32.10+A+B+C

FOOTNOTES:

A. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, plus Presidents' Day, Columbus Day, Veteran's Day & V-J Day, providing the employee has worked at least one day in the calendar week in which the holiday falls.

B. Employee who has been on the payroll for 1 year or more but less than 5 years and has worked 150 Days during the last year of employment shall receive 1 week's paid vacation; 5 to 10 years - 2 weeks' paid vacation; 10 or more years - 3 week's paid vacation.

C. Employees on the seniority list shall be paid a one hundred dollar (\$100.00) bonus for every four hundred (400) hours worked, up to a maximum of five hundred dollars (\$500.00)

All drivers working on a defined hazard material job site shall be paid a premium of \$2.00 per hour over applicable rate.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Pick-up trucks, station wagons, & panel trucks

GROUP 2: Two-axle on low beds

GROUP 3: Two-axle dump truck

GROUP 4: Three-axle dump truck

GROUP 5: Four- and five-axle equipment

GROUP 6: Low-bed or boom trailer.

GROUP 7: Trailers when used on a double hook up (pulling 2 trailers)

GROUP 8: Special earth-moving equipment, under 35 tons

GROUP 9: Special earth-moving equipment, 35 tons or over

GROUP 10: Tractor trailer

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

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

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

be:

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

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

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

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

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

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

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

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

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

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

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END OF GENERAL DECISIO"

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SECTION 01069

HEALTH & SAFETY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for maintenance of health and safety while performing work within wastewater treatment facility and pumpstation site limits

1.02 REQUIREMENTS

- A. The Contractor's attention is directed to the fact that the work site is at a wastewater treatment facility and that unsafe conditions may occur. The Contractor is advised that wastewater, methane, hydrogen sulfide and other toxic gases may be encountered on this project.
- B. The Contractor is responsible to monitor working conditions at all times during construction and, if it is found to be necessary, to provide appropriate protective clothing, equipment and facilities for his personnel, and to establish workplace procedures to ensure their safety, and to enforce the use of these procedures, equipment and facilities in accordance with the following guidelines:
 - 1. Safety and Health Regulations Promulgated by the U.S. Department of Labor OSHA, 29 CFR 1910 - Occupational Safety and Health Standards, and 29 CFR 1920 - Safety and Health Regulations for Construction.
 - 2. U.S. Environmental Protection Agency Interim Standard Operating Safety Guidelines - Office of Emergency and Remedial Response - Hazardous Response Support Division, Rev. September 1982.
 - 3. U.S. Environmental Protection Agency Medical Monitoring Program Guidelines.
- C. The Contractor shall implement a Health and Safety protection program. The procedures for such implementation shall be submitted to the Engineer and Owner for approval. The procedures shall include provisions for stations allowing workers to wash and to put on and remove protective clothing, and stations for vehicles to be cleaned, if necessary, before leaving the site, air monitoring, and evaluation of areas where unsafe levels of gas has accumulated.
- D. The Contractor shall engage an independent, qualified Health and Safety expert having experience in similar wastewater treatment facility conditions, to monitor site conditions and recommend all necessary Health and Safety protection. The Contractor shall follow such recommendations and shall provide such protection to his personnel, and personnel of the Owner and Engineer, as may be affected.

- E. The Contractor shall comply with all Federal, State, and local safety requirements related to the presence of combustible and nausea-inducing gases.
- F. In addition to the above requirements, the Contractor shall comply with the following requirements:
1. All construction equipment on the site shall be equipped with vertical exhaust pipes or a spark proof exhaust.
 2. Smoking shall not be permitted in any area where gases can accumulate, or in areas where geomembrane liners are being installed.
 3. When working in the presence of a detectable concentration of methane, the soils shall be wetted.
 4. Welding or open flames shall not be permitted in enclosed areas. In other areas in which a detectable concentration of methane is found, ground mats shall be used.
 5. Toxic gas indicators, a combustible gas indicator, and fire extinguishers shall be available at all times during operations. Periodic monitoring with portable monitoring devices shall be employed in areas susceptible to gas accumulation, with the Contractor furnishing daily to the Engineer, three (3) copies of a certified statement of their findings.
- G. If, at any time, the Owner or the Engineer is apprised of a safety hazard which demands immediate attention because of its high potential for harm to the public travel, persons on or about the work, or public or private property, the Owner or the Engineer shall have the right to order such safeguards to be erected and such precautions to be taken as necessary and the Contractor shall comply with such orders. If, under such circumstances, the Contractor does not or cannot immediately put the work into proper and approved condition, or if the Contractor or his representative is not upon the site so that he can be notified immediately of the insufficiency of safety precautions, then the Owner may put the work into such a condition that is shall be, in his opinion, in all respects safe, and the Contractor shall pay all expenses of such labor materials as may have been used for this purpose by him or by the Owner. The fact that the Owner or the Engineer does not observe a safety hazard or does not order the Contractor to take remedial measures shall in no way relieve the Contractor of the entire responsibility for any costs, loss or damage by any party sustained on account of the insufficiency of the safety precautions taken by him or by the Owner acting under authority of this Section.
- H. If the Contractor is alerted to the fact that conditions of high hazard are present or can be present at the site during the performance of the work. It is the responsibility of the Contractor to take appropriate safety precautions to meet whatever conditions of hazard may be present during the performance of the work, whether reasonably foreseeable or not. The safety conditions enumerated in the within Specifications are the minimum permissible and neither the Owner nor the Engineer make any representation that the safety standards provided herein will be adequate to meet all eventualities. The Contractor is therefore alerted to the fact that it shall be its

responsibility to anticipate and provide such additional safety precautions, facilities, personnel and equipment as shall be necessary to protect life and property from whatsoever conditions of hazard are present or may be present.

- I. The Contractor shall supply and erect highly visible safety fencing a minimum of three feet in height around all construction areas that pose a threat to safety. The Contractor shall erect safety fencing at his own discretion or as directed by the Engineer and shall maintain such fencing until such a time that the potential safety hazard has been rectified. Upon final completion of construction all safety fencing shall be removed off-site by the Contractor. Safety fencing requirements of OSHA shall be enforced by the Contractor.

- J. During operations, whenever unsafe levels of hazardous gases are detected, all work will cease in that area until acceptable levels are reached.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reference material, abbreviations, and terms used in the Construction Documents and establishes edition dates and complete titles for standards referenced elsewhere in the Specifications.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Obtain copies of standards when required by Contract Documents.
- C. Maintain copy at jobsite during submittals, planning, and progress of the specific work, until Substantial Completion.
- D. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. 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.

1.03 SCHEDULE OF REFERENCES

AA	Aluminum Association 818 Connecticut Ave. N.W. Washington, DC 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
AFBMA	Anti-Friction Bearing Manufacturers Association

AGC	Associated General Contractors of America 1956 E Street, N.W. Washington, DC 20006
AGM	American Gear Manufacturers Association
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 400 North Michigan Avenue Eighth Floor Chicago, IL 60611
AISI	American Iron and Steel Institute 1000 16 th Street, N.W. Washington, DC 20036
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
ANS	American National Standard
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
API	American Petroleum Institute
ARI	Air-Conditioning and Refrigeration Institute 1501 Wilson Boulevard Arlington, VA 22209
ASCE	American Society of Civil Engineers 345 East 47 th Street New York, NY 10017
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329

ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASPA	American Sod Producers Association 4415 West Harrison Street Hillside, IL 60162
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWG	American or Brown and Sharpe Wire Gage
AWPA	American Wood-Preservers' Association 7735 Old Georgetown Road Bethesda, MD 20014
AWS	American Welding Society
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
BIA	Brick Institute of America 11490 Commerce Park Drive Reston, VA 22091
CS	Commercial Standard
EJCDC	Engineers' Joint Contract Document Committee American Consulting Engineers Council 1015 15 th Street, N.W. Washington, DC 20005
FM	Factory Mutual System 1151 Boston-Providence Turnpike PO Box 688 Norwood, Massachusetts 02062
Fed Spec.	Federal Specification General Services Administration Specification and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407

IBR	Institute of Boiler and Radiator Manufacturers
ICBO	International Conference of Building Officials 5360 S. Workman Mill Road Whittier, CA 90601
IPS	Iron Pipe Size
JIC	Joint Industry Conference Standards
MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
NASSCO	National Association of Sewer Service Companies 101 Wymore Road, Suite 521 Altamonte, FL 32714
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association PO Box 781 Herndon, VA 22070
NCPWB	National Certified Pipe Welding Bureau
NEMA	National Electrical Manufacturers' Association 2101 'L' Street, N.W. Washington, DC 20037
NFPA	National Fire Protection Association Battery March Park Quincy, MA 02269
NPT	National Pipe Thread
OS&Y	Outside screw and yoke
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077

SMACNA	Sheet Metal and Air Conditioning Contractors' National Assoc. 8224 Old Court House Road Vienna, VA 22180
Stl. WG	U.S. Steel Wire Washburn and Moen, American Steel and Wire or Roebling Gage
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062
USS Gage	United States Standard Gage
125-lb. ANS	American National Standard for Cast-Iron Pipe Flanges and Flange
250-lb. ANS	Fittings, Designation B16.1-1975, for the appropriate class

1.04 EDITION DATES

- A. Reference to publications and reference material shall be understood to mean the latest edition, unless stated otherwise.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01172

PIPE PENETRATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install pipe penetration assemblies as shown. This Section covers materials for the various pipe penetration configurations. Refer to Drawings for details of assembly and location.

1.02 SUBMITTALS

- A. Submit manufacturers' literature, installation instructions, and where applicable, fire rating and certified test results of the various components on all items to be furnished in accordance with Section 01300.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Unless otherwise shown all pipe sleeves shall be Schedule 40 galvanized steel pipe conforming to ASTM A53 as specified in Section 01600. Sleeves to be sealed with mechanical seals shall be sized in accordance with the seal manufacturer's recommendations. Sleeves to be sealed by caulking and sleeves for insulated piping shall be sized as required.
- B. External wall penetrations 36-in diameter and less may be made by means of a ductile iron sleeve capable of being bolted directly to the formwork. Seal of the annular space between the carrier pipe and the sleeve shall be made by means of a confined rubber gasket and be capable of withstanding 350 psi. Sleeve shall have an integrally cast waterstop of 1/2-in minimum thickness, 2-1/2-in minimum height. Sleeves shall be by Omni-Sleeve, Malden, MA or equal.

2.02 WALL CASTINGS

- A. Unless otherwise shown, wall castings shall be ductile iron conforming to ANSI/AWWA A21.51/C151, thickness Class 53, diameter as required. Flanges and/or mechanical joint bells shall be drilled and tapped for studs where flush with the wall. Castings shall be provided with a 2-in minimum circumferential flange/waterstop integrally cast with or welded to the casting, located as follows: for castings set flush with walls located at the center of the overall length of the casting; for castings which extend through wall located within the middle third of the wall.

2.03 SEALING MATERIALS

- A. Mechanical seals shall be modular, adjustable, bolted, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. The seal shall be rated by the manufacturer for 40-ft of head or 20 psig. Mechanical seals shall be Link-Seal LS-300, LS-400, or LS-500, depending on pipe size, by Thunderline Corp., Wayne, MI or equal. Seals for standard service shall be insulating type incorporating EPDM rubber sealing elements, glass reinforced plastic pressure plates, and galvanized steel bolts and hardware. Seals in exterior wall penetrations and water containing structures shall be for corrosive service incorporating EPDM rubber sealing elements, glass reinforced plastic pressure plates, and 18-8 stainless steel bolts and hardware. Seals for fire rated walls shall incorporate silicone rubber sealing elements, galvanized steel pressure plates, and galvanized steel bolts and hardware.
- B. Caulking for iron, steel and copper piping shall consist of braided oakum packing or fire retardant pliable material, Fig. 310 by Sealtite Co.; White Oakum W.S.-600 by American Manufacturing Co., or equal, followed by poured molten soft virgin lead. Minimum length of lead segment shall be one half of pipe diameter, or 6-in, whichever is less. Lead shall be flush with end of sleeve. Cooled lead shall be expanded with a caulking iron to form a water seal.
- C. Caulking for PVC pipe shall meet all the requirements in Paragraph B above except that lead wool, compacted to form a watertight seal, shall be used in place of molten lead.
- D. Sealant shall be a two part foamed silicone elastomer by Dow Corning Co., Product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303; or Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corp. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.04 MISCELLANEOUS MATERIALS

- A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corp.; Euclid Chemical Corp.; Master Builders Company or equal.
- B. Non-shrink grout shall be Masterflow 713 by Master Builders Co.; Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or equal.
- C. Escutcheons plates shall be furnished in finished building spaces only.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Assemble and install components of pipe penetration assemblies as detailed on the Drawings.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for project meetings.

1.02 PRECONSTRUCTION CONFERENCE

- A. The Engineer will schedule and administer a pre-construction conference.
- B. The pre-construction conference will be scheduled and administered within fourteen (14) calendar days after the dated "Notice to Proceed". The Contractor shall be prepared to address such topics as projected construction schedules, major personnel, critical work areas, construction facilities and shop drawing submittals.

1.03 PROGRESS MEETINGS

- A. The Engineer will schedule and administer progress meetings and specially called meetings throughout the duration of the Work at minimum monthly intervals.
- B. The time and location of such meetings shall be designated by the Engineer and shall be convenient for all parties involved.
- C. The Engineer will, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies to participants, and those affected by decisions made.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for submission of schedules and shop drawings.

1.02 PROGRESS SCHEDULE

- A. Within fourteen (14) calendar days after execution of the Contract Documents, the Contractor shall submit to the Engineer for review a construction progress schedule conforming to requirements specified. This schedule should show the proposed dates of commencement and completion of each of the various subdivisions of work required under this Contract and the anticipated monthly percentage of completion based on the total contract price. The Contractor shall be responsible for updating and/or revising this schedule whenever directed by the Engineer throughout the duration of the Contract.
- B. Special attention is directed to the requirement that the Contractor shall start the Work, as specified under this Contract, no later than thirty (30) calendar days after the execution of the Contract Documents, unless otherwise directed by the Owner. The Contractor shall comply with all pre-construction requirements as specified. The Owner reserves the right to delay the commencement of the Work or any part thereof if the specified requirements as determined by the Engineer have not been satisfied. The Owner further reserves the right to limit or, delay construction, or certain activities thereof, in certain areas of the Contract should the Owner deem it to be in the public's best interest and/or safety to do so.
- C. The Contractor shall contact the appropriate town or city authorities concerning any public or semi-public events that may occur during the construction period that may affect construction. The Contractor alone shall be responsible for arranging his construction sequence to conform to any restrictions these events may impose. No claims for extras will be allowed because of any delay, extra materials handling, extra excavation, etc. caused by the imposed restrictions. However, additional time may be granted for completion of the work to compensate for delays caused by said restrictions.

1.03 SHOP DRAWINGS

- A. Submit six (6) copies of all (One in reproducible transparency form unless otherwise specified) shop and working drawings of materials and equipment for which such drawings are specifically requested.

- B. A maximum of two (2) submittals of each shop drawing will be reviewed by the Engineer. If more submittals are required due to the Contractor's neglect or failure to fulfill the requirements of the Contract plans and specifications, or to make corrections or modifications required by the Engineer in the review of the first two submittals, the Engineer will review the submittal and the Contractor will be responsible for the cost of the review, as determined by the Owner based on the Engineer's documentation of time and rates for additional services established in the Engineering Agreement between the Owner and the Engineer.
- C. If resubmittals on shop and working drawings are required, the Engineer will retain three (3) copies and three (3) copies will be returned to the Contractor. When resubmittals are returned to the Engineer, six copies of the complete submittal shall again be required.
- D. Such drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, etc., depending on the subject of the drawing. When the dimensions are of particular importance, or when specified, the drawings shall be certified by the manufacturer or fabricator as correct for the Contract.
- E. When so specified or if considered by the Engineer to be acceptable, manufacturer's specifications, catalog data, descriptive matter, illustrations, etc., may be submitted in place of shop and working drawings.
- F. The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings to eliminate delay to the Work due to the absence of such drawings. All shop and working drawings must be submitted to the Engineer within thirty (30) calendar days prior to incorporation into the Work, unless otherwise permitted by the Engineer. **Prior to the submittal of any shop drawings, the Contractor shall submit a schedule of proposed shop drawing transmittals.** The schedule shall identify the subject matter of each transmittal, the corresponding specification section number and the proposed date of submission. Prior to and during the progress of the Work the schedule shall be revised and resubmitted as requested by the Engineer.
- G. No material or equipment shall be purchased or fabricated for the Contract until the required shop and working drawings have been submitted as hereinabove provided and reviewed for conformance to the Contract requirements. All such materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.
- H. Until the necessary review has been made, the Contractor shall not proceed with any portion of the Work (such as the construction of foundations) for which review is required.

- I. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24 inch by 36 inch sheets, except those which are made by changing existing standard shop and working drawings. All drawings shall be clearly marked with the names of the Owner, Contractor, and building, equipment, or structure to which the drawing applies, and shall be suitable numbered. Submitted shop drawings shall be accompanied by a multi-part letter of transmittal provided by the Engineer, and completed by the Contractor as directed by the Engineer.
- J. Only drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Drawings and Specifications in all respects. All drawings which are correct shall be marked with the date, checker's name, and indication of the Contractor's approval, and then shall be submitted to the Engineer; other drawings shall be returned for correction.
- K. If a shop drawing shows any deviation from the Contract requirements, the Contractor shall make specific mention of the deviations in his letter of transmittal.
- L. The review of shop and working drawings by the Engineer will be general only, and nothing contained in this Section shall relieve, diminish or alter in any respect the responsibilities of the Contractor under the Contract Documents and in particular, the specific responsibility of the Contractor for details of design and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance as specified.
- M. Should the Contractor submit equipment that requires modifications to the structures, piping, appurtenances, or layouts etc., either existing or as detailed on the Drawings, he shall also submit details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do the work necessary to make such modifications.
- N. The Contractor shall furnish additional copies of shop drawings or catalog cuts when so requested.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

1. Requirements for computer generated Critical Path Method (CPM) construction scheduling and Narrative progress report.
2. No portion of this specification shall take precedent over SECTION 00500-Contract Agreement.

1.02 SUBMITTALS

A. Submit in accordance with SECTION 01300-Submittals

1. Quality Assurance/Control Submittal
 - a. Name and version of CPM software proposed for use.
 - b. List of construction projects completed on which progress of work was controlled with CPM software.
2. Schedule
 - a. Within 30 days following the receipt of the Notice to Proceed, the Contractor shall submit two color copies of a computer generated schedule and a list of activities to the Engineer. Following review by the Engineer and Owner the Contractor shall meet with the Engineer and Owner to discuss the review. The Contractor shall incorporate the Engineer's comments into the schedule and submit eight color copies of the revised schedule within 14 days following receipt of the Engineer's comments.

PART 2 PRODUCTS

2.01 SOFTWARE

- A. Computer based scheduling software used by the Contractor shall be the product of a recognized commercial computer software producer and shall be capable of meeting the requirements specified herein.

PART 3 EXECUTION

3.01 PREPARATION

A. General

1. The Contractor shall prepare his proposed CPM schedule based on a breakdown of work tasks that he has developed.
2. The construction schedule and updates shall be prepared by the Contractor or the Contractor's qualified consultant.

B. Schedule

1. Each schedule shall be prefaced with the following summary data:
 - a. Contract name and number
 - b. Contractor's Name
 - c. Contract duration
 - d. The effective or starting date of the schedule
 - e. Revision date of the latest schedule.
2. The CPM schedule shall be sequenced by early start date and shall include the following minimum items:
 - a. Activity Name
 - b. Estimated duration
 - c. Activity description
 - d. Early start date (calendar date)
 - e. Early finish date (calendar date)
 - f. Latest allowable start date (calendar date)
 - g. Latest allowable finish date (calendar date)
 - h. Status (whether critical)
 - i. Estimated cost of the activity
 - j. Float (total and free)
 - k. Major milestones
3. Separate milestones shall be included for Notice-to-Proceed and Project Completion Date.
4. Activities shall include major components of the work including submittals that might impact the critical path, subcontractor work, major and critical equipment design, fabrication, testing, delivery and installation times, system/subsystem/component testing, process and facility startup, training, demobilization, project cleanup and closeout. Critical portions of process instrumentation and control system work, shall be defined in detail in a sub schedule.
5. The sum of the costs assigned to the activities shall be equal to the Contract price. Activity costs shall not be assigned to submittals or submittal reviews. Comply

with SECTION 01026-Schedule of Values. Provide a table showing the anticipated monthly percentage of completion, based on the total contract price.

6. Critical activities, predecessors, free float and total float shall be clearly displayed on the schedule in graphical form. Schedules that contain activities showing negative float or that extend beyond the contract completion date will not be approved.
7. Each schedule submittal shall also include a list of activities in the order in which the activities will be performed, along with activity durations, activity predecessors, type of predecessor (finish-start, finish-finish, start-start, lead/lag), and any dependency or required date.
8. The schedule shall be based on a standard 5-day work week with allowance for holidays and adverse weather.
9. Engineer's approval of the CPM schedule is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work prior to the contract completion date. Omissions and errors in the approved CPM schedule shall not excuse performance less than that required by the Contract. Approval by the Engineer in no way makes the Engineer an insurer of the CPM schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of approval by its agent, the Engineer, of the CPM schedule.

C. Narrative Progress Report

1. Include as a minimum:
 - a. Summary of work completed during the previous period (since submission of last narrative progress report).
 - b. Explanation for variations between actual work completed in previous period and planned work as reported in last period.
 - c. Summary of work planned during the next period.
 - d. Current and anticipated delaying factors and their estimated impacts on other activities and milestones, both critical and non-critical.
 - e. Corrective actions taken or proposed.
2. A Narrative Progress Report shall be submitted monthly to the Engineer, at least 5 working days prior to the progress meeting.
3. At the discretion of the Engineer, the Contractor may be required to submit a revised CPM schedule showing completion to date and any changes to the previous schedule.

3.02 MONITORING SCHEDULE

- A. The CPM approved construction schedule shall be used by the Contractor throughout the duration of the project for planning, organizing, and directing the Work, and for reporting progress of the Work.
- B. The Contractor is solely responsible for monitoring schedule compliance. When a delay to the critical path occurs, the Contractor shall immediately notify the Engineer in writing. Within one week of the notification, the Contractor shall submit for the Engineer's approval, a description of proposed actions to return the project to schedule.

3.03 MODIFYING SCHEDULE

- A. If the Contractor desires to make changes in his method of operating which affect the approved CPM schedule, he shall notify the Engineer in writing stating what changes are proposed and the reason for the change. If the Engineer approves these changes, the Contractor shall revise and submit for approval, without additional cost to the Owner, all of the affected portions of the CPM schedule.
- B. It may be necessary for the contract schedule or completion time to be adjusted by the Owner to reflect the effects of job conditions, weather, technical difficulties, strikes, unavoidable delays on the part of the Owner or its representatives and other unforeseeable conditions which may indicate schedule adjustments or completion time extensions. Under such conditions, the Engineer will direct the Contractor to reschedule the work or contract completion time to reflect the changed conditions and the Contractor shall revise his schedule accordingly.
- C. Float time is a project resource available to both the Contractor and the Owner to meet contract milestones and completion dates. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float suppression techniques shall be shared to proportionate benefit of OWNER and CONTRACTOR.
- D. If the Contractor provides an accepted schedule with an early completion date, the Owner reserves the right to reduce the Time of Completion to match the early completion date by issuing a deductive Change Order at no change in Contract Price.

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Contractor's quality control of products, suppliers, manufacturers, services, site conditions, and workmanship, to produce Work of specified quality.

1.02 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Comply fully with manufacturers' instructions, including each step in sequence.
- B. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. 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.
- D. Perform work by persons qualified to produce workmanship of specified quality.
- E. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.03 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 to be removed, clear area only after field sample has been accepted by the Engineer.

1.04 CERTIFIED WELDERS

- A. Structural welds shall be made only by operators who have been qualified by tests, as prescribed in the "Standard Qualification Procedure" of the American Welders Society, to perform the type of work required.

- B. Pipe welds shall be made only by operators who have been qualified by the National Certified Pipe Welding Bureau and each operator's qualification record shall be submitted to the Engineer before any work is performed.
- C. Shop welding shall be in accordance with the "Code for Welding in Building Construction".

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Qualification, duties and responsibilities of testing laboratories.
2. Coordination and scheduling responsibilities of the Contractor.

B. Related Sections

1. Section 01600 - Materials and Equipment

1.02 PAYMENT PROCEDURES

A. Initial Testing

1. The Owner will pay for initial testing services required by the Engineer.

B. Retesting

1. When initial tests indicate noncompliance with the Contract Documents, subsequent retesting occasioned by the noncompliance shall be performed by the same testing agency, and costs thereof will be deducted by the Owner from the Contract Sum.

C. Contractors Convenience Testing

1. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. E-329-90, Use in the Evaluation of Testing and Inspection Agencies as Used in Construction.

1.04 REQUIREMENTS

A. Work included:

1. Cooperate with the Owner's selected testing agency and all others responsible or testing and inspecting the Work.
2. Provide other testing and inspecting as specified to be furnished by the Contractor in this Section and/or elsewhere in the Contract Documents.
3. Where no testing requirements are described, but the Owner directs testing, the Contractor shall provide testing under the requirements of this Specification.

B. Work not included:

1. Selection of testing laboratory: The Owner will select a prequalified independent testing laboratory.

1.05 QUALITY ASSURANCE

A. Qualifications

1. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E329-90.

B. Regulatory requirements

1. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.
2. Regulatory Requirements Inspections and tests required by codes or ordinances, or by a plan approved authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01600 - Materials and Equipment.

- B. Promptly process and distribute, to the Engineer, required copies of test reports and instructions to assure necessary retesting and replacement of materials with the least possible delay in progress of the Work.

1.07 SCHEDULING

A. Establishing schedule

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.
2. Provide all required time within the construction schedule.
3. Coordinate testing activity with the appropriate testing laboratory.

B. Revising schedule

1. When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.

C. Adherence to schedule

1. When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Site Tests

1. Representatives of the testing laboratory shall have access to the Work at all times and at all locations where the Work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.
2. All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

END OF SECTION

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SECTION 01510

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for temporary utilities required during construction.

1.02 GENERAL REQUIREMENTS

- A. The Contractor is responsible for payment of all costs associated with the installation and operation of all temporary utilities necessary for the completion of the work. The General Contractor shall arrange with the Engineer and Owner methods of determining monthly utility costs for Temporary Utilities prior to connection of any temporary systems. The Contractor shall pay the Owner on a monthly basis for all temporary utility costs. The Temporary Utilities to be paid by the Contractor include but are not limited to the following: Electricity, Water, Sanitary, Heating, Ventilation, Plumbing and other services required to complete the work.

1.03 TEMPORARY WATER

- A. Temporary pipe lines and connections from the permanent service lines, necessary for the use of the General Contractor and his Subcontractors shall be installed, protected, and maintained at the expense of the General Contractor.
- B. Provide an adequate supply of drinking water from an approved source of acceptable quality, satisfactorily cooled, for his employees and those of his Subcontractors.

1.04 TEMPORARY ELECTRICITY

- A. Provide electrical energy required for temporary lighting and power.
- B. Assume all costs necessary to provide a temporary, separately metered electric service for all construction. Temporary electric service shall be connected to Owner's existing service.
- C. The General Contractor shall pay for the cost of electrical energy consumed by himself and by all of his Subcontractors. The Contractor shall record meter readings weekly and provide a copy of the meter readings to the Engineer and Owner. The entire electric bill shall be proportioned according to the KWH used. The Owner will provide the Contractor and Engineer with copies of the monthly electric bills as well as with the calculations for determining the amount owed by the Contractor. The Contractor shall reimburse the Owner within 15 days of receiving the monthly bill

and backup from the Owner, by means of a separately issued check, made payable to the Owner.

- D. Temporary wiring of a special nature shall be paid for by the Contractor including but not limited to special circuits required by electric welders, elevators, lifts, pumps or other special equipment requiring high-amperage and/or special voltage service and exterior lighting circuits for protection against vandalism, public warning lights and lights for advertising, etc.
- E. The General Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, motors, and accessories required for their work. They shall also pay for all temporary wiring of construction offices and buildings used by them.
- F. Temporary wiring installed by the Electrical Subcontractor shall be removed after it has served its purpose.
- G. Electrical work to be done in accordance with applicable codes.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide adequate sanitary facilities for the use of those employed on the Work. Sanitary facilities shall be made available when the first employees arrive on the site of the Work, be properly secluded from public observation, and be maintained during the progress of the Work in suitable numbers.
- B. Maintain sanitary facilities in an orderly and sanitary condition at all times and enforce their use. Rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Owner, or any adjacent property.

1.06 TEMPORARY HEATING

- A. Within 30 calendar days after the execution of this Contract, submit in writing to the Engineer for approval, three copies of method and time schedule for heating during construction which shall concur with his progress schedule submitted under Specification Section 01300.
- B. The installation and operation of heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection. Heating devices which may cause damage to finish surfaces shall not be used.
- C. After the permanent heating system has been installed, tested, and made ready for operation, the Contractor may, at his own risk and expense, use it for providing heat for protection of the Work. He shall provide and pay for all fuel and care necessary, and, when the Work is ready for acceptance, he shall, at his own expense, put the

system into first-class condition, even to the extent of replacing worn or damaged parts as directed.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01525

TEMPORARY ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for protecting portions of the Work which are affected by inclement weather conditions.
- B. Provide "Weather Protection" and heat to permit construction work to be carried on during the months of November through March. These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of the Engineer. Included in the preceding category, without limitation, are such items as site work, excavation, pile driving, steel erection, erection of certain "exterior" wall panels, roofing, and similar operation.

1.02 SUBMITTALS

- A. Within 30 calendar days after execution of this contract, submit in accordance with Specification Section 01300, proposed methods for "Weather Protection".

1.03 WEATHER PROTECTION

- A. Weather Protection shall be provided for protection of that work adversely affected by moisture, wind and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during dates consistent with the approved Progress Schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations.
- B. Furnish and install all enclosures and be responsible for all costs, including heating required to maintain a minimum temperature of 40 degrees F., at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract Documents with added regard to performance obligations of the Contractor.
- C. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01560

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for cleaning, maintenance of the site, barriers and fences required during construction.

1.02 CLEANING DURING CONSTRUCTION

- A. Unless otherwise specified under the various trade Sections of the Specifications, the General Contractor shall perform clean-up operations during construction as herein specified.
 - 1. Control accumulation of waste materials and rubbish; periodically dispose of off-site. Bear all costs, including fees resulting from disposal.
 - 2. Clean interior areas prior to start finish work and maintain areas free of dust and other contaminants during finishing operations.
 - 3. Maintain project in accordance with all local, State and Federal Regulatory Requirements.
 - 4. Store volatile wastes in covered metal containers, and remove from premises.
 - 5. Prevent accumulation of wastes that create hazardous conditions.
 - 6. Provide adequate ventilation during use of volatile or noxious substances
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on site.
 - 2. Do not dispose or volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.
 - 4. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
 - 5. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.
 - 6. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and wind blown debris, resulting from construction operations.

7. Provide on-site containers for collection of waste materials, debris, and rubbish.
8. Remove waste materials, debris, and rubbish from the site periodically and dispose of at legal disposal areas off the construction site.
9. Handle material in a controlled manner with as little handling as possible. Do not drop or throw materials from heights.
10. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.
11. During its progress, the work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
12. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes, structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc. shall, upon completion of the work, be left in a clean and neat condition.

1.03 DUST CONTROL

- A. Provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract.
- B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions or performance obligations of the General Contractor.

1.04 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize amount of bare soil exposed at one time.
- C. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts for clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Construct sediment control devices for discharge from dewatering trenches.

G. Construct all sedimentation control devices shown on the plans.

1.05 NOISE CONTROL

A. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

B. Execute construction work by methods and by use of equipment which will reduce excess noise.

1. Equip air compressors with Silencers, and power equipment with mufflers.

2. Manage vehicular traffic and scheduling to reduce noise.

1.06 POLLUTION CONTROL

A. Special care shall be taken to prevent contamination or muddying up or interfering in any way with the stream flows, if any along the line of work. No waste matter of any kind will be allowed to discharge into the stream flows or impounded water of any pools or other bodies of water.

1.07 SURFACE WATER CONTROL

A. Take all precautions to prevent damage to the work or equipment by high waters or by storms. The Engineer with the approval of the Owner may prohibit the carrying out of any work at any time when in his judgement, high water or storm conditions are unfavorable or not suitable, or at any time, regardless of the weather, when proper precautions are not being taken to safeguard previously constructed work or work in progress.

B. In case of damage caused by the failure of the Contractor to take adequate precautions, the Contractor shall repair or replace equipment damaged and shall make such repairs or rebuild such parts of the damaged work, as the Engineer may require, at no additional expense to the Owner.

1.08 BARRIERS AND ENCLOSURES

A. Fences and Barricades

1. Provide and maintain temporary fences, barriers, lights, guardrails, and barricades as indicated in the Contract Documents, or as necessary to secure the Work and adjacent property, and protect persons and property.

2. Obtain necessary approvals and permits and provide temporary expedients as necessary to accommodate tasks requiring items mentioned herein.

B. Protection of Trees

1. The Contractor shall take care not to harm trees along the sides of roads or within the existing facility in which the construction work is to be done or trees on adjacent lands except as indicated on the drawings or with the written permission of the Owner and any other owner of the trees involved. Care shall be taken not to cut tree roots so as to harm the growth of trees to remain.
2. If, in the opinion of the Engineer, any trees damaged during construction can be repaired, the Contractor shall satisfactorily repair same at no further cost to the Owner.
3. If, in the opinion of the Engineer, any tree damaged during construction cannot be repaired and should be removed, the Contractor shall satisfactorily remove and replace, in kind, same at no further cost to the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for delivery, storage, handling and installation of systems, materials, manufactured units, equipment, components, and accessories used in the work.

B. Related Sections

1. Section 01300 - Submittals

1.02 DELIVERY

A. Refer to Specifications' Sections for requirements pertaining to delivery and handling of materials and equipment.

B. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturers' unopened containers or packaging, dry.

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct, and products are undamaged.

1.03 STORAGE AND PROTECTION

A. Refer to Specifications' Sections for requirements pertaining to storage and protection of materials and equipment.

B. Store products in accordance with manufacturers' instruction, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturers' instructions.

C. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

- D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- E. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.

1.04 INSTALLATION STANDARDS

- A. Comply with Specifications and referenced standards as minimum requirements.
- B. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.
- C. Do not use materials and equipment removed from existing structures, except as specifically required, or allowed, by the Contract Documents.
- D. Perform work by persons qualified to produce workmanship of specified quality.
- E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.
- F. When work is specified to comply with manufacturers' instructions, submit copies as specified in Section 01300 - Submittals, distribute copies to persons involved, and maintain one set in field office.
- G. Perform work in accordance with details of instructions and specified requirements.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01631

USE OF OTHER THAN FIRST NAMED MANUFACTURER

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section includes requirements related to the Contractor's responsibilities when using a named manufacturer or product other than the first named.

1.02 EQUIVALENT MATERIALS AND EQUIPMENT

- A. Whenever a material, article, or method is specified or described by using the name of a proprietary product or the name of a particular manufacturer(s) or vendor(s), followed by the phrase "or equal," the specific item mentioned shall be understood as establishing the type, function, dimension, appearance, and quality desired and is to be the basis upon which bids are to be prepared, subject to the provisions of this Section.
- B. In every instance, the design was completed using criteria required to accommodate the first named manufacturer. When practical, other named manufacturers were included in the Technical Specifications based upon performance and design criteria comparable to the first named. However, in some instances, the size, shape, loadings, configuration, and/or other design criteria for other named manufacturers may require redesign of the Work. Other named manufacturers may be used subject to the requirements of this Section.
- C. When the Contractor uses any manufacturer or product other than the first named in the specifications, which use requires modification to the Work, the Contractor shall, to the satisfaction of the Program Manager, review and revise the design of the Work, including coordination with other Technical Specification sections to ensure that all component units fit and function as a whole, to properly accommodate the use of that product.
- D. The Contractor shall bear the costs and liability for all redesigned elements of the Work necessary to properly accommodate the proposed item.

1.03 SUBMITTALS

- A. In addition to the requirements of Section 01300, the Contractor shall submit complete data and engineering documents that provide a complete analysis of the proposed item and the extent of the redesign of the Work necessary to properly incorporate the proposed item into the Work. The Contractor shall:
- B. Identify each and every element of the design of the Work that must be modified to:
 - 1. Accommodate the proposed item.
 - 2. Coordinate the proposed item with the overall design, inclusive of all related disciplines.
 - 3. Ensure the proper functioning of the entire system in which the item is to be incorporated.

- C. Include complete engineering drawings, bearing the seal of a Professional Engineer registered in the Commonwealth of Massachusetts, addressing all requirements in 1.02 above.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF USE OF OTHER THAN FIRST NAMED MANUFACTURERS

SECTION 01665

SERVICES OF MANUFACTURER'S REPRESENTATIVES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for services provided by manufacturer's representatives.

1.02 SERVICES OF MANUFACTURER'S REPRESENTATIVES

A. General

1. Arrange for a qualified factory trained service representative from each company manufacturing or supplying certain equipment and systems, as listed in the Table at the end of this section and as specified in Division 11 through Division 16, to perform the duties described herein.
2. Qualified factory trained service representative shall be approved by the Engineer
3. All 8-hour days specified herein and in other sections of the specifications are exclusive of travel time
4. Since the specified pre-startup operator training and post-startup services will be integrated into a plant-wide schedule, the Owner may redistribute the total number of instructor hours between pre- and post startup services.

B. Supervision of Installation

1. Provide on-site supervision and advice to the Contractor to ensure that proper procedures are followed during equipment installation.

C. Equipment Checkout

1. Inspect, align, operate, test and adjust the equipment after equipment installation has been completed and equipment is presumably ready for operation, but before it is operated by others.
2. The inspection shall include, but shall not be limited to, the following points as applicable:
 - a. Soundness (without cracked or otherwise damaged parts)
 - b. Completeness in all details as specified
 - c. Correctness of setting, alignment, and relative arrangement of various parts
 - d. Adequacy and correctness of packing, sealing and lubricants.
3. Operate, test and adjust the equipment, as required, to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.

4. Upon completion of the work, submit a complete signed report of the result of the inspection, operation, adjustments and tests to the Engineer via the Contractor. The report shall include:
 - a. Detailed descriptions of the points inspected and work completed
 - b. Deficiencies noted and/or corrected
 - c. Tests and adjustments made
 - d. Quantitative results obtained if such are specified
 - e. Suggestions for precautions to be taken to ensure proper maintenance
 - f. A certificate that specifically states that "... the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacture's warrantee null and void".

D. Field Acceptance Test

1. Tests shall be conducted by the Contractor, with assistance from the manufacturer's representative, after the Engineer has reviewed completed and equipment checkout report
2. Manufacturer's representative shall be present during field acceptance tests

E. Pre-Startup Operator Training

1. General

- a. Provision for classroom and hands on training to plant personnel in the operation and maintenance of the equipment prior to placing the equipment in full operation.
- b. Provide the Owner's personnel and their consultants with sufficient information and skills training on the theory, design, site specific operation and maintenance practices (including items such as routine monitoring with normal and abnormal parameters, troubleshooting techniques, and preventive and corrective maintenance requirements) to ensure that equipment and systems can be efficiently and effectively operated and maintained by the trainees upon completion of the training.
- c. Training shall be a combination of classroom, field observance and hands-on applications.
- d. Provide the following as specified herein:
 - 1) Lesson Plans
 - 2) Trainee Manuals
 - 3) Catalog of training materials.
- e. The Contractor shall provide a credit to the Owner for any unused instructor hours.
- f. Training classes shall be based on the approved Contractor Operation and Maintenance Manual.
- g. Conduct the training at scheduled times in accordance with the Contractor's approved comprehensive training schedule for all equipment, system and

components. All training shall be coordinated and scheduled with the Owner a minimum of 7 days in advance. All training sessions will be conducted during the day shift. Currently the day shift is approximately 7:00 AM to 3:00 PM. For scheduling and training effectiveness, no one class will be longer than 4 hours.

2. Operations Sessions

- a. Overview of the equipment and its' auxiliary support/systems covering nomenclature, function and theory of operation.
- b. General safety requirements for operation of the equipment and its' auxiliary/support systems, including suggested safety equipment.
- c. Pre-start-up safety and equipment check.
- d. Equipment and auxiliary/support systems start-up procedures covering manual and automatic modes, if available.
- e. Routine operation and monitoring requirements; including specifics on normally expected ranges for items such as oil, water pressure and temperatures, discharge pressures, sensory observations, etc., procedures to change operating parameters (such as air or flow rates).
- f. Equipment/systems shut down procedures covering manual and automatic modes (if applicable).
- g. Operational troubleshooting of equipment and auxiliary/support systems.
- h. Procedures for handling non-routine operational problems such as response to alarms, power failures, emergency shutdown, auxiliary/support system failures, etc.

3. Maintenance Sessions

- a. If session is specific to a discipline; (e.g., electrical, mechanical, I&C), include only appropriate maintenance items for the discipline. If session is to include multiple disciplines, include all items for those disciplines and indicate in submittal outline which discipline the material refers to.
- b. For All Disciplines provide:
 - 1) An overview of the equipment and its' auxiliary/support systems covering nomenclature, function and theory of operation.
 - 2) General safety requirements for maintenance of the equipment and its' auxiliary/support systems appropriate to each discipline including suggested safety equipment and practices. Cover local/remote lockout procedures, safe procedures for handling alarms and built in safety devices during preventive and corrective maintenance.
 - 3) Overview of pre-start-up, routine operation monitoring, and shutdown procedures covering automatic and manual modes (if applicable).
- c. For Each Specific Discipline provide:
 - 1) Preventive maintenance procedures to be followed; include parts' lube quantities, types, frequencies, application points, time requirements to perform procedures, etc.

Note: Information should be provided to trainees from the O&M manuals which cross references manufacturer's lube requirements.

- 2) Specific procedures to cover adjustment requirements for alignment, wear, calibration, etc. for all preventive maintenance and corrective maintenance procedures, including time required to perform.
- 3) Special tools, techniques or procedures required for either preventive or corrective maintenance of equipment or its' auxiliary support systems.
- 4) Assembly/disassembly procedures required for preventive or corrective maintenance, including time required to perform.
- 5) Maintenance troubleshooting of equipment and auxiliary/support systems.

F. Post-Startup Services

1. Provision for assistance to the Owner in the calibration, tuning and troubleshooting, plus any additional training which may be required during the one-year guarantee period.

1.03 SUBMITTALS

1. Submit instructor qualifications, training outline, and lesson plans 90 calendar days prior to pre-startup operator training. Qualifications of the factory trained service representative, as defined below.
2. Submit trainee manuals at least 30 calendar days prior to scheduled training.
3. Training Outline/ Lesson Plans:
 - a. 4 copies
 - b. Training outline/lesson plans to cover each major trainee group (i.e.: operations, electrical maintenance, instrumentation, etc). If the same session outline is to be used for more than one type of trainee group, such as one which would cover equipment identification and principals of operation, this information should be so indicated on the outline. The outline should be detailed and include length of session for each major topic and type of session; i.e., field or classroom.
 - c. The lesson plan shall be cross referenced to the trainee manuals provided and include instructor references for the use of training aids, training strategies, etc. They should contain sufficient technical material to guide the instructor in the delivery of the training material session. Lesson plans are to be provided for each separate technical discipline to be trained. Generic "informational" lesson plans may be used for multiple trainee discipline target groups. The specific number of lesson plans for each session will be determined by the complexity, content and objectives of the subject equipment covered.
 - d. The purpose of the manual is to provide specific guidance for the instructor and the trainees on what is to be taught and how, as well as to insure consistency and completeness of the sessions when they are presented to different groups of the same target trainee group.

4. Trainee Manuals
 - a. 4 copies for review. 6 final copies.
 - b. Key trainee manuals to the training outline. Copies should be available to pass out to each trainee at the session; they are to be retained by the trainee for future use. This trainee manual is not the O&M manual required in the specification, however, similar materials may be included as appropriate.
 - c. The purpose of the manual is to provide an organized package of information for the trainee, which will be used during the training sessions as well as for future reference material.
 - d. The organization of the manual should correspond to the training outline. Material in the manual should include information on the training topics, the training outline, and other relative reference material. Specifically, all manuals should be geared toward an eighth grade level of reading.
 - e. Manuals for Operations training sessions should include a description of the equipment, pre-start-up checks, start-up and shutdown procedure, specific monitoring checks including expected parameters, troubleshooting and safety procedures, etc. as described previously.
 - f. Manuals for Maintenance training sessions should include a description of the equipment, pre-start-up checks, start-up and shutdown procedure, specific monitoring checks including expected parameters, troubleshooting and safety procedures, etc. as described previously.
5. 2 copies of a catalog of all training materials including training outline, lesson plans and trainee manuals.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Factory trained service representative shall have the training and experience to provide technical and/or process related advice, and/or assistance, relating to the installation, operation, maintenance and utilization of the products that he represents. Additional qualifications may be specified elsewhere.
2. Representative is subject to acceptance by Engineer. No Substitute representatives will be allowed unless prior written approval by Engineer has been given.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

- A. Equipment and Components Requiring Services is listed in the Table at the end of this section.
- B. Provide a credit to the Owner for unused service manhours as specified below, at the manufacturer's published field service rate plus travel costs.

SERVICES OF MANUFACTURER'S REPRESENTATIVE
Manhour Requirements Table

Specification Section	Section Number	Supervision of Installation	Equipment Checkout	Field Acceptance Tests	Pre-Startup Operator Training	Post-Startup Services
Sluice Gates	11282	8	4	4	4	8
Screenings Equipment	11330	8	8	16	4	8
Vertical Conveyor	11555	8	8	8	4	8
Hoisting Equipment	14600	4	4	4	4	4
HVAC Equipment	15500	4	4	4	4	4
Fire Alarm System	16720	4	4	8	4	4
Engine/Generator	16612	8	4	4	4	4
Sewage Pumps	11310	8	8	16	8	8

EQUIPMENT CERTIFICATION

Owner: _____ Date: _____

Project: _____

Contractor: _____

Equipment Manufacturer: _____

Equipment: _____

Specification Section: _____

As an authorized representative of the Equipment Manufacturer, the undersigned certifies that the equipment listed above conforms to the requirements of the construction contract between the Contract and the Owner. The undersigned further certifies that the equipment has been installed in accordance with the Manufacturer's written instructions, that the equipment is ready for permanent operation and that nothing in the installation will render the Equipment Manufacturer's warranty null and void.

(Authorized Manufacturer's Representative) Date: _____

(Witness) Date: _____

Remarks: _____

EQUIPMENT TRAINING CERTIFICATION

Owner: _____ Date: _____

Project: _____

Contractor: _____

Equipment Manufacturer: _____

Equipment: _____

Specification Section: _____

As an authorized representative of the Equipment Manufacturer, I certify that I have trained the Owner's personnel in the proper operation and maintenance of the above equipment.

(Authorized Manufacturer's Representative) Date: _____

The following personnel listed below attended the training session(s):

(Owner's Representative) Date: _____

(Beta Engineering Witness) Date: _____

END OF SECTION

SECTION 01680

EQUIPMENT AND SYSTEM CHECKOUT, CERTIFICATIONS AND TESTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements and procedures for physical checkout certification, and testing of equipment.

1.02 DEFINITIONS

- A. Shop Testing is defined as testing that is done by the manufacturer either at the place of manufacture, the place of assembly, or at another location where the required testing apparatus is located, for the purpose of proving that the equipment meets the requirements of the pertinent technical specification(s).
- B. Equipment Checkout, Inspection and Certification is defined as the process of physically inspecting products after they have been installed in the work, and then certifying that the products have been properly and completely installed, and are ready for field and/or functional testing.
- C. Field Testing is defined as testing that is performed by the Contractor with supplier assistance on products they have been installed in the work and after the performance of physical checkout, for the purpose of proving that the tested products meet the requirements of the pertinent technical specifications. While field testing can be described as "shop testing in the field", it may be required regardless of whether or not shop testing was performed on the same piece of equipment or material.
- D. System Testing is defined as testing performed on a "system" normally comprised of two or more pieces of equipment, after the equipment has been installed in the work, and after physical checkout and field testing has been completed, for the purpose of providing that the system meets requirements as specified and as indicated.
- E. Manufacturer's Representative, sometimes referred to as the Factory-Trained Service Technician, is defined as a person or persons provided by the manufacturer, who is qualified by having the training and experience to provide technical and/or process related advice, and/or assistance, relating to the installation or utilization of the products provided by that same

manufacturer, for installation and utilization in the work. Such training and experience shall include a minimum of three years participation in similar work including no less than three similar projects during this three year period. The qualifications of each representative must be submitted to the Engineer for approval at least 30 days prior to their first site visit.

- F. The Testing Checkout Coordinator is defined as the person provided by the contractor to coordinate and oversee the total spectrum of testing and inspection activities required by the contract documents. The testing and checkout coordinator shall have been in responsible charge of at least two similar projects in the last four years.

1.03 ROLES AND RESPONSIBILITIES

- A. The Contractor shall provide all outside services, materials, labor, supplies, test equipment and other items necessary to perform the testing specified herein. In addition, arrange for and provide the participation or assistance of survey crews, engineers, quality control technicians, manufacturers' representative(s), and required governmental agency representatives.

1.04 CHECKOUT PLAN

- A. The Contractor shall submit a checkout plan based upon the requirements defined herein to the Engineer. Six copies of checkout plan (preliminary) shall be submitted for review within 90 calendar days prior to the proposed date of the first test, whichever occurs first. The plan shall define:
 1. The logical and systematic performance of physical inspections, shop, field, and system tests.
 2. A list of all shop tests, and supplier certifications, including those required by the applicable technical specifications. Provisions shall also be included for retesting in the event it is required.
 3. Participants in the testing.
 4. Special test equipment.
 5. Sources of the test media (water, power, air) and the proposed method of delivery of the media to the equipment to be tested.
 6. Ultimate disposal of the test media.
- B. The plan shall be reviewed by the Engineer, modified or revised as necessary by the Contractor, then approved by the Engineer. The Contractor shall continue to update the checkout plan, working in conjunction with the Engineer prior to the start of the scheduled equipment checkout and functional testing activities.

- C. The Contractor shall designate, in the checkout plan, a testing and checkout coordinator to coordinate and manage the activities defined in the checkout plan, as approved by the Engineer.

1.05 EQUIPMENT AND SYSTEM CHECKOUT AND CERTIFICATIONS

- A. Checkout is defined as inspection by the Contractor, Engineer and Owner to verify conformance to the contract drawings and specifications. Checkout procedures will be conducted by the Contractor in the presence of the Engineer and Owner to verify the presence, appropriateness, and proper construction or installation of each being "checked out". Typical elements of the checkout include the following:
 - 1. Verify exterior areas for backfill, grading, surfacing, drainage, landscaping, roadways, fencing, and gates.
 - 2. Verify buildings for structure, masonry, architectural, mechanical systems, electrical/lighting, communications, and HVAC.
 - 3. Verify concrete structures for structural integrity, finish tolerance, durability, appearance, embedded and inserted items, painting and surface applications.
 - 4. Verify steel structures for member alignment, connection bolts torque, connection welds integrity, painting, fire proofing and surface applications.
 - 5. Verify mechanical systems and items for setting, alignment and securing, check and adjust packing and seals, lubrication, drying out, drive connection and alignment including rotation and belt/chain tension, painting or surface applications, and tagging for project system.
 - 6. Verify piping systems for material, size, components, direction, alignment of joints and bolts/welding, packing and seals, screens and filters and strainers, leak and pressure hydro tests, painting and color coding, hangers and anchors and expansion provision and supports, clean out of foreign matter and tagging for project system.
 - 7. Verify electrical and control/instrumentation systems for conduit and tray installation, wire/cable material and size, circuit continuity and identification, voltage testing, ground continuity and testing, terminal installation and identification, jar switches and circuit breakers and transformers tested, substation operation tested, and tagging for project system.
 - 8. Verify communication system including telephone, fire/smoke alarm, security, page/part, closed circuit TV similar to electrical above.
 - 9. Verify computer systems by station, function, and network interface.

- B. Each piece of equipment and system must be certified by the manufacturer's representative as specified in Section 01735 Services of Manufacturer's Representatives.

1.06 FIELD TESTING OF EQUIPMENT

- A. When required by the technical specifications, perform field testing on installed equipment. Field testing shall be in addition to and not in lieu of, any shop testing either required or otherwise performed. Perform field testing as a part of the overall equipment and system testing process defined herein and in accordance with the approved checkout plan.
- B. Provide ninety days written notice indicating the date and time for testing one piece of equipment, or a series of equipment pieces. Submit with this notice the following for approval by the Engineer:
 - 1. Description of the tests, specifically outlining how the test will prove conformance with the requirements in the technical specifications.
 - 2. Testing devices that will be used in the tests. Description shall state what portion of the tests that the devices will perform or measure, and device accuracy.
 - 3. Personnel used to perform the tests. Submit resumes, qualifications, and experience. As a minimum, personnel must have three years experience with the manufacturer and operation of the equipment to be tested and will have participated in five similar tests during this period of experience.
 - 4. Schedule of testing. Schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or test failure.
 - 5. Test forms. Provide test forms for recording reporting on the field test data, prior to the test.
 - 6. Material and equipment required for the test. This material and equipment shall be supplied at no additional cost to the Owner.
 - 7. Water and Power Requirements. Water and power requirements shall be identified in the plan by the Contractor and will be supplied by the Contractor for field testing purposes. The Contractor shall provide all temporary piping and wiring required for field testing; and equipment and labor for the reuse of the test water. When testing is performed with water during freezing conditions, the Contractor shall take measures to prevent damage to the work caused by freezing of the water.
 - 8. Operational Requirements. Include valve positions, set-ups, gate positions, including temporary arrangements that are required to run the tests so that the Owner can anticipate and plan for the testing situation.

9. Provide seven days written notice to the Engineer prior to the actual start of any testing. This will include a statement by the Contractor that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.
- C. Field test procedures will be reviewed and returned by the Engineer within 30 days of receipt. Incorporate minor comments on the procedures, equipment, or personnel prior to testing. Major comments by the Engineer will require a resubmission of the field test procedure and proposed test date. The Contractor will be notified, in writing, by the Engineer if a formal resubmission is required with the transmittal of the review comments.
- D. Submit within one week after completion of the tests, the following to the Engineer for approval:
1. Completed test forms for each device tested.
 2. Completed certification documentation.
 3. A written summary of testing, reporting on the results and summarizing the entire procedure.
 4. A schedule for retesting, if necessary. Perform any retesting required to fulfill the intent of the technical specification test requirements at no additional cost to the Owner.

1.07 SYSTEM TESTING

- A. Specific system tests shall be performed by the general contractor in addition to the requirement for shop, field, and other tests called for in the technical specifications. System tests will be performed with fluid or gaseous substances that are generally non-septic, non-corrosive, non-toxic, and non-inflammable.
- B. Provide 30 days written notice indicating the date and time during which the specific functional test is proposed. Submit with this notice, the following to the Engineer for approval:
1. Testing devices that will be used in the tests. Description shall state what portion of the tests that the devices will perform or measure, and device accuracy.
 2. Personnel used to perform the tests. Submit resumes, qualifications, and experience. As a minimum, personnel must have three years experience with the manufacturer and operation of the equipment to be tested and will have participated in five similar tests during this period of experience.

3. Schedule for Testing: Schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or system test failure.
 4. Test forms. Provide test forms for recording reporting on the field test data, prior to the test.
 5. Material and equipment required for the test. This material and equipment shall be supplied at no additional cost to the Owner.
 6. Water and Power Requirements. Water and power requirements shall be identified in the plan by the Contractor and will be supplied by the Contractor for system testing purposes. The Contractor shall provide all temporary piping and wiring required for field testing; and equipment and labor for the reuse of the test water. When testing is performed with water during freezing conditions, the Contractor shall take measures to prevent damage to the work caused by freezing of the water.
 7. Operational Requirements. Include valve positions, set-ups, and gate positions that are required to run the tests in the written request so that the Engineer can anticipate and plan for the testing.
 8. Provide seven days written notice to the Engineer prior to the actual start of any testing. This will include a statement by the Contractor that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.
- C. The Engineer, and the Owner may witness the performance of these tests, at their option.
- D. A review of the system test package by the Engineer will be made within two weeks of receiving the package. The Contractor shall incorporate minor comments on the procedures, equipment, and personnel prior to testing. Major comments by the Engineer will require a resubmission of the system test package and test date.
- E. Submit within one week after completion of the tests, the following to the Engineer for approval.
1. Completed test forms, for each device.
 2. Completed certification.
 3. A written summary of testing, reporting on the results and summarizing the entire procedure.
 4. A schedule for retesting, if necessary, including changes to procedures, testing devices, or personnel. Any retesting required to fulfill the intent of the test requirements due to negligence, poor workmanship, or products

that fail to meet the contract requirements, shall be at no additional cost to the Owner.

1.08 CORRECTIONS TO THE WORK

- A. Correct any items of work failing to meet the specified requirements, at no additional cost to the Owner. Correct the nonconforming items by re-work, modification, or replacement, to the option of the Engineer. This includes the provision of all required labor, materials, and requirements for retesting as specified herein, to verify that the items conform with contract documents.

1.09 SAFETY

- A. Conduct all specified test procedures in compliance with all applicable safety standards and regulations.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01700

CONTRACT CLOSE-OUT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for specific administrative procedures, close-out submittals and forms used at substantial and final completion of the Work.
- B. Contractor shall satisfy all administrative requirements within the Contract Documents and the Requirements listed in this section prior to Contract Close-out.

1.02 FINAL CLEANING

- A. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- B. The Contractor shall restore or replace, when and as directed, any public or private property damage by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end, the Contractor shall do as required, all necessary highway or driveway, walk and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.
- C. Unless otherwise specified under the various Sections of the Specifications, the Contractor shall perform final cleaning operations as herein specified prior to final inspection.
- D. At completion of work, remove waste materials, rubbish tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.
- E. Cleaning shall include all surfaces, interior and exterior in which the Contractor and all Subcontractors have had access whether existing or new.

- F. Refer to Sections of the Specifications for cleaning of specific products or work.
- G. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
- H. Use only those cleaning materials and methods that are recommended by the manufacturer of surfaces material to be cleaned.
- I. Employ experienced workmen, or professional cleaners, for final cleaning operations.

1.03 PROJECT RECORD DOCUMENTS

- A. Project Record Documents also referred here as Record Drawings shall consist of all the contract drawings.
- B. The Contractor and all Subcontractors shall be required to maintain one set of Record Drawings, as the work relates to their Sections of the Specifications, at the site.
- C. Record Drawings shall be stored and maintained in the General Contractor's field office apart from other documents used for construction. The Record Drawings shall be maintained in a clean, dry, and legible condition and shall not be used for construction purposes.
- D. Record Drawings shall be available at all time for inspection by the Engineer. All deficiencies noted shall be promptly corrected.
- E. The following information shall be indicated on the Record Drawings:
 - 1. Record all changes, including change orders, in the location, size, number, and type both horizontally and vertically of all elements of the projects which deviate from those indicated on all the contract drawings.
 - 2. The tolerance for the actual location of utilities and appurtenances within the building to be marked on the Record Drawings shall be plus or minus two (2) inches.
 - 3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) ft. intervals and at all changes of direction.
 - 4. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, clean outs, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps and maintenance devices. The location of these internal utilities, appurtenances and devices shall be shown by offsets to the column grid lines on the drawings.

5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served, and function on the Record Drawings.
- F. At the end of each month and before payment for materials installed, the Contractor, and his Subcontractors, shall review Record Drawings for purpose of payment. IF THE CHANGES IN LOCATION OF ALL INSTALLED ELEMENTS ARE NOT SHOWN ON THE RECORD DRAWINGS AND VERIFIED IN THE FIELD, THEN THE MATERIAL SHALL NOT BE CONSIDERED AS INSTALLED AND PAYMENT WILL BE WITHHELD.
- G. Prior to the installation of all finish materials, a review of the Record Drawings shall be made to confirm that all changes have been recorded. All costs to investigate such conditions shall be borne by the applicable party as demonstrated by the Engineer.
- H. At the completion of the contract, each Subcontractor shall submit to the Contractor a complete set of his respective Record Drawings indicating all changes. After checking the above drawings, the Contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the Record Drawings to the Engineer.

1.04 EQUIPMENT AND SYSTEM CHECKOUT, CERTIFICATIONS AND TESTING

- A. Comply with requirements of Section 01680 Equipment and System Checkout, Certifications and Testing.

1.05 OPERATING AND MAINTENANCE MANUALS

- A. Comply with requirements of Section 01730 Operation and Maintenance Manuals.

1.06 SPARE PARTS

- A. Comply with requirements of Section 01750 Spare Parts.

1.07 LUBRICANTS

- A. Comply with requirements of Section 01751 Lubricants.

1.08 WARRANTIES

- A. Comply with requirements of Section 01740 Warranties.

1.09 FINAL INSPECTION

- A. The Contractor shall submit written certification that:
 1. Project has been inspected for compliance with Contract Documents.

2. Equipment and systems have been tested in the presence of the manufacturers representative and are operational and satisfactory.
3. Project is completed, and ready for final inspection.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01710

STARTUP

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Startup requirements for processes, equipment and components, and the roles and responsibilities of the Contractor and the Owner.

1.02 DEFINITIONS

- 1. Startup: The initial operation of a sufficiently completed facility and/or plant by the Owner, utilizing wastewater and related substances (sludge, wastewater, scum), or other media, which the facility has been designed to process.

1.03 DESCRIPTION OF WORK

- A. The primary responsibility for startup rests with the Contractor with assistance from the Owner as specified herein.
- B. The Contractor shall not operate any of the existing facilities at any time. This shall include the starting and stopping of equipment or opening and closing of valves. Whenever the Contractor believe his work will effect or be effected by the existing facilities operation he shall so notify the Engineer in writing three (3) working days prior to the intended start of the work. This notification shall clearly detail the work to be completed, the method by which the existing facilities operation may be affected and the assistance requested of the Owner.
- C. The Contractor shall, upon orders by the Engineer, startup, adjust and place in satisfactory operation all plant equipment constructed under each Phase of this Contract and shall be responsible to pay the cost of all utilities until the Engineer certifies the dates of substantial completion.
- D. At the discretion of the Engineer, individual startups may be required for various phases of the work. If this occurs, the phase startups will be ordered by the Engineer when the following has been completed for all equipment and systems within each Phase. The Engineer may order the startups prior to the completion of non-essential items of work.
 - 1. Compliance with Section 01665 Services of Manufacturer's Representatives, including:
 - a. Supervision of Installation

- b. Equipment Checkout
 - c. Field Testing of Equipment
 - d. Pre-Startup Operator Training
- 2. Compliance with requirements of Section 01680 Equipment and System Checkout, Certifications and Testing
 - 3. Compliance with requirements of Section 01730 Operation and Maintenance Manuals
 - 4. Compliance with requirements of Section 01750 Spare Parts
 - 5. Compliance with requirements of Section 01751 Lubricants
- E. The Contractor shall be responsible for maintaining all equipment until the dates of substantial completion.
- F. The Contractor shall assist the Owner during startup in any way deemed appropriate by the Engineer.
- G. There will be a date of substantial completion certified by the Engineer for each Phase of construction. These dates will not be certified until the following requirements have been satisfied by the Contractor:
- 1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment processes are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance must meet acceptable standards for the particular unit.
 - 2. All field tests have been completed and satisfactory reports forwarded to the Engineer.
 - 3. All pre-startup training has been completed by the manufacturer's representatives.
 - 4. All spare parts and lubricants have been satisfactorily delivered to the Owner.

1.04 ROLES AND RESPONSIBILITIES

A. Contractor's Responsibilities

- 1. Startup
 - a. Develop specific startup plans and schedule.
 - b. Provide specific startup material and operating supplies until substantial completion or until acceptance of a specific system. Supplies include lubricants, chemicals, gases, specialized fluids, electric power, water (City and non-potable process water) and all other required appurtenances.
 - c. Provide the necessary craft or labor assistance, in the event of an emergency equipment failure requiring immediate attention, (emergency is defined as a failure of function which precludes the further operation of a

critical segment of; or the whole of the work) with a response time of not less than four hours from the time of notification. The time of notification is defined as the time of contact between the Engineer's representative and the Contractor's representative.

- d. Clarify submittals, testing requirements, schedules, or other items related to the startup of the equipment and facilities specified and indicated in the Contract Documents.
 - e. Correct all failures or equipment problems identified during startup when notified by the Engineer.
 - f. Attend meetings related to the review of startup plan(s).
2. Performance Testing (where specified in individual technical specifications Sections 11 through 16).
 - a. Review procedures for performance testing.
 - b. Provide manufacturer's representative to provide guidance during performance testing.
 - c. Provide manufacturer's representatives and operating supplies for retesting of systems that fail to pass the initial performance tests due to deficiencies in products or workmanship at no additional cost to the Owner.
 - d. Resolve and correct all equipment or system failures during the performance testing.
 3. Provide to the Engineer a list of 24 hour, "on call" representative supervisory persons who will monitor the startup and performance testing.

B. Owner's Responsibilities

1. Assist in the startup testing activities. The Owner will endeavor to be cooperative with the Contractor when required. However, it is emphasized that the existing facilities operations and treatment take precedence and only requests that do not adversely affect the flow or treatment will be considered. Additionally, any assistance given to the Contractor must be completed when the Owner's schedule and manpower permit. There may be instances when the Owner cannot provide assistance at the time of the Contractor's request and this shall not be the basis for a claim by the Contractor.
2. Provide staff to operate and maintain equipment, systems, and facilities requiring startup.

1.05 SUBMITTALS

- A. Specific Startup Plans and schedule for all phases of startup.
- B. List of 24-hour "on call" representative supervisory persons

END OF SECTION

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SECTION 01730

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for compiling and submitting operation and maintenance manuals.

1.02 OPERATION AND MAINTENANCE MANUALS

A. General

1. Include all elements and components of the system including instrumentation. Provide a description of how the equipment or complete system works. Additionally, where a number of components are furnished to provide a complete system, describe the operation of components as they relate to the complete system.
2. Include all necessary instruction for the maintenance and operation of the equipment or system in accordance with the manufacturer's recommendations, and as herein specified.
3. Customize the manual so that only data pertaining to the specific equipment or system to be furnished is included. If a standard type manual is utilized, it shall be neatly annotated to highlight the data pertaining to, and deleting the data not pertaining to, the specific equipment or equipment being furnished.
4. Bind each manual for each type of equipment or system separately as specified below

B. Content of Manuals

1. Table of Contents and index. Provide title of Contract and schedule of products and systems, indexed to content of the volume.
2. Brief description of each system and components. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests. Include equipment Nameplate Data (Serial No., Model No., rating, voltage, etc.).
3. Names, addresses, and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
4. One copy of each approved shop drawing and each Contractor's coordination and layout drawing
5. Record drawings of wiring diagrams and control schematics including external connection diagrams.

6. Test and balancing reports, calibration data, alignment records, and other information.
7. Copy of any applicable warranties, guarantees and bonds
8. Operating Procedures:
 - a. Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - b. Manufacturer's printed operating instructions.
9. Maintenance Procedures:
 - a. Complete maintenance instructions (include routine, preventive and corrective maintenance).
 - b. Manufacturer's printed maintenance instructions, parts list, illustrations, and diagrams.
 - c. Include maintenance schedule and types of lubricants. Cross-reference lubricants to products offered by at least three major lubricant suppliers.
10. Spare Parts:
 - a. List of recommended spare parts, manufacturer's current price, and recommended quantity
 - b. Parts lists to include the specific part or identification number used by the manufacturer of the parts. Arbitrary sequential numbers or letters keyed to a sectional diagram are not satisfactory.
11. Additional Requirements: As specified in individual product specification sections.

C. Format

1. Binder

- a. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers; two inch maximum ring size. When multiple binders are used, correlate data into related, consistent groupings. Provide a table of contents in each binder.
- b. All binders to be of similar design and color, but sized to suit the individual manuals with a minimum allowable edge of width of 1 inch.
- c. Identify each manual with a permanent label affixed to the outside binding of the binder and include the following information:
 - 1) Name of Contract, Contract Number
 - 2) Location of equipment or system (i.e. Primary Settling Tanks)
 - 3) Common name of equipment or system (i.e. Chain and Flight Sludge Collectors)
- d. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

2. Material for Content

- a. Loose leaf on 60 pound, punched paper
- b. Holes reinforced with plastic cloth or metal
- c. Page size, 8 1/2 by 11 inches
- d. Diagrams, illustrations, and attached foldouts as required, of original quality, reproduced by dry copy method
- e. Drawings: Provide with reinforced punched, binder tab. Bind in with text; fold larger drawings to size of text pages

1.03 SUBMITTALS

- A. Sample of typical binder, cover and tabbed fly leaf.
- B. Provide one (1) electronic copy (.pdf) and six (6) copies of O&M manuals for approval no later than the time that the equipment is delivered to the site. If the manual is satisfactory, the Engineer will retain all six (6) copies. If the manual is not satisfactory, the Engineer will retain one (1) copy and return five (5) copies to the Contractor. When manuals are resubmitted, one (1) electronic copy (.pdf) and six (6) copies will again be required. When the manual is satisfactory, except for some missing information, the Engineer may, at his option, retain all six (6) copies of the manual and request six (6) copies of the additional information to be provided.
- C. All manuals pertaining to equipment or a system within each specific components of construction must be completely approved prior to the Field Acceptance Tests of that component.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01740

WARRANTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1.02 SUBMITTAL

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than a date of Substantial Completion for the Work, or a designed portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner prior to acceptance of this portion of the Work.
- C. Refer to individual Sections of Division 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.

1.03 WARRANTY REQUIREMENT

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the contract Documents.
- F. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.04 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01750

SPARE PARTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Spare parts which are identical and interchangeable with original parts shall be provided with equipment as specified in each Section of the Specifications. Spare parts shall be individually packaged in boxes bearing the equipment reference, tag number, and part identification (Example: Primary Scum Pump No. 1).
- B. Subsequent to the approval of the appropriate operation and maintenance manuals but prior to the delivery of the spare parts, the Contractor shall prepare and submit an itemized tabulation of all spare parts to be provided. The tabulation shall include the name of the equipment for which the spare part is intended, type of spare part, manufacturer of spare part, manufacturer model or manufacturer identification number of spare part, quantity of spare part, and page in the appropriate operation and maintenance manual detailing the parts list.
- C. Spare parts shall be stored by the Contractor in a location approved by the Engineer. Unless otherwise directed by the Engineer, the Contractor shall deliver the spare parts to the Owner at the time of "Substantial Completion." Spare parts shall be stored in accordance with the manufacturer's written recommendations, and shall be protected against theft, vandalism, weather, and all other adverse conditions. Spare parts delivered to the Owner shall be in new, undamaged condition. Upon delivery to the Owner, spare parts shall be logged in against the above noted tabulation and inspected by the Contractor in the presence of the Engineer. Any missing or damaged spare parts shall be replaced by the Contractor at no expense to the Owner.

1.02 SPECIAL TOOLS

- A. Provide special tools required for operation, service, or maintenance of the products as specified or as needed, as determined by the manufacturer's representative.
- B. Pack items to protect them during storage. Tag items and containers to clearly identify them.

1.03 CONTRACT SPECIFIC REQUIREMENTS

- A. Specific requirements for spare parts for this contract are included in the technical specifications.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01751

LUBRICANTS

PART 1 GENERAL

1.01 REQUIREMENTS

- A. The Contractor shall furnish and deliver to the Owner such oil, grease and any special lubricants that are necessary for proper operation of all equipment furnished under this contract. The quantity furnished shall be sufficient for one year's operation after the date of substantial completion. The grade of lubricants furnished shall be in accordance with the recommendations of the equipment manufacturers.
- B. Subsequent to the approval of the appropriate operation and maintenance manuals but prior to the delivery of the lubricants, the contractor shall prepare and submit an itemized tabulation of all lubricants to be provided. The tabulation shall include the name of the equipment for which the lubricant is intended, its tag number, type of lubricant, manufacturer of lubricant, frequency of lubrication, quantity of lubricant required for one year, and page in the appropriate operation and maintenance manual referencing the lubricant.
- C. All lubricants shall be delivered to the Owner prior to the start-up of the equipment. They shall be delivered in the manufacturer's unopened containers and shall be labeled with the equipment name for which it is to be used. At the time of delivery they shall be logged in against the above noted tabulation and inspected by the Contractor in the presence of the Engineer.
- D. The Contractor shall also furnish and deliver to the Engineer such grease guns and auxiliary lubricating devices as are required to conveniently maintain all equipment furnished. As a minimum, one grease gun and accessories will be furnished for each individual item of equipment requiring lubrication.
- E. Prior to substantial completion, the Contractor shall submit an "Equivalent Lubrication Table" which shall list equivalent products from at least four major oil companies for all lubricants that will be required for all the equipment provided under this Contract.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01800

MAINTENANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for maintaining work completed under this Contract.

1.02 MAINTENANCE PERIOD

- A. The general maintenance period for all construction or materials under this Contract shall be one (1) year subsequent to the date of the acceptance of the work by the Owner, or as provided by other sections of this Specification.
- B. If the Owner puts any structure or equipment to use prior to acceptance of all work under the Contract, the maintenance period for such structures or equipment shall be calculated from the time use begins.
- C. Contractor agrees to replace the material which does not conform to the Contract requirements, and to repair any damage of material or work without cost to the Owner, to satisfaction of Engineer, in conformance with Contract Documents provided orders for replacement and/or repairs are received in writing by the Contractor within the one year period.
- D. This Section shall in no way limit the duration of the Contractor's responsibility for the correction of any defect due to workmanship or materials provided by the Contractor which are not in compliance with the Contract Documents.

1.03 ABUSE OF WORK

- A. Contractor is not obligated to perform work of replacement or repair that he may prove is required because of abuse by parties other than the Contractor, after the date the Owner puts to continuous use the work requiring replacements or repair, or after date the Owner has approved the Certificate of Completion.

1.04 EMERGENCY REPAIRS

- A. If the Owner deems necessary, the Owner shall order replacement or repairs be undertaken within 24 hours.
- B. If the Contractor delays or fails to make the ordered replacement or repairs within the time specified, the Owner shall have the right to make such replacements or repairs

and the expense shall be deducted from moneys due the Contractor, or moneys of the Contractor retained by the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01810

MAINTENANCE OF OPERATIONS AND SEQUENCE OF CONSTRUCTION

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. The existing wastewater treatment facility will be maintained in continuous operation by the Owner at all times during the entire construction period. The Contractor shall schedule his operations to conform with the requirements specified herein, and shall include in his construction progress schedule all events which will impact operation of the existing treatment facilities.
- B. The Contractor shall at all times conduct his operations so as to interfere as little as possible with existing works. The Contractor shall develop a program, in cooperation with the Engineer and interested officials, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as deviations there from are expressly permitted. All work of connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time and when the demands on the facilities best permit such interference, even though it may be necessary to work outside of normal working hours to meet these requirements. Before starting work which will interfere with the operation of existing facilities, the Contractor shall perform all preparatory work and shall see that all labor, tools, materials, and equipment are made ready and at hand.
- C. The Contractor shall make minor modifications in the work relating to existing structures as may be necessary to satisfactorily complete the work, without additional compensation.
- D. The Contractor shall plan and conduct his work so that such work does not adversely impact the intended plant operation. The Contractor's operations shall in no way cause a reduction in the effluent quality or create any nuisance not normally attributable to such operation, unless approved by the Owner, Engineer and State regulatory agencies. It shall be the Contractor's responsibility to ensure complete compatibility with the plant operations in his working schedules.
- E. All costs associated with maintaining existing flows and plant operations, including providing, maintaining, operating, and removal of all equipment and required appurtenances, shall be considered part of the bid price for the work being constructed. It being understood and agreed to by the Contractor that the price, as indicated in the bid, shall constitute full and complete compensation to the Contractor

for providing all provisions necessary and/or required for maintaining flow during construction.

- F. The Burrillville WWTF is designed to treat average daily flow of 1.5 MGD and peak hourly flow rate of 4.5 MGD. Unless specifically noted below, the construction activities under this Contract shall not, under any circumstances, reduce the treatment capability of the plant. The treatment capability of the plant refers to all portions of wastewater treatment including disinfection and on site utilities including but not limited to city water, plant effluent water, electrical power and instrumentation wiring, natural gas, and chemical lines.
- G. Any approved construction activity which will affect the treatment capability of the plant shall be done, unless otherwise approved by the Engineer, during low influent flow periods. Low influent flow periods are defined as early weekday and weekend mornings (between MIDNIGHT and 7 A.M.), during dry weather periods only. The Contractor may work on the existing facilities at such times if he so chooses.
- H. The Oakland pump station is designed to discharge 300 GPM or 0.432 MGD. The construction activities under this Contract shall not, under any circumstances, reduce the pumping capacity of the pump station.

1.02 RELATED WORK

- A. Section 00700 - General Conditions
- B. Section 00800 - Miscellaneous Conditions
- C. Section 01010 - Summary of Work
- D. Section 01300 - Submittals
- E. Section 01310 - Construction Progress Schedule
- F. Section 01510 - Temporary Utilities
- G. Section 02149 - Maintaining Existing Flow

1.03 SUBMITTALS

- A. Submit, in accordance with the provisions of Section 01300, complete descriptions of procedures to maintain plant operation to supplement the construction progress schedule developed in accordance with Section 01310. The description shall include

step-by-step procedures, required duration, and specific procedures required to be performed by the Owner's personnel.

1.04 SCOPE OF WORK

A. The general items of work in this construction contract include, but are not necessarily limited to the following:

- Headworks Facility
 - Installation of a new influent channel fine screen unit
 - Installation of a new washer / compactor unit for screenings
 - Electrical work associated with the new equipment
 - Instrumentation and Control equipment
 - Demolition of existing seal water system and associated equipment
 - Construction and operation of a temporary bypass system
 - HVAC improvements
 - Fire alarm improvements
- Oakland Pump Station
 - Demolition of two (2) existing wastewater pumps, piping, valves, and appurtenances
 - Installation of two (2) **25-hp** wastewater pumps, piping, valves, and appurtenances
 - Remove existing generator and underground storage tank
 - Installation of new generator with integral fuel storage tank
 - Electrical associated with the new equipment
 - Construction and operation of a temporary bypass system
 - Wet well modifications as shown and specified
- All related temporary bypass pumping, civil, architectural, structural, heating and ventilation, plumbing, electrical and instrumentation control work, yard piping and site work.

1.05 CONTRACTOR'S AND OWNER'S RESPONSIBILITIES AND LIMITATIONS

A. The Contractor's construction activities shall not disrupt any wastewater conveyance or treatment operation, no matter how minor, without the approval of the Engineer and Owner.

B. The Contractor shall not operate or utilize any existing plant facilities. This includes the starting and stopping of equipment, the opening and closing of valves or the use of existing piping. Whenever the construction work requires action by the Owner, the Contractor shall so notify the Engineer as described below.

C. The Contractor shall notify the Engineer in writing of any construction activity that will affect any of the Owner's treatment operations or require assistance from the Owner in operating any existing facilities. This notification shall be received at least

one week prior to the planned construction work. The request shall clearly detail the Contractor's planned work, how his work will affect the operation of the existing facilities, the estimated duration of the work, and any assistance required of the Owner. The Contractor's request shall also explain why other construction methods, which may have less of an impact on treatment operations, are not feasible.

- D. It is emphasized that the operations of the existing facilities take precedence over all construction activities. Denials of requests from the Contractor for the Owner's assistance in modifying his plant operations shall not be a basis for any claim by the Contractor. Any approved assistance given to the Contractor from the Owner will be provided when the Owner's schedule and manpower permit. The Contractor shall also provide access for the Owner's personnel to all existing facilities at all times throughout the construction period.

1.06 SEQUENCE OF CONSTRUCTION

- A. The detailed schedule for construction shall be based upon the schedule submitted by the Contractor and approved by the Engineer as specified above. However, as a guide for bidders in the preparation of their bid and for the Contractor in the preparation of his schedule, scheduling requirements are described below for specific portions of the work.
- B. The order of construction shall be subject to the approval of the Engineer; such approval or direction, however, shall in no way relieve the Contractor's responsibility to perform the work in strict accordance with the Contract Documents. The construction plans and specifications have been developed to minimize the construction impacts on the operation of the pumping stations and Wastewater Treatment Facility. The Contractor shall note the requirements of Section 01010 with regard to the operation of the plant and the phasing of construction when developing his work sequence. The Contractor's work sequence must be specifically detailed in the CPM which is required under Section 01310.
- C. Whenever the Contractor's proposed work will require the Owner to deviate from the normal operation of the plant, the Contractor shall so notify the Engineer in writing. Such notification shall be submitted one week prior to the planned construction activity and shall include all information as described in Section 01010.
- D. Contractor should note that other construction activities being performed under separate contracts will be underway at the time this contract is awarded. Contractor shall coordinate activities, as required, to minimize conflicts with other construction activities being performed on the property.
- E. A large portion of the work will be constructed in phases. Prior to proceeding to a second related phase of work, the first phase of work must be completed in its entirety, including all related appurtenant work. All items within that system must be

operational including instrumentation and controls, including alarms. In addition, compliance with the requirements of the following specifications must be achieved for a phase to be considered completed:

1. Section 01680 - Checkout, Certification and Testing
 2. Section 01710 - Startup
 3. Section 01730 - Operation and Maintenance Manuals
 4. Section 01735 - Services of Manufacturers Representatives
 5. Section 01750 - Spare Parts
 6. Section 01751 - Lubricants
- F. The Contractor shall note the following scheduling requirements to maintain plant operations. These requirements should be incorporated into the planned work sequence.

G. Scheduling Requirements to Maintain Operations

1. Headworks Facility
 - a. Scheduling and Requirements
 - The Contractor shall notify the Engineer in writing two weeks prior to beginning work on the Screenings Channel
 - The Contractor will isolate/drain the wet well/channel, remove excess wastewater, including excess grease, grit, and rags. The Contractor will also be responsible for additional cleaning, as required, to complete the work and protect the Contractor's personnel.
 - New equipment must be successfully started up and remain operational as intended for a minimum of 5-days prior to taking the bypass system offline.
 - The Contractor will be required to construct temporary bulkhead(s) and install/operate a bypass system(s), as required, to isolate the Headworks for equipment (gates and screenings) demolition and installation.
2. HVAC
 - a. Scheduling Requirements
 - HVAC improvements must be conducted during mild weather, with temperature above freezing and below 85 degrees F.
 - b. See Specification 01015 Special Conditions for ventilation requirements
 - c. Suggested Sequence of Construction
 - Refer to Division 15 and H&V drawings.

END OF SECTION

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DIVISION 02

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SECTION 02050

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes requirements for demolition of existing facilities and removal of equipment and materials for reuse or salvage.
- B. Items scheduled for demolition are shown on the Contract Drawings.
- C. Items or areas scheduled for partial or selective demolition are shown on the Contract Drawings.
- D. Refer to Specification Section 01060 for removal of above ground storage tank permit requirements.

1.02 SUBMITTALS

- A. Shop Drawings
 - 1. In accordance with Specification Section 01300
- B. Quality Assurance/Control Submittals
 - 1. Methods of demolition and equipment proposed for use in demolition
 - 2. Copies of Permits required for demolition.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Utilities
 - 1. Notify Owner to turn off affected services prior to demolition.
 - 2. Remove utilities to be abandoned as a result of demolition.
 - 3. Seal water, sewer, and services as shown on Contract Drawings using plugs, caps or seals as needed.
 - 4. Temporary Sewer Bypass system shall be installed, started up, tested, and accepted prior to any demolition work.
- B. Equipment Salvage and Reuse
 - 1. Do not remove equipment or materials without approval of Engineer.

2. Properly store and maintain equipment and materials to be reused in the Work.

3.02 SEQUENCE

A. See Section 01800 - Maintenance.

3.03 SAFETY

A. Protect persons and property throughout progress of work.

B. Have acceptable fire extinguishers available at all times where demolition by burning torches is being conducted.

C. Burning of demolition debris not permitted on or near site.

D. Explosives not to be used or brought to site without prior written permission by Engineer.

E. Maintain circulation of traffic within area of demolition operations.

F. Provide and maintain lights, barriers and temporary passageways for safe access within area of demolition operation.

G. Take precautions to minimize spread of dust and flying particles. Keep work area wetted down to prevent dust from rising.

H. Provide maximum practical protection from inclement weather to materials, equipment and personnel in partially dismantled structures.

3.04 DEMOLITION

A. Dismantle and remove existing piping, pumps, motors, equipment and other appurtenances indicated without damaging existing structures, equipment and appurtenances to remain.

B. Confine demolition work, new construction and operations to areas that will not interfere with continued use and operation of water pump station.

C. Floors and/or roofs, shall not be overloaded. Complete demolition on upper levels before disturbing supporting members on lower levels. Provide storing and bracing where necessary to prevent settlement or displacement of existing or new structures.

D. On exposed surfaces, at the joint between old and new concrete, the existing concrete shall be removed to a straight rather than a rough line.

E. Piping

1. Remove piping to be abandoned as indicated, specified and directed by Engineer or if it interferes with new work.
2. Remove to nearest solid support, cap and leave in place piping not indicated to be removed or interfering with new work.
3. Piping to be removed which passes through an existing wall shall be cut off and properly capped on each side of the wall.
4. Underground piping to be abandoned and remain shall be properly capped unless it interferes with new structures or as indicated, specified and directed by Engineer.

3.05 REPAIR/RESTORATION

- A. Repair or remove and replace items not scheduled for demolition damaged by Contractor's operations to original condition as directed by Engineer.
- B. The Contractor shall exercise extreme caution when removing sections of concrete from slabs or walls that are to be utilized as part of the new construction. Demolition shall be to the exact limits indicated on the Drawings. Over-excavated concrete shall be replaced at the Contractor's expense and to the satisfaction of the Engineer. Any damage to the remaining structure caused by the Contractor's operations shall be satisfactorily repaired at the Contractor's expense.

3.06 DISPOSAL

- A. The contractor shall provide a disposal plan for approval by the Owner and Engineer. Contractor shall provide all receipts, bills of lading, manifests and other applicable documentation for any offsite disposal.
- B. All mechanical equipment, including generators, interior piping and other appurtenances indicated on the drawings or specified and directed by Engineer to be demolished or removed will be removed from the property of the Owner immediately after disassembly and will become the property of the Contractor. The Owner reserves the right to remove any equipment or piping prior to signing of the agreement.
- C. Debris from structures, including concrete, masonry, steel or other rubble shall become the property of the Contractor, unless otherwise directed by the Engineer, and shall be promptly removed from site at the Contractor's expense.

3.07 CLEANING

- A. Leave affected areas of demolition in a clean, safe and orderly condition, ready to accept new work if proposed.

END OF SECTION

SECTION 02055

REMOVAL AND DISPOSAL OF UNDERGROUND STORAGE TANKS

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred in the text by the basic designation only.

- A. American Petroleum Institute (API)
 - 1. API RP 1604 - 1987 (supp. 1989) Removal and Disposal of Used Underground Petroleum Storage Tanks
 - 2. API PUBL 1628 - 1989 Assessment and Remediation of Underground Petroleum Releases
- B. Code of Federal Regulations (CFR)
 - 29 CFR 1910 - Occupational Safety and Health Standards
- C. Rhode Island Department of Environmental Management (RIDEM)
 - DEM-OWM-UST-08-07 – Rules and Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials

1.02 DESCRIPTION OF WORK

The Work includes removing and disposing of one (1) underground storage tank and connected piping, tank inspections, and backfilling. The underground storage tank is one (1) 600-gallon diesel tank at the Spring Lake Pump Station.

The temporary bypass system shall be in place, tested, and operating, prior to removing the tank from service, to ensure that pumping station operation is not interrupted.

1.03 CLOSURE APPLICATION AND REQUIRED FEES

The Contractor shall complete and submit the appropriate closure application and submit the closure fee (\$75.00 per tank) to the RIDEM Division of Waste Management Underground Storage Tank section on behalf of the Owner. The Contractor shall submit applications and checks within seven (7) calendar days from the Notice to Proceed and at least ten (10) business days prior to the date that the underground storage tanks are to be permanently removed from service. At the Owner's expense, the Owner will be represented by qualified environmental personnel during the course of all work described in this section. The Owner's representative will prepare any necessary closure documentation and will submit such documentation to the RIDEM.

1.04 NOTIFICATIONS

- A. With proper notification to the RIDEM and the Owner, work may commence upon approval of the closure application by the RIDEM.
- B. Local fire safety officials must be notified concerning removal activities.
- C. The Contractor must notify the RIDEM Division of Waste Management Underground Storage Tank Section, 72 hours in advance of planned UST excavation for the project (401-222-2797).
- D. DIG-SAFE must be notified at least 72 hours prior to underground tank removals.

1.05 QUALIFICATIONS (CONTRACTOR EXPERIENCE)

- A. Prior to start of Work, submit data for approval showing that the tank removal Contractor, subcontractors, and personnel employed on the project have been engaged in removal, transportation, and disposal of underground tanks and associated piping, are familiar with and shall abide by the following:
 - 1. API RP 1602.
 - 2. 40 CFR 280 and State and local regulations and procedures.
 - 3. Applicable safety rules and regulations.
 - 4. Use of equipment and procedures for testing and vapor-freeing tanks.
 - 5. Handling and disposal of types of wastes encountered in underground tank and pipe removal including disposal of underground tanks and associated piping.
 - 6. Excavation, testing, and disposal of petroleum contaminated soils, liquids and sludge.
 - 7. Provide documentation that tank removers are certified.
- B. In addition, provide data proving experience on at least three prior projects which include types of activities similar to those in this project. Provide project titles, dates of projects, owners of projects, point of contact for each project, and telephone numbers of each point of contact.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 REMOVAL AND DISPOSAL OF TANK

Furnish labor, materials, equipment, necessary permits, laboratory tests, and reports to remove and dispose of products remaining in the underground tank; clean and purge the underground tank and associated piping, and backfill to the level of the adjacent ground. Dispose of tank and associated piping, and residual fuel and sludge from the underground storage tank.

3.02 SPILL AND DISCHARGE CONTROL PLAN

Develop, implement, maintain and submit to the Engineer a comprehensive spill and discharge control plan for review and approval. The plan shall provide contingency measures to control and mitigate potential spills and discharges from handling and transporting contaminated soils and water. A possible source of guidance for assessment and remediation is API PUBL 1628.

3.03 EXCLUSION ZONE (EZ) AND CONTAMINATED REDUCTION ZONE (CRZ)

Personnel not directly involved with the project shall not be permitted to enter work zones, which shall be an area located a minimum of 10' from the limits of the tank excavation.

3.04 TRAINING

Furnish copies of current OSHA training certification statements for Contractor personnel prior to initial entry into the work site.

3.05 PERSONNEL AND EQUIPMENT DECONTAMINATION

Decontaminate personnel and equipment before exiting the work zones.

3.06 UNFORESEEN HAZARDS

Notify the Owner of any unforeseen hazard or condition which becomes evident during work.

3.08 STORAGE TANK DATA

Tank No.	Tank Capacity	Date Installed	Type of Lining	Type of Fuel	Remarks
1 Oakland	600	1991	None	Diesel	4.0' diameter 8.0' long. Buried approx. 2.5' below grade - in use.

3.09 FUEL REMOVAL

All possible fuel will be pumped or otherwise removed from the tank by the Contractor. Evacuated product will be temporarily stored on-site and put into new tank when installed. Alternatively, it may be sold to a local fuel oil supplier or otherwise disposed. Residual fuel and sludge shall be considered contaminated or waste fuel and pumped into 55-gallon drums or other suitable containers for disposal in accordance with approved procedures meeting local, state, and federal regulations. Drums or tanks used for containerizing waste fuel shall be furnished by the Contractor.

3.10 TEMPORARY CONTAINMENT OF EXCAVATED SOIL

Provide temporary containment in areas designated by the Owner. Refer to Section 02075 for means to handle petroleum contaminated soil.

3.11 EXCAVATION

Notify the Owner at least 48 hours prior to start of tank removal work. Stage operations to minimize the time that tank excavations are open and the time that contaminated soil is exposed to the weather. Provide protection measures around the excavation area to prevent surface water runoff from entering and to prevent erosion of stockpiled soil within the excavation area.

3.11.1 Excavation Procedures

Excavate, as required, to remove tanks and piping. Place soil removed from the excavation in a temporary containment area. Location of the containment area shall be coordinated with the Owner and the Engineer prior to excavation. Non-contaminated soil materials may be used as backfill for tank and pipe excavations upon approval by the Owner, Engineer or by the regulatory agency. To determine soil contamination levels, the Engineer shall continuously monitor excavated soil materials with a Portable photoionization detector (PID) capable of detecting total volatile organic vapor concentrations to a minimum of 1.0 ppm. Contaminated soil with PID readings of 10 ppm or greater shall be stockpiled for further testing prior to disposal. Soils with PID readings less than 10 ppm may be used as clean backfill. Contaminated soils shall be disposed of in accordance with local, State and Federal regulations.

3.11.2 Petroleum contaminated soil shall be stockpiled on a minimum of two layers of six mil polyethylene sheets with hay bales surrounding the pile for proper stormwater control. At the end of each working day or at the completion of excavation activities, whichever occurs first, the Contractor shall cover the stockpiled soil with a minimum of one layer of six mil polyethylene sheeting.

- 3.11.3 Contaminated soil shall be removed from site within thirty (30) days of stockpiling. Documentation in the form of a receipt of the final disposal shall be forwarded to the RIDEM Office of Waste Management no later than ten (10) days after disposal.
- 3.11.4 Soil removal methods and equipment shall be selected to minimize disturbance to areas beyond the limits of the excavation area. Material that becomes contaminated as a result of the Contractor's operations shall be removed and disposed of at no additional cost to the Owner. Where excavation extends below the groundwater table, dewatering methods shall be employed on a localized basis to facilitate excavation operations. Potentially contaminated water generated by dewatering during excavation required for removal of tanks or piping, surface water collected in open excavation, or water used for washing equipment or existing concrete or bituminous surfaces, shall be collected and tested in accordance with EPA SW-846 and EPA 600-4-79-20 and state or locally required analyses.
- 3.11.5 During excavation activities, if asphalt pavement, concrete slabs, or other structures are encountered, remove and wash with high pressure, water cleaning equipment if contaminated. Remove and dispose of the pavement, concrete, and other structures as directed by the Engineer and as specified in Section 02050, "Demolition and Removal".

3.12 TESTING

3.12.1 Stockpiled Soils

At no additional expense to the owner, the Contractor shall sample the stockpiled soils for characterization prior to disposal. Analyses shall be run for the criteria established by the contractor's selected disposal facility.

3.13 WATER DISPOSAL

Dewatering will be permitted only with approval of the Owner. Water generated during removal of tanks and piping shall be stored and tested. If contaminated, transport and dispose of water in accordance with local, State and Federal requirements.

3.14 REMOVAL OF UNDERGROUND TANKS ANCHORS, SLABS, AND ASSOCIATED PIPING

3.14.1 Tank Purging

Remove flammable vapors in accordance to API PUBL 2015. Tanks shall be certified as "vapor free" prior to further work.

3.14.2 Cleaning and Testing

Cleaning and tank atmosphere testing shall be in accordance with Section 13219, "Cleaning Petroleum Storage Tanks", and with API PUBL 2015.

Distribution (product delivery) piping shall be cleaned and removed. Test the tank atmosphere and the excavation area for flammable, or combustible vapor concentrations, with a combustible gas indicator until the tank is removed from the excavation and from the site.

3.14.3 Tank and Piping Removal

Prior to removal of the tank, the Contractor shall cut and cap existing fuel oil supply and return lines as directed by the Owner or Engineer. The tank shall then be placed on a level surface and rendered useless in accordance with API RP 1604.

3.14.4 Concrete Slabs

Concrete slabs associated with the UST shall removed and disposed of by the Contractor.

3.15 CLOSURE REPORT (CLOSURE ASSESSMENT REPORT)

A closure assessment, if necessary, will be prepared by the Owner or their independent representative. The Contractor is not responsible for this item.

3.16 BACKFILL

Provide backfill, compaction, and grading in accordance with Sections 02200 "Earth Excavation, Backfill, Fill and Grading" and detailed on civil detail sheets.

END OF SECTION

SECTION 02075

HANDLING AND DISPOSAL OF PETROLEUM CONTAMINATED SOIL

PART 1 GENERAL

1.01 DESCRIPTION

- A. The quantity of petroleum-contaminated soil that requires specialized handling and disposal shall be determined by the Owner and/or Engineer.
- B. This item includes the proper removal, handling, on-site storage, transportation and disposal of petroleum contaminated soil. The Contractor is responsible for the appropriate testing for disposal purposes.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL

- A. Potentially contaminated soil will be removed under the direction of the Engineer and/or Owner and stockpiled on-site for proper testing. The Contractor is responsible for all appropriate testing for disposal purposes.
- B. Petroleum contaminated soil shall be stockpiled on a minimum of two layers of six mil polyethylene sheets with hay bales surrounding the pile for proper storm water control. At the end of each working day or at the completion of excavation activities, whichever occurs first, the Contractor shall cover the stockpiled soil with a minimum of one layer of six mil polyethylene sheeting.
- C. Contaminated soil shall be removed from site within thirty (30) days of stockpiling. Documentation in the form of a receipt of the final disposal shall be forwarded to the RIDEM Office of Waste Management no later than ten (10) days after disposal.

END OF SECTION

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SECTION 02100
SITE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for removal of vegetation and topsoil at the site.

1.02 DEFINITIONS

- A. Clearing: Removal of trash, vegetation, or organic matter alive or dead.
- B. Grubbing: Removal of vegetation including stumps, buried logs and roots.
- C. Scalping: Removal of grass turf to a depth of 3 inches.
- D. Stripping: Removal of top soil after scalping operation is complete.

1.03 QUALITY ASSURANCE

- A. Obtain Engineer's approval of staked work limits prior to starting the clearing, grubbing, and stripping.

1.04 PROJECT/SITE CONDITIONS

- A. Environmental Requirements
 - 1. Install erosion and sediment controls prior to starting the Work.
- B. Existing Conditions
 - 1. Temporarily remove property improvements, to the minimum extent necessary, to complete the work and restore improvements to condition which existed prior to construction.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Chips from cleared trees and brush.

PART 3 EXECUTION

3.01 PROTECTION

- A. Do not cut or injure any trees or other vegetation outside the limits of disturbance as indicated on the drawings.
- B. Trees, shrubbery, or planting, along the traveled highways or roads, shall not be removed except with the written approval of the Engineer.
- C. Preserve certain vegetation such as trees, shrubs, hedges and plants within the construction area, as indicated on the drawings to be protected.
- D. Work In Improved Property
 - 1. Protect trees, cultivated hedges, lawns, shrubs, and plants that might be damaged by the Contractor's operations.
 - 2. Temporarily replant and care for trees less than 4 inches in diameter that would be damaged by the construction operation. After the construction operations have been substantially completed, replant in their original positions and care for until growth is reestablished. If trees, cultivated hedges, lawns, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced at the Contractor's expense by items of kind and quality existing at the start of the work.
 - 3. Do such handwork as may be required to prevent damage to buildings and improvements.
 - 4. Protect fences and stone walls and if needed to be removed to facilitate construction or if damaged, upon completion of the work, properly restore or repair to at least as good condition as existed prior to start of the work.

3.02 CLEARING

- A. Cut or remove all trees, saplings, brush, and vines, windfalls, logs, and trees lying on the ground, dead trees and stubs more than 1 foot high above the ground surface.
- B. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and the stubs to be cleared shall be cut as close to the ground surface as practicable, but no more than 6-inches above the ground surface in the case of small trees, and 12-inches in the case of larger trees. Saplings, brush, and vines shall be cut off close to the ground.
- C. Selective Trimming

1. Cut back limbs and branches of trees to be preserved only to the extent necessary for construction.
2. Trim neatly, and cleanly so that the remaining tree will not be damaged and healing will be facilitated. Where limbs and branches over 1 inch in diameter have been cut, the newly cut area of the tree shall be given a thorough application of approved tree-healing paint.

D. Salvaged Wood

1. Logs, timber and other wood removed in the course of clearing found to be acceptable, as determined solely by the Engineer, shall remain the property of the applicable private property owner or the Owner, unless otherwise directed by the Engineer.
2. Cut logs, timber and other wood in 4 foot lengths and stack, as directed by the Engineer.
3. Prior to the final completion of the contract, all unclaimed logs, timber and other wood previously cut and stacked shall be removed from the site and properly disposed of by the Contractor at no additional cost to the Owner.

E. Chips from Cleared Wood and Brush

1. Stockpile for future use on cleared easements as indicated on the Drawings.
2. Spread at locations shown on the drawings once work is substantially complete.
3. If the wood chips from the cleared wood are not of sufficient amount, the Contractor at his own expense shall furnish the required amount to provide a minimum thickness as shown on the Contract Drawings.
4. Elm wood and elm bark shall not be used as chips for ground cover.

3.03 GRUBBING

- A. Remove completely all stumps.
- B. Remove to a depth of 12-inches all roots larger than 3-inches in diameter.
- C. Remove to a depth of 6-inches all roots larger than 1/2-inches in diameter.
- D. Measure depths from the existing ground surface or the proposed finished grade, whichever is the lower.

3.04 STRIPPING

- A. Strip topsoil, loam and unsuitable earth from the ground surface in areas cleared and grubbed.

- B. Utilize topsoil and loam, where possible, for finished surfacing.
- C. All loam to remain on site.
- D. Dispose of unsuitable materials off site at authorized disposal location.

3.05 DISPOSAL OF CLEARED AND GRUBBED MATERIALS

- A. Dispose of cleared and grubbed materials off site at authorized disposal location.
- B. Such disposal shall be carried on as promptly as possible after removal of material in the clearing and grubbing operations and shall not be left until the final period of cleaning up.
- C. Elm bark whether stripped from the wood or intact with the wood shall be either buried at least 1 ft. below grade in approved dumping areas or burned in a suitable incinerator off-site with satisfactory anti pollution and fire prevention controls to prevent the spread of Dutch Elm Disease.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for designing, furnishing, installing, maintaining, operating and removal of temporary dewatering systems required to lower and control water levels and hydrostatic pressures during construction.
2. Requirements for disposing of pumped water.

B. Related Sections

1. Section 02160 – Excavation Support
2. Section 02200 – Earth Excavation, Backfill, Fill, and Grading.

1.02 DEFINITIONS

- A. Dewatering: Lowering the zone of saturation and intercepting groundwater seepage which would otherwise emerge from the slopes or bottom of the excavations. The purposes of dewatering are to increase the stability of excavated slopes; prevent loss of material from beneath the slopes or bottom of the excavation; improve the excavating and hauling characteristics of on site soil; prevent rupture or heaving of the bottom of an excavation; and dispose of pumped water. In addition, dewatering is required to place and compact structural fill.

1.03 DESIGN REQUIREMENTS

- A. The Contractor is responsible for the adequacy of the dewatering system.

B. Design dewatering systems to:

1. Effectively reduce the hydrostatic pressure and lower the groundwater levels to a minimum of 2 feet below excavation in soil;
2. Develop a substantially dry and stable subgrade for the protection of subsequent operations;
3. Result in no damage to adjacent buildings, structures, utilities and other work, included in this contract.
4. Depressurize stratified layers of sand that may be confined by silt layers so that a stable excavation bottom is maintained.

- C. Methods may include sump pumping, single or multiple stage well point or jet eductor well point systems, deep wells, or combinations thereof.

- D. Locate dewatering facilities where they will not interfere with existing utilities, facilities and/or construction work to be done under this Contract.
- E. Contractor is responsible to obtain all necessary permits from state and local authorities regarding the operation and discharge of the dewatering system, and to conduct all necessary sampling and testing that may be required by those authorities.

1.04 SUBMITTALS

A. Shop Drawings

- 1. In accordance with Section 01300 submit the following prior to dewatering system installation:
 - a. Proposed system components.
 - b. Operational plan to include locations and depth of components.
 - c. Method of disposal of pumped water, including method of insuring proper sediment removal should upset in dewatering system occur.

B. Quality Assurance/Control Submittals

- 1. In accordance with Section 01300 submit the following:
 - a. Dewatering systems to be designed under the direct supervision of a professional Civil Engineer registered in the state which the work is to be done.
 - b. Complete Certificate of Design at the end of this section.
 - c. Provide documentation demonstrating ability and experience of installing contractor for the type of conditions under this contract.
 - d. Names, addresses and telephone numbers of supervisory personnel actively involved in at least five successful projects requiring dewatering.

1.05 PROJECT/SITE CONDITIONS

A. Environmental Requirements

- 1. Dispose of all pumped water in accordance with agencies having jurisdiction.

B. Existing Facilities

- 1. Direct discharge to the Clear River is not permitted.

C. Existing Conditions

- 1. Due to proximity to the Clear River groundwater is expected to be encountered. The approximate groundwater elevation is shown in the Contract Drawings.
- 2. Groundwater surface is subject to fluctuations during periods of heavy precipitation.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Surface Drainage

1. Construct dikes, ditches, pipe lines, sumps or other means to intercept and divert precipitation and surface water away from excavations.

B. Drainage of Excavated Areas

1. Construct dikes, ditches, pipe lines, sumps or other means to collect surface and seepage water which may enter the excavation.
2. Discharge water through settling basins or method approved by Engineer when water is to be deposited into an existing watercourse.

3.02 INSTALLATION

- #### A. Advise Engineer of changes made to Operation Plan as submitted under article 1.05 of this section, made to accommodate field conditions.

3.03 MONITORING

- #### A. Observe and record daily the elevation of the groundwater during the length of the dewatering operation and provide data to Engineer on daily basis.

3.04 OPERATION

- #### A. Operate dewatering systems to lower the groundwater level in excavations allowing all subsequent work to be done on a stable dry subgrade.
- #### B. Modify dewatering procedures which cause, or threaten to cause, damage to new or existing facilities, to prevent further damage. Modifications made at no additional expense to the Owner.
- #### C. Maintain the water level a minimum of two (2) feet below subgrade or at lower elevation to eliminate hydrostatic pressure on structures.
- #### D. Prevent disturbance of foundation soils and loss of ground as water is removed.
- #### E. Notify the Engineer of disturbance to the foundation soils caused by an interruption or inadequacy of the dewatering system.
- #### F. Maintain on site, auxiliary equipment to operate the dewatering system continuously while excavations are opened below elevation of final grade.

3.05 DISPOSAL OF WATER

- #### A. Discharge water in a manner that will not cause erosion, flooding, damage to existing facilities, completed Work or adjacent property, improved or otherwise.

3.06 REMOVAL

- A. Remove all material and equipment from the site upon completion of dewatering operations.
- B. Seal all dewatering wells upon completion of the dewatering by pressure injecting a grout capable of sealing the wells and preventing leakage.

END OF SECTION

CERTIFICATE OF DESIGN

Re: Contract Between

OWNER: _____
(Name)

and
CONTRACTOR: _____
(Name)

on
CONTRACT: _____
(Title)

_____ Dated: _____
(Number)

Contractor hereby certifies that _____
(Designer)

1. Is licensed or registered to perform professional engineering work in the state of _____
(Location of Project)
2. Is qualified to design the _____
(Item)
specified in Section _____ of the subject contract;
3. Has designed _____ before;
4. Has prepared the design in full compliance with the applications and requirements of
Section _____ of subject contract including all applicable laws, regulations, rules and
codes; and
5. The work has been signed and sealed pursuant to the applicable state law.

FOR: _____
(Contractor)

BY: _____
(Signature)

_____ Dated: _____
(Name and Title)

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SECTION 02149

MAINTAINING EXISTING FLOW

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to maintain existing flow, implement and complete all flow diversions and/or bypass pumping required to complete all Work at the WWTF and Oakland pump station.

1.02 PERFORMANCE REQUIREMENTS

- A. It is essential to the operation of the existing sewerage system and wastewater treatment facility that there is no interruption of the wastewater flow throughout the duration of this project. An interruption shall be considered, but may not be limited to, any condition that in the sole opinion of the Engineer adversely affects or alters operation of the existing sewage system and/or any other portion or component of the existing sewerage treatment and collection system including the associated flows; allows the level of sewage flow to increase, rise, collect, surcharge and/or overflow existing facilities in any manner; or results in any operational or permit violations being issued to the Owner.
- B. The Contractor shall provide, maintain, and operate temporary facilities such as dams, bulkheads, pumping equipment (both primary and backup units as required) conduits, electrical power, and all other labor and equipment to intercept and maintain the existing sewage flow before it reaches the point where it would interfere with his work, carry it past his work, and return it to the existing facilities beyond his work.
- C. The Contractor's attention is directed to the fact that the existing wastewater flow may be affected by high groundwater and rainfall. Increases in normal flow should be expected during periods of wet weather. The range of flows experienced at the Wastewater Treatment Facility varies widely as shown in table below. The Contractor shall therefore take all precautions necessary including monitoring weather forecasts to fully accommodate, control and sufficiently handle the increases in flow during periods of wet weather and/or storms as well as periods of normal flow. The Contractor is responsible for providing and sizing His equipment accordingly. On/off operation of the bypass system is **not acceptable at the WWTF**. The WWTF bypass shall be capable of automatic speed adjustment that closely matches the incoming flow to the WWTF.

Location	Flow Min. (MGD)	Flow Max (MGD)	Average Flow (MGD)
WWTF	0.2	4.5	1.0
Oakland Pump Station	Not Applicable	0.432	Not Applicable

- D. The Engineer may prohibit the carrying out of any work at any time when in his sole judgment, increased flow conditions are unfavorable or not suitable, or at any time, regardless of the existing flows, when proper precautions are not being taken to safeguard the existing sewerage system and/or wastewater treatment facility, previously constructed work, work in progress and/or the general public.
- E. In case of damage caused by the failure of the Contractor to take adequate precautions, the Contractor shall repair or replace equipment damaged and shall make such repairs or rebuild such parts of the damaged work, as the Owner may require, at no additional expense to the Owner.

1.03 SUBMITTALS

- A. In accordance with SECTION 01300 submit the following:
 - 1. **A bypass plan including hydraulic calculations and drawings, stamped and certified by a Professional Engineer licensed in the State of Rhode Island, shall be provided to the Engineer by the Contractor for review.**
 - 2. Detailed plans and descriptions outlining all provisions and precautions to be taken regarding the control and handling of existing sewage flows.
 - 3. Include such items as schedules, locations, elevations, capacities of equipment, materials, traffic maintenance plans, and all other incidental items necessary and/or required by the Owner to ensure proper protection of the facilities and compliance with the requirements herein specified.
 - 4. Qualifications as described herein.
 - 5. Detailed proposal for noise prevention measures for review of at least thirty (30) consecutive calendar days prior to anticipated usage.
 - 6. Shop drawings for all pumping, piping, and appurtenances for type and size of equipment required to perform the flow diversion and/or bypass pumping work as required herein.
- B. The Engineer reserves the right to limit and/or otherwise restrict the Contractor's overall proposal and/or operations without claim should the Engineer deem it to be in the Owner's or public's best interest to do so.

1.04 QUALIFICATIONS

- A. Contractor shall have completed a minimum of five (5) bypass operations of similar capacity and for durations of not less than two (2) weeks each.

PART 2 PRODUCTS

2.01 EQUIPMENT

ALL BYPASS PUMPING EQUIPMENT INCLUDING PUMPS, PIPING, VALVES AND APPURTENANCES SHALL BE IN PLACE AND IN NORMAL WORKING CONDITION PRIOR TO SHUT-DOWN OF ANY TANK OR EQUIPMENT.

A. General

1. At a minimum, all equipment shall be supplied in duplicate for emergency situations. Provide adequate on-line backup facilities so that no interruption in service is encountered. Equipment and installation are subject to the approval of the owner and the engineer.

B. Pumping System(s)

1. All pumping units (primary and secondary) and appurtenances shall be sized properly to handle the flows encountered including increased flows due to wet weather.

C. Piping System(s)

1. All piping systems (primary and secondary) and appurtenance shall be sized properly to handle the flows encountered including increased flows due to wet weather.

D. Power Generating Facilities

1. Provide power generating facilities including all required fuel capable of providing all power necessary to operate any primary and secondary pumping systems.
2. Maintain facility to be ready for use if required.

E. Noise Prevention

1. Noise prevention measures for all equipment shall be used to insure minimum noise impact on surrounding areas.
2. Measures may include but shall not be limited to insulation, electric pumping units, and hospital grade silencers or mufflers.
3. Noise shall be kept to a minimum particularly if any night, Saturday, Sunday or holiday work be deemed necessary by the Engineer for work under this Contract.
4. Should at any time prior to or during the performance of above mentioned work, the Engineer determines the noise prevention measures being used are not

adequate, the Contractor shall at no additional cost to the Owner suspend all work until acceptable measures are incorporated.

F. Flow Metering

1. A strap on doppler ultrasonic flow meter that produces a 4-20 mA signal proportional to the influent flow shall be provided with the bypass system.
2. The Contractor shall provide, install, maintain, and protect temporary control wiring from the proposed bypass system flow meter to the RTU located in the operations building.
3. The Contractor's I&C integrator shall provide programming as needed to integrate the temporary influent flow signal into the RTU that allows the WWTF to continue flow pacing of chemicals.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Keep the Engineer advised at all times of any changes made to the overall operation(s) to accommodate field conditions.
- B. Flow diversions and/or bypass pumping shall be maintained at all times as long as it is necessary to maintain the flow through the limits of the project during construction.
- C. Maintain auxiliary and/or emergency equipment at the site to continue flow diversion and/or by-pass pumping operations in the event of a breakdown and/or loss of normal power.
- D. No work shall begin until all provisions and requirements of this Section have been reviewed and approved by the Engineer.
- E. The Engineer reserves the right to limit and/or otherwise restrict the Contractor's overall activities and/or operations at any time without claim should the Engineer deem it to be in the Owner's or public's best interest to do so.

END OF SECTION

SECTION 02160

EXCAVATION SUPPORT

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Contractor shall properly design and furnish all labor and materials necessary and shall construct complete, all sheeting, bracing supports, and appurtenances required to perform the Work including sheet piling for construction of structures and buildings, trench support and cofferdams, permanent and temporary alike, as indicated on the Drawings and specified or as otherwise directed by the Engineer or required by agencies having jurisdiction over the Work.
- B. Wood timber or steel sheeting shall be used except where otherwise indicated, specified or directed by the Engineer and agencies having jurisdiction over the work.

1.02 DESIGN RESPONSIBILITY

- A. The Contractor shall be fully responsible for providing complete and adequately designed sheeting as required and/or directed by the Engineer in accordance with the provisions set forth herein. The sheeting shall be designed to resist hydrostatic pressures in accordance with the Contractor's dewatering design.
- B. The Contractor shall engage, at his own expense, the services of a fully competent and qualified Professional Engineer, hereinafter referred to as the "Contractor's Engineer", registered in the State in which the Work is being constructed, for the design of all sheeting requirements to accomplish the Work specified, and for supervising the proper on-site installation associated therewith. The Contractor's Engineer shall be acceptable to the Engineer and demonstrate a minimum of ten (10) years documented experience in the field of sheeting design and implementation. Prior to the actual employment of the Contractor's Engineer, the Contractor shall submit to the Engineer, to the full extent deemed necessary, a detailed resume stating the Contractor's Engineer's professional qualifications, related experience and references, and if requested, examples of work similar to that required for the Work specified, for a general review by the Engineer and a means of documenting the requisite experience hereinbefore specified. Only after a satisfactory review of the Contractor's Engineer's overall qualifications by the Engineer in fulfillment of the requisite experience hereinbefore specified shall the Contractor finalize such employment and begin the design aspects of the Work.
- C. The Contractor's attention is directed to the fact the acceptance of the Contractor's Engineer and/or his/her qualifications by the Owner and/or Engineer shall not be an overall approval of the Contractor's Engineer nor the sheeting designs and methods of installation employed during the Work. It being understood that all sheeting requirements necessary to accomplish the Work specified and/or indicated on the Drawings shall be designed by and installed under the direct supervision of the Contractor's Engineer who shall ultimately and fully bear the responsibility for that Work.

1.03 QUALITY ASSURANCE

- A. The Contractor's Engineer shall provide and maintain throughout the sheeting installation and/or Work sufficient supervision and technical guidance to the Contractor for proper sheeting materials, equipment, operations and methods to the extent necessary to assure strict compliance with the Contractor's Engineer's design, all safety procedures and standard requirements for such Work, and the successful completion of the Work. Failure to provide and/or maintain such supervision and/or technical guidance during the Work shall in no way relieve the Contractor's Engineer and/or the Contractor from their overall responsibilities and obligations under the Contract, nor shall it be a basis for any claim by either against the Owner and/or Engineer.
- B. The Contractor and Contractor's Engineer shall fully indemnify and save harmless the Owner and Engineer and their agents, employees and representatives, from and against any and all claims as stipulated under the Agreement, whether directly or indirectly arising out of, relating to or in connection with the Work.
- C. Quality assurances and proper safety procedures must be maintained at all times and be in strict accordance with the Contractor's Engineer's requirements and consistent with all federal, state and local regulatory agencies having jurisdiction over the Work. Should any conflict in requirements, regulations, restrictions or codes exist between that which is specified by the Contractor's Engineer and any federal, state or local agency, the more stringent application shall prevail.

1.04 PRODUCTS AND DESIGN CRITERIA

- A. The overall sheeting design, quality of materials and methods of installation for all sheeting applications necessary to accomplish the Work specified shall be consistent with the established standards of the construction industry and must, as a minimum, comply with the requirements for earth support systems for excavations as defined by current US Department of Labor, Occupational Safety and Health Act (OSHA) regulation applicable thereto, and any other federal, state and local agencies having jurisdiction and/or requirements pertaining thereto including Building Code requirements for the State in which the work is being performed. The design and implementation thereof shall be in accordance with sound engineering practice and modern accepted principles of soil mechanics, and shall include the effects of hydrostatic forces and all surcharge loads which may be reasonable anticipated. The methods employed shall be to the extent necessary to permit the proper and satisfactory installation and construction of the Work specified; to withstand all loads and forces encountered; to provide soil restraint and control of water as required; to insure the safety of the workers and all other personnel on or near the site; to prevent injurious caving or erosion, or loss of ground; to maintain at all times proper and safe pedestrian, vehicular traffic on public and private streets, property and rights-of-way; and to stabilize unforeseen areas of work encountered during the execution of the Work as deemed necessary by the Owner and/or Engineer.
- B. The Contractor and Contractor's Engineer's attention is directed to the fact that should any additional investigations, subsurface explorations and/or other appurtenant information be required to fulfill the needs of this design, as determined by the Contractor's Engineer above and beyond that which is already provided under these Contract Documents, the Contractor shall obtain all such information and data required at his own expense.

1.05 SHOP DRAWINGS AND/OR DESCRIPTIVE LITERATURE

- A. Prior to the installation of any sheeting, the Contractor shall submit to the Engineer for documentation ONLY, complete sheeting layout and detail drawings and sheeting descriptions bearing the Contractor's Engineer's State of Rhode Island Professional Seal and signature. Said submission shall be for informational purposes only as a means of documenting the work to be performed and will not be considered an approval or disapproval of the design and/or the implementation thereof. This submission will not relieve the Contractor of the sole responsibility for the adequacy of the system nor shall it be construed as an approval or guarantee that the Contractor's proposed equipment, materials and methods for the sheeting, bracing or appurtenances will be adequate for the work required at the locations of and for the Work required by this Contract.
- B. Included as part of this submission, the Contractor's Engineer must provide a complete listing of all references, codes and specifications used by the Contractor's Engineer and required by any federal, state or local agency having jurisdiction, and to which the sheeting design conforms.
- C. Specific design calculations are not to be submitted to the Engineer. In the event design calculations are submitted to the Engineer, they shall be returned to the Contractor without review nor checking by the Engineer.

1.06 CERTIFICATE OF DESIGN

- A. The Contractor's special attention is directed to the required "Certificate of Design", the form of which is provided at the end of this Section. The Contractor and Contractor's Engineer shall complete this "Certificate" in its entirety for each location of work to be done, and any revisions associated there with, and submit it simultaneously with, as an integral part thereof, the sheeting submission. Any submission made without the completed "Certificate", appropriately signed and sealed, shall be returned to the Contractor. The Owner and/or Engineer hereby reserves the right to delay sheeting work and/or any work associated with, or dependent upon, the proper implementation of sheeting, without cause for claim against the Owner or Engineer, until a complete and appropriate submission is rendered. This Certification shall indicate that the sheeting, bracing and all appurtenances related thereto are designed to withstand the required loads, forces to be encountered, and to provide soil and water control, and are in compliance with these specifications and all federal, state or local agencies having jurisdiction over the Work to be performed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Timber sheeting and bracing:
 - 1. Timber sheeting and bracing may be of any species of wood which will satisfactorily withstand all driving and construction stresses and the loads to which the members will be subjected. Sheeting shall not be less than 3 inches nominal thickness and shall be provided with continuous interlocks. All timber sheeting and bracing shall be free from worm-holes, windshakes, loose knots, decayed or unsound portions or other defects which might impair its strength or tightness.

B. Steel sheeting:

1. The shapes, sizes, and lengths of steel sheeting to be utilized are optional with the Contractor, providing they are satisfactory to withstand all driving and construction stresses and provided with continuous interlocks.

C. Bracing, Hardware and Fastenings:

1. Bracing and other supports whether of steel or of timber, shall be of the strength and dimensions necessary to satisfactorily withstand the loads to which they will be subjected. All bracing and other supports shall be free from any defects which might impair this strength. The Contractor shall provide all necessary hardware and fastenings necessary in connections with satisfactory installation of all sheeting and bracing.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The Contractor shall be fully responsible for ensuring adequate safety measures are provided at all times and shall comply with all safety requirements of federal, state and local agencies having jurisdiction over the Work. Installation of the sheeting including all bracing, supports and appurtenances, shall be adequate to permit the performance of the Work and be in accordance with the requirements of the Contractor's Engineer and the sheeting design associated therewith.
- B. Any movements of sheeting and/or appurtenances which prevent the proper completion of the work shall be corrected at the expense of the Contractor.
- C. Sheeting shall be installed in a manner which will prevent the disturbance of the surrounding surface, subsurface conditions and/or structures. Any such disturbances shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

3.02 REMOVAL

- A. If used no sheeting shall be removed except with specific written approval by the Engineer.
- B. Sheeting shall be cut-off as directed by the Engineer.
- C. Any sheeting approved for removal by the Engineer shall become the property of the Contractor.
- D. All restoration and clean up shall be as indicated and as specified.

CERTIFICATE OF DESIGN

(Owner)

Contract Reference: _____
_____, dated _____.

In accordance with the provisions of the above referenced Contract, as the designated Contractor,

(Contractor's Name and Address)

hereby certifies that _____

(Contractor's Engineer's Name and Address)

(1) Is properly licensed and currently registered as a Professional Engineer in the State (or Commonwealth) of _____;

(2) Is fully qualified to design and supervise the _____

(Item of work and location)

In accordance with the provision specified under the appropriate Section and/or Subsections of the Contract Documents:

(3) Has successfully designed and supervised _____

(Item of work)

before and demonstrates a minimum of ten (10) documented years of proven experience in such field;

(4) Has personally examined the type(s) and locations(s) of the Work required under this Contract, and the overall conditions associated therewith, to the extent necessary to fully satisfy his or her professional responsibilities for designing and supervising the above referenced work;

- (5) Has prepared the attached design in full compliance with the applications and requirements of the Contract Documents, sound engineering practice, modern accepted principles of construction, and all applicable federal, state and local laws, regulations, rules and codes having jurisdiction over the Work;
- (6) Will provide sufficient supervision and technical guidance to the Contractor throughout the Work to ensure compliance with the design and all quality assurances necessary to successfully complete the Work;
- (7) Hereby indemnifies and holds harmless the _____
 _____ and BETA Group, Inc.,
 (name of owner)
 and their agents, employees and representatives, from and against any and all claims, whether directly or indirectly, arising out of, relating to or in connection with the Work; and
- (8) This "Certificate of Design" together with all applicable designs, drawings, details, specifications on other related documents necessary to complete the Work as specified, have been signed and sealed pursuant to applicable state law.

In recognition and observance of the above referenced statements, the undersigned parties hereby acknowledge and accept the responsibilities and obligations associated therewith.

CONTRACTOR:

CONTRACTOR'S ENGINEER:

(Contractor's Name)

(Engineer's Name)

By: _____

By: _____

(Name and Title)

(Name and Title)

Date: _____

Date: _____

(SEAL)

(P.E. STAMP)

(Note: Contractor to fully reference all attachments below)

END OF SECTION

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SECTION 02200

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for; excavating in earth for trenches and structures; backfilling excavations; furnishing necessary material; compaction; constructing embankments and fills; miscellaneous earth excavations and miscellaneous grading.

B. Related Sections

1. Section 01025 - Measurement and Payment
2. Section 01410 - Testing Laboratory Services
3. Section 02140 - Dewatering
4. Section 02160 – Excavation Support
5. Section 02149 – Maintaining Existing Flow
6. Section 02215 - Aggregate Materials
7. Section 03300 - Cast-In-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

1. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).

1.03 MEASUREMENT AND PAYMENT PROCEDURES

A. Sheeting

1. As specified in SECTION 01025, Contractor paid only for certain sheeting left in place.

B. Test Pits

1. Where determination of the exact location of pipe or other underground structure is necessary for doing the work properly, the Contractor may be required to excavate test pits to determine such locations. When such test pits may be properly considered as incidental to other excavation, the Contractor shall receive

no additional compensation, the work being understood to be included as part of the excavation. When the Engineer orders test pits beyond the limits of excavation he considers a part of the work, such test pits shall be paid for as specified in SECTION 01025.

1.04 QUALITY ASSURANCE

A. Field Samples

1. Provide samples of materials as requested by the Engineer, to the Quality Control Engineer hired by the Owner, prior to delivery of materials on site, in order to facilitate field testing of compaction operations and material properties.

1.05 PROJECT/SITE CONDITIONS

A. Existing Conditions

1. There are pipes, drains, and other utilities in locations not indicated on drawings, no attempt has been made to show all services, and completeness or accuracy of information given is not guaranteed.

1.06 MAINTENANCE

- A. Maintain all work in accordance with SECTION 01800.

PART 2 PRODUCTS

2.01 MATERIALS

A. Suitable Aggregate

1. The nature of materials will govern both acceptability for backfill and methods best suited for placement and compaction.
2. All material whether from excavations or from borrow, after being placed and properly compact, will make a dense stable fill and containing no vegetation, masses of roots, individual roots more than 18 inches long, or more than 1/2 inch in diameter, stones over 6 inches in diameter, or porous matter.
3. Organic matter to be well distributed and not to exceed minor quantities.

B. Trench and Excavation Backfill

1. In general, and unless other material is indicated on drawings or specified, material used for backfilling trenches and excavations shall be suitable material which was removed in the course of making the construction excavations. If sufficient suitable material is not available from the excavations, the backfill

material shall be screened gravel, bank-run gravel, or selected borrow as directed in accordance to respective Specification Sections.

C. Structure Backfill

1. Unless otherwise indicated or specified, all fill and backfill under structures and pavement adjacent to structures shall be compacted bank-run gravel containing not more than 10 percent material passing a 200 sieve. When coarse aggregate and fine aggregate are indicated or specified for use under structures, they shall conform to the requirements for coarse and fine aggregate specified in SECTION 03300.

D. Filling and Embankment Backfill

1. Suitable selected materials available from the excavations and not required for backfill around pipes or against structures may be used for filling and building embankments, except as otherwise specified. Material needed in addition to that available from construction operations shall be obtained from suitable gravel banks or other suitable deposits. The Contractor shall furnish, at his own expense, all borrow material needed on the work.

E. Additional materials

1. Concrete: In accordance with SECTION 03300.
2. Screened gravel: In accordance with SECTION 02215.
3. Bank-run gravel: In accordance with SECTION 02215.
4. Selected borrow: In accordance with SECTION 02215.

2.02 EQUIPMENT

A. Well Points

1. Designed to drain soil and prevent saturated soil from flowing into excavation.

B. Pumping Units

1. Designed for use with the wellpoints, capable of maintaining a high vacuum, and handling large volumes of air and water at the same time.

C. Underdrain Pipe

1. HDPE pipe enclosed in crushed stone encased in filter fabric..
2. Sewer pipe of quality know as "seconds".

2.03 SOURCE QUALITY CONTROL

- A. Provide Engineer with access to location of off site sources of materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify all existing utilities and facilities prior to excavation.

3.02 PROTECTION

A. Utilities

1. Support and protect from damage existing pipes, poles, wires, fences, curbing, property line markers, and other structures, which the Engineer decides must be preserved in place without being temporarily or permanently relocated.
2. Restore items damaged during construction without compensation, to a condition at least equal prior to construction.

B. Trees

1. Enclose the trunks of trees adjacent to work with substantial wooden boxes of height necessary to protect trees from injury from piled material, equipment, operations or otherwise.
2. Employ excavating machinery and cranes of suitable type and size and operate with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.
3. When trimming is required, make all cuts smooth and neat without splitting or crushing.
4. Cover cut areas with an application of grafting wax or tree healing paint.
5. Branches, limbs, and roots shall not be cut except by permission of the Engineer.

C. Plantings

1. Protect by suitable means or temporarily replant and maintain cultivated hedges, shrubs, and plants which may be injured by the Contractor's operations
2. Replant in their original positions and care for until growth is re-established, once the construction operations have been substantially completed.
3. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to which existed prior to the start of the Work.

D. Paved surfaces

1. Do not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels shaped as to cut or injure paved surfaces.

2. All surfaces which have been injured by the Contractor's operations shall be restored to a condition at least equal to which existed prior to start of the Work.
3. Suitable materials and methods shall be used for such restoration.

3.03 PREPARATION

A. Pavement Removal

1. Remove only existing pavement as necessary for the prosecution of the work.
2. Engineer may require that pavement be cut with pneumatic tools or saws without extra compensation to Contractor, where in the opinion of the Engineer it is necessary to prevent damage to the remaining road surface.
3. Dispose large of pieces of broken pavement before proceeding with excavation.

B. Top Soil Removal

1. From areas which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated.

C. Subgrade

1. Remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas where embankments will be built or material will be placed for grading.
2. Shape as indicated on the drawings and prepare by forking, furrowing, or plowing to bond first layer of the new material placed.

3.04 RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES

A. The structures to which the provisions of this article apply include pipes, wires, and other structures which meet all of the following:

1. Are not indicated on the drawings or otherwise provided for.
2. Encroach upon or are encountered near and substantially parallel to the edge of the excavation.
3. In the opinion of the Engineer will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

B. In removing existing pipes or other structures, the Contractor should use care to avoid damage to materials, and the Engineer shall include for payment only those new materials which, in his judgment, are necessary to replace those unavoidably damaged.

- C. Whenever the Contractor encounters certain existing structures as described above and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed to change the location of, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work, the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.
- D. When fences interfere with the Contractor's operations, he shall remove and (unless otherwise specified) later restore them to a condition which existed prior to the start of the Work, all without additional compensation. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

3.05 EXCAVATION

- A. Execute operation of dewatering, sheeting and bracing without undermining or disturbing foundations of existing structures or of work previously completed under this contract.
- B. Excavate to widths that provide suitable room for:
 - 1. Building structures or laying and jointing piping.
 - 2. Placing all sheeting, bracing, and supports.
 - 3. Cofferdamming, pumping and draining.
- C. Render bottom of excavations firm, dry and acceptable in all respects.
- D. Do not plow, scrap or dig by machinery, earth at finished subgrade which results in disturbance of material below subgrade, unless indicated or specified, and remove with pick and shovel, last of material to be excavated, just before placing pipe, masonry or other structure.
- E. Make all excavations in open, except as otherwise specified or permitted.
- F. Excavation Near Existing Facilities
 - 1. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools. Such manual excavation when incidental to normal excavation shall be included in the work to be done under items involving normal excavation.
- G. Unauthorized Excavation
 - 1. If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled at the Contractor's expense with

thoroughly compacted, screened gravel, if the excavation was for a pipeline, or with Class B concrete, if the excavation was for a masonry structure.

H. Unsuitable Material

1. If material unsuitable for foundation (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel, bank-run gravel, fine aggregate or concrete as directed.

3.06 TRENCHING

A. Trench Excavation

1. Where pipe is to be laid in specified bedding material or concrete cradle, the trench may be excavated by machinery to, or to just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed.
2. Where pipe is to be laid directly on the trench bottom, the lower part of trenches in earth shall not be excavated to subgrade by machinery, but, just before the pipe is to be placed, the last of the material to be excavated shall be removed by means of hand tools to form a flat or shaped bottom, true to grade, so that the pipe will have a uniform and continuous bearing and support on firm and undisturbed material between joints except for limited areas where the use of pipe slings may have disturbed the bottom.

B. Depth of Trench

1. Excavate trench to depths permitting the pipe to be laid at the elevations, slopes, or depths of cover indicated on the drawings, and at uniform slopes between indicated elevations.

C. Width of Trench

1. Excavate trench as narrow as practicable and do not widen by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
2. Excavate trenches with approximately vertical sides between the elevation of the center of the pipe and an elevation 1 ft. above the top of the pipe.

D. Trench Excavation in Fill

1. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least 1 ft. above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure

maximum consolidation of material under the pipe location. The pipe trench shall then be excavated as though in undisturbed material.

- E. Length of trench open at any one time will be controlled by conditions, subject to any limits that may be prescribed by Engineer.

3.07 BACKFILLING

A. General

- 1. Frozen material shall not be placed in the backfill nor shall backfill be placed upon frozen material. Previously frozen material shall be removed or shall be otherwise treated as required, before new backfill is placed.

B. Fill and Backfill Under Structures

- 1. The fill and backfill materials shall be placed in layers not exceeding 6 in. in thickness. Unless otherwise indicated or specified, each layer shall be compacted to 95 percent in accordance with ASTM D1557.

C. Backfilling Around Structures

- 1. Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been done, special leakage tests, if required, shall be made. Promptly after the completion of such tests, the backfilling shall be started and then shall proceed until its completion. The best of the excavated materials shall be used in backfilling within 2 ft. of the structure. Unequal soil pressures shall be avoided by depositing the material evenly around the structure.
- 2. The material shall be placed and compacted to 90 percent in accordance with ASTM D1557 unless otherwise indicated or specified.

D. Backfilling Pipe Trenches

- 1. As soon as practicable after the pipes have been laid and the joints have acquired a suitable degree of hardness, if applicable, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, the backfilling shall be started and thereafter it shall proceed until its completion.
- 2. With the exception mentioned below in this paragraph, trenches shall not be backfilled at pipe joints until after that section of the pipeline has successfully passed any specified tests required. Should the Contractor wish to minimize the maintenance of lights and barricades and the obstruction of traffic, he may, at his own risk backfill the entire trench, omitting or including backfill at joints as soon as practicable after the joints have acquired a suitable degree of hardness, if

applicable, and the related structures have acquired a suitable degree of strength. He shall, however, be responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair or replace leaking or defective joints or pipe.

3. No stone or rock fragment larger than 12 in. in greatest dimension shall be placed in the backfill nor shall large masses of backfill material be dropped into the trench in such a manner as to endanger the pipeline. If necessary, a timber grillage shall be used to break the fall of material dropped from a height of more than 5 ft. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted, in which case they shall be broken up as directed.
4. Zone Around Pipe
 - a. Backfilled with the materials and to the limits indicated on the drawings.
 - b. Material shall be compacted to 90 percent by tamping.
5. Remainder of Trench
 - a. Compact by water-jetting, or tamping, in accordance with the nature of the material to 95 percent in accordance with ASTM D1557. Water-jetting may be used wherever the material does not contain so much clay or loam as to delay or prevent satisfactory drainage. However, tamping shall be used if water-jetting does not compact the material to the density required.
6. Excavated material which is acceptable to the Engineer for surfacing or pavement subbase shall be placed at the top of the backfill to such depths as may be specified elsewhere or as directed. The surface shall be brought to the required grade and stones raked out and removed.

E. Placing and Compacting Embankment Material

1. After the subgrade has been prepared as hereinbefore specified, the material shall be placed thereon and built up in successive layers until it has reached the required elevation.
2. Layers shall not exceed 12 in. in thickness before compaction. In embankments at structures, the layers shall have a slight downward slope away from the structure; in other embankments the layers shall have a slight downward slope away from the center. In general, the finer and less pervious materials shall be placed against the structures or in the center, and the coarser and more pervious materials, upon the outer parts of embankments.
3. Each layer of material shall be compacted by the use of approved rollers or other approved means so as to secure a dense, stable, and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.

4. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.
5. The portion of embankments constructed below proposed structures shall be compacted to 95 percent in accordance with ASTM D1557. The top 2 ft. of an embankment below a pavement base shall be compacted to 95 percent. All other embankments shall be compacted to 90 percent in accordance with ASTM D1557.

3.08 METHODS OF COMPACTION

A. Water-Jetting

1. Saturate backfill material throughout its full depth and at frequent intervals across and along the trench until all slumping ceases.
2. Furnish one or more jet pipes, each of sufficient length to reach the specified depth and of sufficient diameter (not less than 1-1/4 in.) to supply an adequate flow of water to compact the material.
3. Equip jet pipe with a quick-acting valve, supply water through a fire hose from a hydrant or a pump having adequate pressure and capacity to achieve the required results.

B. Tamping and Rolling

1. Deposit backfill material and spread in uniform, parallel layers not exceeding 8 in. thick before compaction. Before the next layer is placed, each layer shall be tamped to obtain a thoroughly compacted mass. Care shall be taken that the material close to the bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar power equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling, and compacting.
2. If necessary to ensure proper compaction by tamping (or rolling), the backfill material shall first be wet by sprinkling. However, no compaction by tamping (or rolling) shall be done when the material is too wet either from rain or too great an application of water to be compacted properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compaction.

C. Miscellaneous Requirements

1. Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. Only suitable quantities of stones and rock fragments shall be used in the backfill; the Contractor shall, as part of the work done under the items involving earth excavation and rock excavation as appropriate, furnish and place all other necessary backfill material.
2. All voids left by the removal of sheeting shall be completely backfilled with suitable materials, and thoroughly compacted.

3.09 DISPOSAL OF SURPLUS EXCAVATED MATERIALS

- A. No excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted by the Engineer.
- B. Surplus excavated materials suitable for backfill shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes within a haul of 1 mile from the point of excavation; all as directed or permitted and without additional compensation.
- C. Surplus excavated materials not needed as specified above shall be hauled away and dumped by the Contractor, at his expense, at appropriate locations, and in accordance with arrangements made by him.
- D. All excess materials deemed "suitable" by the Engineer are the property of the Owner. The Contractor shall place these materials at a location specified by the Owner within the confines of the work site. The materials shall be placed in a manner that utilizes the available space efficiently and to the satisfaction of the Owner. Reworking the dumped materials to efficiently use stockpile area is considered incidental to the contract and no separate payment will be made.

3.10 DISPOSAL OF SPECIAL WASTES

- A. The Contractor's attention is directed to the requirements set forth by the State of Rhode Island, Department of Environmental Management, (RIDEM) regarding "Special Hazardous Wastes" and the proper disposal thereof. All waste materials and debris, as designated by the Owner and/or Engineer, including but not limited to any sewers, storm drains, catch basins, and combined system pipelines and associated structures, or any portions thereof, including but not limited to sludge, grit, sediment, dirt, sand, rock, grease, roots and other liquid, solid or semi-solid materials contained therein, shall be considered "Type 5 - Rhode Island Special Hazardous Waste (005)" In addition, any excavated soils contaminated in any manner, as designated by the Owner and/or Engineer, shall also fall under this category and shall be handled the

same. When so encountered, all such materials and debris shall be removed to the extent so ordered by the Engineer and properly disposed of in strict compliance with the requirements of the RIDEM, Division of Waste Management, Rules and Regulations for Hazardous Waste Management, amended 4/19/92. and other regulating authorities to an approved and certified waste disposal site. It shall remain the sole responsibility of the Contractor to apply for and obtain all required permits, bonds and/or insurance relative to such disposal. The Contractor shall also pay all costs associated with the disposal, required permits, bonds and insurance with no additional expense to the Owner. All handling of such "Special Hazardous Waste" shall be done in strict compliance with the RIDEM requirements and/or any other federal, state or local agency having jurisdiction or authority over the same. Under no circumstances shall sewage, solids or other "Special Hazardous Wastes" removed from the sewer lines be dumped or spilled onto the streets or into ditches, catch basins or storm drains. The Contractor must use watertight and State approved vehicles in transporting any wastes as hereinbefore designated.

- B. The Contractor shall indemnify and save harmless the Owner and Engineer and all persons acting for or on behalf of the Owner and Engineer from all claims and liability of any nature or kind, and all damages, costs and expenses, including attorney's fees and penalties, arising from the improper handling, transportation or disposal of "Special Hazardous Wastes" as determined by the RIDEM and/or any other federal, state or local agency having jurisdiction or authority over the same.

3.11 DUST CONTROL

- A. During the progress of the Work, maintain the area of activities, by sweeping and sprinkling of streets to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed.

3.12 BRIDGING TRENCHES

- A. Provide suitable and safe bridges and other crossings where required for the accommodation of travel, and to provide access to private property during construction. Remove once bridges and crossings are no longer needed.

3.13 FIELD QUALITY CONTROL

- A. Site Tests

- 1. In accordance with SECTION 01410

3.14 CARE AND RESTORATION OF PROPERTY

- A. Restoration of existing property or structures done as promptly as practicable and not left until the end of the construction period.

END OF SECTION

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SECTION 02210
ROCK EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for removal and disposal of rock.

B. Related Sections

1. Section 00500-Agreement
2. Section 00800- Supplementary Conditions
3. Section 02200-Earth Excavation, Backfill, Fill and Grading

1.02 DEFINITIONS

- A. Rock-as defined in SECTION 00500.

1.03 REQUIREMENTS

- A. Excavate rock if encountered, to the lines and grades indicated on the drawings or as directed, dispose of the excavated material, and furnish acceptable material for backfill in place of the excavated rock.
- B. Excavate rock in pipe trenches to a limit which provides 6-inches clearance minimum from the pipe after it has been laid. Before the pipe is laid, the trench shall be backfilled to the correct subgrade with thoroughly compacted, suitable material or, when so specified or indicated on the drawings, with the same material as that required for bedding the pipe, furnished and placed at the expense of the Contractor.
- C. The use of explosives will not be allowed.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXCESS ROCK EXCAVATION

- A. If rock is excavated beyond the limits of payment indicated on the drawings, specified, or authorized in writing by the Engineer, the excess excavation, whether resulting from over breakage or other causes, shall be backfilled by, and at the expense of the Contractor, as specified below in this section.
- B. In pipe trenches, excess excavation below the elevation of the top of the bedding, cradle, or envelope shall be filled with material of the same type, placed and compacted in the same manner, as specified for the bedding, cradle, or envelope. Excess excavation above said elevation shall be filled with earth as specified in the article titled "Backfilling Pipe Trenches" in SECTION 02200.
- C. In excavations for structures, excess excavation in the rock beneath foundations shall be filled with 3000 psi concrete. Other excess excavation shall be filled with earth as specified in the article titled "Backfilling Around Structures" in SECTION 02200.

3.02 SHATTERING ROCK

- A. Shattering rock at ends of pipe and elsewhere as indicated on the drawings, shall be done by drilling and blasting a single line of holes in the vertical face of the rock at the end of the trench. Drillholes shall have a minimum depth of 4 ft. and maximum spacing of 18 in. on centers. Sufficient explosive shall be used to shatter the rock for future excavation. Shattering shall be completed before any pipe or fitting is placed within 50 ft. of rock to be shattered.

3.03 SHATTERED ROCK

- A. If the rock below normal depth is shattered due to drilling or blasting operations of the Contractor, and the Engineer considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches screened gravel shall be used for backfill. All such removal and backfilling shall be done by and at the expense of the Contractor.

3.04 PREPARATION OF ROCK SURFACES

- A. Whenever so directed during the progress of the work, remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly, using steam to melt snow and ice, if necessary. Water in depressions shall then be removed as required so that the whole surface of the designated area can be inspected to determine whether seams or other defects exist.

- B. The surfaces of rock foundations shall be left sufficiently rough to bond well with the masonry and embankments to be built thereon, and if required, shall be cut to rough benches or steps.
- C. Before any masonry or embankment is built on or against the rock, the rock shall be scrupulously freed from all vegetation, dirt, sand, clay, boulders, scale, excessively cracked rock, loose fragments, ice, snow, and other objectionable substances. Picking, barring, wedging, streams of water under sufficient pressure, stiff brushes, hammers, steam jets, and other effective means shall be used to accomplish this cleaning. Remove free water left on the surface of the rock.

3.05 REMOVAL OF BOULDERS

- A. Remove piles of boulders and loose rock encountered within the limits of earth embankments and dispose in a suitable place.

3.06 DISPOSAL OF EXCAVATED ROCK

- A. Excavated rock may be used in backfilling trenches subject to the following limitations:
 - 1. Pieces of rock larger than permitted under the article titled "Backfilling Pipe Trenches" in SECTION 02200 shall not be used for this purpose.
 - 2. The quantity of rock used as backfill in any location shall not be so great as to result in the formation of voids.
 - 3. Rock backfill shall not be placed within 36 in. of the surface of the finish grade.
- B. Surplus excavated rock shall be disposed of as specified for surplus excavated material as specified in SECTION 02200.

3.07 BACKFILLING ROCK EXCAVATIONS

- A. Where rock has been excavated and the excavation is to be backfilled, the backfilling above normal depth shall be done as specified in SECTION 02200. If material suitable for backfilling is not available in sufficient quantity from other excavations, the Contractor shall, at his own expense, furnish suitable material from outside sources.

END OF SECTION

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SECTION 02215

AGGREGATE MATERIALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and placing materials, which include Crushed Stone, Gravel Borrow and Select Borrow.
2. Location of specified materials as detailed on the Drawings or as directed by the Engineer for excavation below normal depth, utility support, replacement of unsuitable material or elsewhere, as ordered.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading.
2. Section 02500 - Paving

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO).

1. T11-85, Amount of Material Finer than 0.075 mm Sieve in Aggregate
2. T27-84, Sieve Analysis of Fine and Coarse Aggregates.

B. American Society for Testing and Materials (ASTM).

1. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).

1.03 DEFINITIONS

- ###### A. The term Screened Gravel as used in these Contract Documents shall mean Crushed Stone.

1.04 SUBMITTALS

A. Shop Drawings

1. Provide sieve analysis when gradation requirements are given in the Specification.

B. Samples

1. Furnish representative sample including location of source with Shop Drawing transmittal sheet.

1.05 QUALITY ASSURANCE

A. Field Samples

1. The attention of the Contractor is directed to the fact that under Specification SECTION 00700, 1.03 Materials and Equipment, all materials furnished by the Contractor to be incorporated into the Work shall be subject to the inspection of the Engineer. The Engineer shall be the sole judge as to the acceptability of proposed materials and said judgement shall be final, conclusive, and binding.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection

1. In accordance with Specification SECTION 00700, 1.03 Materials and Equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone

1. For bedding and pipe zone material for pipe larger than 3 inches diameter. Well graded in size from 3/8 inches to 3/4 inches or such other sizes as may be approved.
2. For bedding and pipe zone material for plastic pipe 3 inches diameter and less, maximum particle size shall be 3/8 inches.
3. Clean, hard, and durable particles or fragments, free from dirt, vegetation, or other objectionable matter, and free from an excess of soft, thin elongated, laminated or disintegrated pieces.
4. Screened Stone of similar size and grading to this specification may be used instead of Crushed Stone.

B. Gravel Borrow

1. Granular material well graded from fine to coarse with a maximum size of 3 inches, obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted.
2. Gravel shall not contain vegetation, masses of roots, or individual roots more than 18 inches long or more than 1/2 inches in diameter.

3. Gravel shall be substantially free from loam and other organic matter, clay and other fine or harmful substances.
4. Gradation requirements for gravel shall be determined by AASHTO-T11 and T27 and conform to the following:

Sieve	Percent Passing
1/2 inch	60-95
No. 4	50-85
No. 50	8-28
No. 200	0-8

C. Select Borrow

1. Use inorganic natural soils and/or rock having not more than 5 percent by weight passing the No. 200 sieve and having a maximum 3 inch stone size.
2. Use only material well-graded throughout entire site range, free from roots, leaves and other organic materials, free of ice or frost and aggregations of frozen soil particles.
3. Control the moisture content of borrow within plus or minus 3 percent optimum moisture content at the borrow source.

D. Gravel Base Course

1. In accordance with SECTION 02500.

2.02 SOURCE QUALITY CONTROL

A. Test, Inspection

1. Engineer may elect to sample material supplied at the source.
2. Assist the Engineer and/or personnel from the designated testing laboratory in obtaining samples.

PART 3 EXECUTION

3.01 INSTALLATION

A. Crushed Stone

1. Spread in layers of uniform thickness not greater than 6 inches.
2. Compact thoroughly by means of a suitable vibrator or mechanical tamper.

B. Gravel Borrow

1. Spread in layers of uniform thickness not exceeding 12 inches before compaction and moistened or allowed to dry as directed.
2. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment.
3. Compaction shall conform to 95% of minimum dry density per ASTM D 1557.
4. The percolation rate for the compacted bank-run gravel shall not exceed 5 minutes per inch.

C. Select Borrow

1. Spread in layers of uniform thickness not exceeding 12 in. before compaction and moistened or allowed to dry.
2. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment unless otherwise directed by the Engineer.

3.02 FIELD QUALITY CONTROL

A. Site Tests

1. In accordance with SECTION 01410.

END OF SECTION

SECTION 02272

GEOTEXTILE MATERIALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for installation of geotextile filter fabric in trenches and under riprap.

B. Related Sections

1. Section 02100 - Site Preparation
2. Section 02200 – Earthwork
3. Section 02215 – Aggregate Materials

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. D3786, Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method
2. D4355, Test Method for Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
3. D4491, Test Method for Water Permeability of Geotextiles by Permittivity
4. D4533, Test Method for Trapezoid Tearing Strength of Geotextiles
5. D4632, Test Method for Grab Breaking Load and Elongation of Geotextiles
6. D4751, Test Method for Determining Apparent Opening Size of a Geotextile
7. D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
8. D5261, Measuring Mass Per Unit Area of Geotextiles.

1.03 QUALITY ASSURANCE

A. General

1. Producer of fabric to maintain competent laboratory at point of manufacture to insure quality control in accordance with ASTM testing procedures.
2. Laboratory to maintain records of quality control results.

1.04 SUBMITTALS

A. Shop Drawings

1. Submit in accordance with SECTION 01300
2. Include manufacturer's recommended method of joining of adjacent fabric panels.

B. Certificate of Conformance

1. Upon each shipment/delivery of product to the work site, furnish mill certificate(s) from the company manufacturing the fabric attesting that the fabric meets the chemical, physical, manufacturing and performance requirements specified. Fabric will be rejected if it is found to have defects, rips, flaws, deterioration or other damage.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide fabric in rolls wrapped with a heavy-duty protective covering to protect fabric from, mud, dirt, dust, debris and other deleterious sources until it is installed. Label each roll of fabric with number or symbol to identify production run.
- B. Do not expose fabric to ultraviolet radiation (sunlight) for more than 20 days total in period of time following manufacture until fabric is installed and covered.
- C. If Engineer determines material is damaged in any way or has excessive sunlight exposure, the Contractor shall immediately make all repairs and replacements as directed by the Engineer, at no additional cost to the Owner.

1.06 SCHEDULING

- A. Schedule Work so that the covering of the fabric with a layer of the cover material is accomplished immediately after inspection and approval of the placed fabric by the Engineer. Failure to comply with this requirement shall require replacement of the fabric.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER/MATERIAL

- A. The geotextile fabric shall be nonwoven polypropylene designated as MIRAFI 140N as manufactured by Nicolon/Mirafi Group, Norcross, Georgia; or acceptable equivalent and shall meet the following minimum requirements:

<u>Minimum Property (Unit)</u>	<u>Unit</u>	<u>Test Method</u>	<u>Requirements</u>
Weight	oz/sy	ASTM D5261	4.3
Grab Tensile Strength	lbs	ASTM D4632	120
Grab Tensile Elongation	%	ASTM D4632	50
Mullen Burst Strength	psi	ASTM D3786	240
Puncture Resistance	lbs	ASTM D4833	70
Trapezoid Tear Strength	lbs	ASTM D4533	50
Equivalent Opening Size (EOS)	US Std. Sieve (mm)	ASTM D4751	70 (0.21)
Permittivity	sec ⁻¹	ASTM D4491	1.5
Permeability	cm/sec	ASTM D4491	0.22
Flow Rate	gal/min/sf	ASTM D4491	120
Ultraviolet Resistance (strength retained at 500 hrs)	%	ASTM D4355	70

- B. To keep the number of overlay joints to a minimum, fabric shall be provided in sections not less than fifteen (15) feet in width unless otherwise approved by the Engineer prior to delivery to the site.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. For Riprap

1. Prepared areas to receive geotextile in accordance with SECTION 02100 and SECTION 02200
2. Clear subgrade of all sharp objects, large stones, roots, debris, or any other foreign materials that may contribute to puncturing, shearing, rupturing or tearing of the geotextile.
3. Grade area as smooth as possible and compact in accordance with SECTION 02200, with a vibratory roller or other method approved by the Engineer.
4. Inspect subgrade and repair all unstable areas or soft spots with the installation of gravel and recompact prior to the placement of geotextile.

3.02 FABRIC INSTALLATION

A. For Riprap

1. Place at the locations shown on the Contract Drawings.
2. Unroll directly onto the prepared slope in a continuous manner. Join adjacent sections by overlapping the fabric a minimum of 12-inches. Join end sections by

overlapping the fabric a minimum of 2-feet with field-sewn joints or as recommended by the manufacturer.

3. Place fabric on slopes creating a “shingled” effect in the direction of anticipated water flow.
4. Lay fabric smooth, maximizing surface contact with the prepared subbase, free of tension, stress, folds, wrinkles, or creases.
5. Securely anchor fabric sections at the top of the slope as recommended by the manufacturer. Use anchoring pins, nails, staples or other such means to secure fabric to the subbase surface to prevent fabric movement caused by wind uplift, and/or placement of cover material.
6. Maintain sufficient amount of cover material (minimum depth of 6-inches) to protect fabric during placement of riprap. Dozer buckets or blades, or other heavy or damaging equipment shall not be in direct contact with the fabric.
7. Minimize the height from which cover material is dumped and/or dropped directly onto the fabric material in order to avoid fabric damage or movement. Equipment used for spreading and compacting the cover material shall be of the type and size to avoid damage or movement to the underlying geotextile fabric.
8. Spread cover material in the direction of fabric overlap and in a manner that avoids creating undue tension, stress, sagging, buckling and/or other movement of the underlying fabric.

B. Fabric Installation in Trenches

1. In accordance with manufacturers recommendations
2. Place fabric in trench prior to placing crushed stone pipe bedding.
3. Overlap fabric 18-inches minimum for unsewn lap joints.
4. Do not permit equipment to travel directly on fabric.
5. Place fabric in smooth condition to prevent tearing or puncture.
6. Lay fabric loosely, without wrinkles or creases.
7. Leave slack in fabric to allow for adjustment.

3.03 PROTECTION

- A. Protect the work before, during and after installation, and protect the installed work covered by other Sections.

3.04 REPAIR

- A. Geotextile fabric damaged during installation shall be repaired by a piece of geotextile material cut, placed and adequately anchored over the damaged area, subject to a 3-foot minimum overlap requirement or as directed by the Engineer.

- B. If detrimental movement of the geotextile fabric occurs during any step of the installation, as determined solely by the Engineer, the Contractor shall remove the cover material and/or sections of fabric to the limits deemed necessary and reinstall the fabric.
- C. Any fabric damage during its installation or during placement of cover materials shall be replaced by the Contractor at no additional cost to the Owner.

END OF SECTION

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SECTION 02276

SILT FENCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to perform all operations in connection with the silt fence, as indicated on the drawings and as herein specified.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 1. D 3786, Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven fabrics
 2. D 4355, Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
 3. D 4533, Test Method for Trapezoid Tearing Strength of Geotextiles.
 4. D 4632, Test Method for Grab Breaking Load and Elongation of Geotextiles.

1.03 SUBMITTALS

- A. In accordance with SECTION 01300.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Silt Fence as manufactured by Amoco Fabrics and Fibers, or acceptable equivalent.

2.02 MATERIALS

- A. The silt fence shall be comprised of a sediment control fabric and reinforced netting stitched together with heavy duty thread top and bottom, stapled to hardwood posts.
- B. Hardwood posts shall be 4.0 feet long, spaced a maximum 8.0 feet apart with lower ends tapered to facilitate driving into compacted soil.
- C. A 6-inch flap at the bottom of the fence shall be used to toe in the sediment control barrier to prevent silt migration under the barrier.
- D. Each section of fence shall be supplied with a coupling to attach adjoining sections.

E. Silt fence shall conform to the following test requirements:

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
1. Grab Tensile	ASTM D4632	100 lbs.
2. Grab Elongation	ASTM D4632	15 %
3. Trapezoid Tear Strength	ASTM D4533	50 lbs.
4. Mullen Burst Strength	ASTM D3786	275 psi.
5. Equivalent Opening Size	US Std. Sieve	20/30
6. Ultraviolet Resistance	ASTM D4355	70 %

F. Roll Width: 3.0 feet.

G. Roll Length: 100.0 feet.

H. Hay bales shall be machine baled clean salt hay or straw of oats, wheat, barley, or rye, free from seed of noxious weeds, using standard baling wire or string.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install silt fence in accordance with manufacturers written recommendations.

B. Silt fence and hay bales shall be installed prior to any grubbing or earth excavation.

C. Hay bales shall be installed “tight” against silt fence. Excavated soils shall be thoroughly compacted back into trench after installation of erosion control devices.

D. Install silt fence at locations shown on the Contract Drawings or as directed by the Engineer.

3.02 MAINTENANCE

1. Maintain fence throughout the duration of the project.

2. Remove sediments when depths accumulate to 50% of the depth of the fence height, or as necessary.

3.03 REMOVAL AT PROJECT COMPLETION

A. Remove all sediment collected by the silt fence, remove the silt fence, and restore the area to pre-construction condition to the satisfaction of the Engineer.

END OF SECTION

SECTION 02500

PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for construction of all temporary and permanent pavement on paved areas affected or damaged by his operations, whether inside or outside the normal trench limits, as indicated on the drawings and as herein specified.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading

1.02 REFERENCES

- ###### A. This specification makes reference to the requirements of additional specifications as listed . The Contractor shall obtain and familiarize himself with all requirements referenced by this specification prior to preparation and installation of any pavements.

1. Rhode Island Department of Transportation, Standard Specifications for Road and Bridge Construction, including all addenda, issued by the State of Rhode Island Department of Public Works, (referred to as the Standard Specification).

1.03. PAVEMENT SCHEDULE

- ###### A. The Contractors attention is directed to the various pavements required under this contract, and their locations as detailed below.

- ###### B. All pavement thickness specified in this specification shall be of the thickness required after compaction.

1. **Location: WWTF Site Paving and Oakland Pump Station**

Description : Permanent

Requirements: 12" Gravel Base Course (disturbed areas)
1-1/2" Bituminous Base
2-1/2" Bituminous Surface

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Tack

1. Tack coat shall consist of either emulsified asphalt, grade RS-1 or cutback asphalt, grade RC-70 conforming to the requirements of the Rhode Island Standard Specification Section M.03.04.

- B. Bituminous Base
 - 1. Bituminous Base shall conform to the requirements of the Rhode Island Standard Specification Section 402 and M.03.01 for Base Course.
- C. Bituminous Binder
 - 1. Bituminous Binder Course shall conform to the requirements of the Rhode Island Standard Specification Section 402 and M.03.01 for Binder Course.
- D. Bituminous Surface, (Trench)
 - 1. Bituminous Surface Course shall conform to the requirements of the Rhode Island Standard Specification Section 402 and M.03.01 for surface course Class I-1.
- E. Bituminous Surface, (Curb to Curb)
 - 1. Bituminous Surface Course shall conform to the requirements of the Rhode Island Standard Specification Section 402 and M.03.01 for surface course Class I-1.
- F. Reinforced Concrete Base
 - 1. Concrete Base shall conform to the requirements of the State of Rhode Island Standard Specification, Section 501.
- G. Temporary Pavement
 - 1. Temporary Pavement shall be Binder Course conforming to the requirements of the State of Rhode Island Standard Specification, Subsection 402 and M.03.01.1. for Binder Course.
- H. Gravel Base Course
 - 1. Gravel base course in accordance with State of Rhode Island Standard Specification, Subsection M.01.09, Meeting the gradation requirements of Table 1, Column 1, with 100% Passing 3-inch Square Mesh Sieves.

2.02 SOURCE QUALITY CONTROL

- A. The paving plant used by the Contractor for preparation of bituminous paving materials shall be acceptable to the Engineer who shall have the right to inspect the plant and the making of the material.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to placing pavement, all backfill shall have been properly compacted as specified under SECTION 02200 to eliminate settling of backfill. No pavement shall be placed over poorly compacted backfill. Backfill and gravel base course shall be compacted, brought to the proper elevation, and dressed so that new pavement construction shall be at the required grade. The Contractor shall maintain the

surfaces of all excavated and disturbed areas until the pavement is placed. If there is a time lapse of more than 24 hours between completion of preparation of subgrade or placing of gravel base course and placing of paving, or if subgrade or gravel base course has been eroded or disturbed by traffic, the subgrade or gravel base course shall be restored before placing pavement.

- B. When installing permanent pavement on bituminous concrete roadway the edges of existing pavement shall be cut back 12-inches, or more as required, from the trench excavation wall or damaged area to sound undamaged material, straightened, cleaned, and painted with an accepted asphalt emulsion to ensure a satisfactory bond between it and the newly placed surface courses. Existing surface courses shall be stripped from the bituminous concrete base course for at least a 6-inch width and trimmed square and straight so that new permanent surfacing shall be placed on undisturbed bituminous concrete base course. Existing pavement shall be swept clean prior to placing any asphalt emulsion over it. Existing pavement that will be under new pavement shall be painted with asphalt emulsion to ensure a satisfactory bond.
- C. Before permanent pavement is installed, the base shall be brought to the proper grade, and temporary pavement and excess gravel base shall be removed.
- D. All manhole covers, catch basin grates, valve and meter boxes, curbs, walks, walls and fences shall be adequately protected and left in a clean condition. Where required, the grades of manhole covers, catch basin grates, valve boxes, and other similar items shall be adjusted to conform to the finished pavement grade.
- E. The Contractor shall remove and acceptably dispose of all surplus and unsuitable material.

3.02 INSTALLATION

A. General

1. All construction methods and materials shall be satisfactory to the Engineer.
2. Unless indicated otherwise, all permanent bituminous pavement shall be installed in two courses or more. Bituminous base courses shall be carefully spread and raked to a uniform surface and thoroughly rolled before application of the top course.
3. All top courses of permanent paving shall be applied with acceptable mechanical spreaders in widths of at least 9 feet.
4. The rolling for all bituminous and gravel base courses shall conform to the standards listed in the appropriate Subsection of the Standard Specification.
5. Pavement shall be placed so that the entire roadway or paved area shall have a true and uniform surface, and the pavement shall conform to the proper grade and cross section with a smooth transition to existing pavement.

B. Gravel Base Course

1. The gravel base shall be placed to such depth that the furnished compacted gravel base course is the depth as indicated on the drawings and specified herein.

2. The top of the compacted gravel base shall be below the furnish grade a distance required to accommodate the compacted pavement material as indicated on the drawings and specified herein.
3. The gravel base as herein specified shall be 18-inches thick for flexible pavements and 6-inches thick for rigid pavements.

C. Temporary Pavement

1. Temporary pavement shall be placed over all trenches in paved areas where directed by the Engineer.
2. The Contractor, upon completing the backfilling and compaction of the trenches in the streets and the placing of the gravel base course, shall be required to construct temporary pavement unless otherwise directed by the Engineer.
3. Temporary Pavement in city roads shall be placed in one course and shall consist of 2-inch compacted thickness of hot bituminous mix, on a 18-inch compacted thickness gravel base as directed by the Engineer.
4. Temporary Pavement in state roads shall be placed in one course and shall consist of 3-inch compacted thickness of hot bituminous mix, on a 18-inch compacted thickness gravel base as directed by the Engineer.
5. The Contractor shall maintain temporary pavement in good repair and flush with the existing pavement at all times until the permanent pavement is placed.
6. The temporary pavement shall not be removed until such time that the Engineer authorizes the placement of permanent pavement.

D. Bituminous Base

1. Bituminous Base shall be used in city streets and parking areas as listed in Article 1.03 of this specification.
2. Bituminous Base shall be placed to the thickness as indicated in Article 1.03 of this Specification and installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.
3. Prior to placing bituminous base, all temporary pavement and sufficient gravel base course shall be removed, to proper depths as detailed in the contract drawings.

E. Reinforced Concrete Base

1. Reinforced Concrete Base shall be used in the streets as listed in Article 1.03 of this specification.
2. Reinforced Concrete Base shall be 8-inch thick and installed in accordance with the requirements of the Standard Specification.
3. Prior to placing reinforced concrete base, all temporary pavement and sufficient gravel base course shall be removed, to proper depths as detailed in the contract drawings.

F. Bituminous Binder

1. Bituminous Binder shall be used in the streets as listed in Article 1.03 of this specification.

2. Bituminous Binder shall be placed to the thickness as indicated in Article 1.03 of this Specification and installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.

G. Bituminous Surface

1. Bituminous Surface shall be used in the streets as listed in Article 1.03 of this specification.
2. Bituminous Surface shall be placed to the thickness as indicated in Article 1.03 of this Specification and installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.

H. Sidewalks, Driveways, Parking Lots And Curbing

1. Sidewalks, driveways, parking lots and curbing that are removed or damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they are found immediately prior to the start of operations. Materials and methods used for such restoration shall be in conformance with the requirements of the State of Rhode Island Standard Specification.
2. Where the trench locations is in a sidewalk, the entire width of the sidewalk shall be replaced with new material. Side forms shall be set so as to obtain and preserve a straight edge along both sides of the walk.
3. Where trench is in a driveway, the driveway shall be repaved across its entire width with even edges.
4. Parking lots shall be repaved in accordance with Article 3.01 of this section.
5. Gravel base course under sidewalks and driveways shall not be less than 12" inch thick.

I. Surface Maintenance

1. During the guarantee, period, the Contractor shall maintain the bituminous surface and shall promptly make good all defects such as cracks, depressions, and holes that may occur. At all times, the surfacing shall be kept in a safe and satisfactory condition for traffic. If defects occur in surfacing constructed by the Contractor, the Contractor shall remove all bituminous concrete and base course as is necessary to properly correct the defect. After removing bituminous concrete and base course, the Contractor shall correct the cause of the defect and replace the base course and bituminous concrete in accordance with these specifications.

END OF SECTION

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SECTION 02607

PRECAST CONCRETE MANHOLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for modular precast concrete manhole sections with tongue-and-groove joints, cast iron covers, accessories and appurtenances.

B. Related Sections

1. Section 02622 - Polyvinylchloride Gravity Sewer Pipe
2. Section 03300 - Cast-In-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A48, Standard Specification for Gray Iron Castings.
2. A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. C32, Standard Specification of Sewer and Manhole Brick (Made from Clay or Shale), AASHTO Designation M91-42, Red Sewer Brick Only Grade SS.
4. C144, Standard Specification for Aggregate for Masonry Mortar.
5. C150, Standard Specification for Portland Cement.
6. C207, Standard Specification for Hydrated Lime for Masonry Purposes.
7. C443, Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.
8. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
9. C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
10. C1244, Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure.
11. D4101, Standard Specification for Propylene Plastic Injection and Extrusion Materials.

1.03 SYSTEM DESCRIPTION

A. Design Requirements

1. Manholes shall conform in shape, size, dimensions, materials, and other respects to the details indicated in the Contract drawings.
2. All manholes shall have concrete bases. Invert channels may be formed in the concrete of the base or brickwork upon the base.
3. Manhole walls (barrels and cones) shall be precast concrete sections. The top of the cone (not to be more than 12-in.) shall be built of brickwork to permit adjustment of the frame to meet the finished surface.
4. The inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerlines of adjoining pipelines.

1.04 SUBMITTALS

A. Shop Drawings

1. In accordance with Specification SECTION 01300 - SUBMITTALS.

B. Samples

1. Provide representative samples of materials if requested by the Engineer.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE SECTIONS

A. Conform to the ASTM C478 with the following exceptions and additional requirements:

1. All cast in place concrete shall be Class A and shall conform to the requirements specified under SECTION 03300.
2. Wall sections to be 5-inch thick minimum.
3. Type II cement in accordance with ASTM C150.
4. 4.0 feet and 5.0 feet diameter manholes minimum of 4,000 psi - 28 days compressive strength.
5. 6.0 foot diameter manhole minimum of 5,000 psi. - 28 days compressive strength. Except as otherwise permitted.
6. Sections shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 degrees F. for a period of not less than 12 hours or, when necessary for such additional item as may be needed to enable the sections to meet the strength requirements.
7. No more than two lift holes may be cast or drilled in each section.
8. The date of manufacture and the name of trademark of the manufacturer shall be clearly marked on the inside of the barrel.
9. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.

B. Flat Slab Tops

1. Thickness and reinforcement as indicated on the drawings and in accordance with ASTM C-478.

C. Cones

1. Cones shall be precast sections of construction similar to above.

D. Bases

1. The tops of the bases shall be suitably shaped by means of accurate bell-ring forms to receive the barrel sections.
2. All holes for pipes shall be cast in the base sections so that there is a clear distance of four inches minimum between the inside bottom of the base section and the pipe invert.
3. Base pad shall be pre-cast with extended base as indicated on drawings and herein specified.
4. Openings for pipe and materials to be embedded in the wall of the base for these joints shall be cast in the base at the required locations during the manufacture of the base.

2.02 COMPONENTS

A. Pipe Seals

1. Premolded elastomeric-sealed joints fitted or cast integrally into the pipe opening of the manhole base and/or wall section.
2. Provide a watertight joint.
3. Maximum 10-degree omni-directional deflection.
4. Conform to ASTM C-923.
5. Seals to be:
 - a. Lock Joint Flexible Manhole Sleeve made by Interpace Corp., Parsippany, NJ;
 - b. Kor-N-Seal made by National Pollution Control Systems, Inc., Nashua, NH;
 - c. A-LOK manhole pipe seal made by A-LOK Corp., Trenton, NJ;
 - d. or an acceptable equivalent product.
6. All materials, accessories and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint. Furnish manufacturer's written instructions to the Engineer.

B. Aluminum Manhole Steps

1. Cast into walls of the precast sections to form a continuous ladder with a distance of twelve inches (12) between steps.
2. Aluminum drop-front type.
3. Stock No. 12653B made by Aluminum Company of America, Pittsburgh, PA.
4. Stock No. F-14-2-B made by New Jersey Aluminum Co., New Brunswick, N.J.,
5. Or an acceptable equivalent product.
6. Before the steps are built into the masonry and after thorough cleaning, those parts of aluminum steps which will be embedded shall be given a protective coating of an acceptable, heavy-bodied, bituminous material. The cleaning shall be done by suitable means and with suitable cleaning agents to ensure that the surfaces to be coated are free from all foreign matter such as dirt, oil, and grease. The steps shall be thoroughly rinsed and dried before the coating is applied and the coating shall have become thoroughly dry before the steps are built into the masonry.

C. Plastic Manhole Steps

1. Install in walls of the precast sections to form a continuous ladder with a distance of twelve inches (12) between steps.
2. Copolymer Polypropylene plastic manhole step Model PS2-PFSL as manufactured by M. A. Industries, Inc., Peachtree City, Georgia.
3. Plastic steps to be in conformance with ASTM D-4101 for type II propylene copolymers.
4. Plastic to encase 1/2-inch grade 60 steel reinforcing rod conforming to ASTM A-615.

D. Exterior Coating

1. The material shall be:
 - a. Minwax Fibrous Brush Coat made by the Minwax Co., New York, N.Y. or
 - b. Tremco 121 Foundation Coating made by the Tremco Inc., Cleveland, OH; or
 - c. Acceptable equivalent product.

E. Rubber Gaskets (between manhole sections)

1. In accordance with ASTM C443.
2. Gasket configuration per manufacturers recommendation.

F. Butyl Resin Gaskets (between manhole sections)

1. In accordance with ASTM C990.
2. Gasket configuration per manufacturers recommendation.

2.03 ACCESSORIES

A. Manhole Frames and Covers

1. Furnish all cast-iron manhole frames and covers conforming to the details shown on the drawings, or as hereinbefore specified.
2. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
3. Casting shall be thoroughly cleaned and subject to a careful hammer inspection.
4. Castings shall be at least Class 25 conforming to the ASTM A48.
5. Standard sewer manhole frames and covers to have 30 inch opening, and be E.L. LeBaron Foundry Co., Model LC326, or approved equal. Pattern of cover and lettering shall comply with the Owner's standards.
6. Watertight sewer manhole frames to have 32 inch diameter covers with 4 bolts, and gasket, and be E.L. LeBaron Foundry Co., Model LCB326, or approved equal. Pattern of cover and lettering shall comply with the Owner's standards.

B. Brick

1. Sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer.
2. In accordance with ASTM C32, Red Sewer Brick Only Grade SS.
3. In accordance with AASHTO M91-42, Red Sewer Brick Only Grade SS.
4. Reject brick shall be immediately removed from the work.

C. Mortar for Brickwork

1. Composed of Portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volume of cement and lime.
2. The proportions of cement and lime shall be 1:1/4.
3. Cement shall be Type II Portland cement in accordance with Specification SECTION 03300.
4. Hydrated lime shall be Type S conforming to the ASTM C207.
5. Hydrated lime shall be "Mortaseal" manufactured by U.S. Gypsum or
6. "4X Hydrate" manufactured by the New England Lime Company or
7. An acceptable equivalent product.
8. The sand shall conform to ASTM C144.

2.04 STUBS IN MANHOLES

- A. The stubs shall be of PVC pipe and shall have PVC stoppers sealed with pre-molded gasket joints in accordance with Specification SECTION 02622.

- B. Lengths as indicated on the Drawings.

2.05 DROP INLETS

- A. Construct with pipe as specified in SECTION 02622 or with precast concrete sections provided by the manhole manufacturer with all materials conforming to this Specification.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manhole Sections

1. Set so as to be vertical and with sections and steps in true alignment.
2. Rubber gaskets shall be installed in all joints in accordance with the manufacturer's recommendations.
3. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

B. Rubber and/or Butyl Resin Gaskets (between manhole sections)

1. In accordance with manufacturers recommendation.
2. Install in all joints between precast sections.

C. Brickwork

1. Only clean bricks shall be used.
2. Bricks shall be moistened by suitable means, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
3. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded.

D. Plastering And Curing Brick Masonry

1. Outside faces of brick masonry adjustment courses shall be plastered with mortar to a thickness of 1/2-inch.
2. If required, the masonry shall be properly moistened prior to application of the mortar.
3. The plaster shall be carefully spread and troweled. After hardening, the plaster shall be carefully checked by being tapped for bond and soundness.
4. Unbonded or unsound plaster shall be removed and replaced.
5. Brick masonry and plaster shall be protected from too rapid drying by the use of burlaps kept moist, or by other suitable means, and shall be protected from the weather and frost, to insure maximum strength.

E. Exterior Coating

1. The exterior surfaces of all manholes shall be given two coats of waterproofing material.
2. The waterproofing material shall be applied by brush or spray and in accordance with the instructions of the manufacturer.
3. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

3.02 SETTING MANHOLE FRAMES AND COVERS

- A. Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings or directed. Frames shall be set concentric with the top of the masonry and in full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
- B. Manhole covers shall be left in place in the frames on completion of work at the manholes.

3.03 INSTALLING STUBS IN MANHOLES

- A. Stubs shall be set accurately to the required line and elevation and shall be installed in the manhole as indicated on the drawings and in accordance with Specification SECTION 02622.

3.04 DROP INLETS

- A. Construct to the required line and elevations as indicated on the Drawings.

3.05 FIELD QUALITY CONTROL

A. Testing

1. Gravity Sewer Manholes shall be vacuum tested in accordance with ASTM C1244.
2. Lift holes shall be plugged and pipes entering the manhole shall be temporarily plugged.
3. A vacuum of 10 inches of mercury shall be drawn on the manhole.
4. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values in the Table below.
5. If the manhole fails the initial test, necessary repairs shall be made by a method approved by the Engineer. The manhole shall then be retested and repairs shall be made until a satisfactory test is obtained.

Table 1 Minimum Test Times for Various Manhole Diameters

Depth Ft	Diameter (in.)								
	30	33	36	42	48	54	60	66	72
	Time (sec)								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	39	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81

3.06 CLEANING

- A. Manholes to be free of construction debris prior to final inspection.

END OF SECTION

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SECTION 02618

BURIED DUCTILE-IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to furnish, lay, joint, and test ductile-iron pressure pipe, fittings (including special castings), and appurtenant materials and equipment indicated on the Drawings and specified in this Section.

1.02 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. A21.4 Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
 - 2. A21.10 Standard For Ductile-Iron or Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water
 - 3. A21.11 Standard For Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - 4. A21.15 Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 - 5. A21.16 Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service
 - 6. A21.50 Standard for Thickness Design of Ductile-Iron Pipe
 - 7. A21.51 Standard for Ductile-Iron, Centrifugally Cast, for Water

1.03 RELATED SECTIONS

- A. Section 02200 – Excavation, Backfill, Fill, and Grading
- B. Section 15100 – Valves and Appurtenances

1.04 SUBMITTALS

- A. In accordance with SECTION 01300 submit the following:
- B. Shop Drawings
 - 1. Piping layouts in full detail.
 - 2. Location and type of backup block or device to prevent separation.

3. Schedules of all pipe, fittings, special castings, couplings, expansion joints, and other appurtenances.

C. Certificates

1. Sworn certificates in duplicate of shop tests showing compliance with appropriate standard.

D. Manufacturer's Literature

1. Catalog cuts of joints, couplings, harnesses, expansion joints, gaskets, fasteners and other accessories.
2. Brochures and technical data of coatings and lining's and proposed method of application.

1.05 QUALITY ASSURANCE

- A. Inspect and test at foundry according to ANSI Standards.
- B. Owner reserves right to inspect and/or test by independent service at manufacturer's plant or elsewhere at his own expense.
- C. Owner reserves right to perform visual inspection and hammer test before installation.

PART 2 PRODUCTS

2.01 GRAVITY SANITARY SEWER PIPE AND FITTINGS

- A. **All gravity sanitary sewer pipe lines and fittings shall be ductile iron pipe lined with a ceramic-filled amine-cured epoxy, Protecto 401 by Indurall.** The lining thickness shall be 40 mils minimum. Application shall be performed by an applicator approved by the coating manufacturer, in accordance with manufacturer's instructions and under controlled conditions at the applicator's shop or the pipe manufacturer's plant. Applicator shall submit a certified affidavit of compliance with manufacturer's instructions and requirements specified herein.
- B. For gravity sewer pipeline use a minimum thickness class 52 ductile iron pipe.

2.02 PIPE

A. Ductile-Iron Pipe

1. All ductile-iron pipe shall be designed in accordance with ANSI A21.50 and shall be manufactured in accordance with ANSI A21.15 or ANSI A21.51.
2. Unless otherwise indicated or specified, ductile-iron pipe shall be at least thickness Class 52.

B. Pipe For Use With Couplings

1. Pipe for use with sleeve-type couplings shall be as specified above except that the ends shall be plain (without bells or beads). The end shall be cast or machined at right angles to the axis.

2.03 FITTINGS

A. General

1. Fittings shall conform to the requirements of ANSI A21.10 and shall be at least Class 150.
2. Push-on or mechanical-joint fittings shall be all-bell fittings unless otherwise indicated or specified.

B. Nonstandard Fittings

1. Fittings having nonstandard dimensions and cast especially for this project shall be of acceptable design. They shall be manufactured to meet the requirements of the same specifications and shall have the same diameter and thickness as standard fittings, but their laying lengths and types of ends shall be determined by their positions in the pipelines and by the particular piping to which they connect.

2.04 ADAPTERS

- A. Where it is necessary to joint pipes of different type, the Contractor shall furnish and install the necessary adapters unless solid sleeves are indicated on the drawings or permitted. Adapters shall have ends, conforming to the above specifications for the appropriate type of joint, to receive the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell-and-spigot type joints will be sufficient for proper jointing.

2.05 JOINTS

A. Restrained

1. Where so indicated, pipe and fittings shall be furnished with approved joints, lugs or hooks cast integrally for use with bolts or bridle rods and socket clamps to keep the piping from pulling apart under pressure.

B. Push-On and Mechanical

1. Joints for push-on and mechanical-joint pipe shall conform to ANSI A21.11.
2. The plain end of push-on pipe shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
3. Push-on and mechanical-joint pipe and fittings shall be provided with sufficient quantities of accessories conforming to ANSI A21.11.
4. At Contractors option, joints in buried exterior pipelines shall be either push on joints or mechanical joints.

C. Gaskets

1. Gaskets shall be of a composition suitable for exposure to the product which the pipe is intended.

D. Bolts

1. Ductile Iron or Kor-10 steel T bolts and nuts or approved equal.
2. 304 stainless steel T bolts and nuts shall be provided for submerged applications.

2.06 COUPLINGS

A. Flexible Connections

1. Where flexible connections in the piping are specified or indicated on the drawings, they shall be obtained by the use of sleeve-type couplings, split couplings, or mechanical-joint pipe and/or fittings as herein specified.

B. Sleeve-Type Couplings (Dresser Style Coupling)

1. To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe and shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
2. Sleeve-type couplings shall be style 441 or 442, made by Smith-Blair of Texarkana, AR; or be acceptable equivalent products.
3. The couplings shall be provided with 304 stainless steel bolts and nuts, unless noted otherwise.
4. All couplings shall be furnished with the pipe stop removed.
5. All couplings shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.
6. All gaskets provided with metallic tips for electrical continuity through joints.

2.07 ACCESSORIES

A. Tapped Connections

1. Tapped connections in pipe and fittings shall be made in such manner as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses, shall not exceed the listed size in the appropriate table of the Appendix to the above-mentioned ANSI A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
2. Where the size of the connections exceeds that given above for the pipe in question, a boss shall be provided on the pipe barrel, the tap shall be made in the flat part of the intersection of the run and branch of a tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or permitted by the Engineer.
3. All drilling and tapping of cast-iron pipe shall be done normal to the longitudinal axis of the pipe; fitting shall be drilled and tapped similarly, as appropriate.

Drilling and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.

2.07 VALVES

A. All valves shall be in accordance with specification Section 15100.

2.08 FINISHES

A. Lining

1. Inside of pipe and fittings shall be coated with double thickness cement lining and bituminous seal coat conforming to ANSI A21.4. The standard bituminous coating is specified under the appropriate ANSI Standard for the pipe and fittings.

B. Coating

1. Outside of pipe and fittings shall be coated with the standard bituminous coating conforming to appropriate AN Standard.
2. Outside surfaces of castings to be encased in concrete shall not be coated.
3. Machined surfaces shall be cleaned and coated with a suitable rust-preventative coating at the shop immediately after being machined.

PART 3 EXECUTION

3.01 HANDLING

A. Pipe and Fittings

1. The Contractor's attention is directed to the fact that cast iron used for pipe and fittings is comparatively brittle. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coatings.
2. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the Work.
3. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

3.02 CUTTING

A. Pipe

1. Except as otherwise approved, all cutting shall be done with a machine having rolling wheel cutters, knives, or saws adapted to the purpose. Hammer and chisel

or so-called wheel span cutters shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.

2. Cut ends to be used with push-on joints shall be carefully chamfered to prevent cutting the gasket when the pipe is laid or installed.

3.03 INSTALLATION

A. Pipe and Fittings

1. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
2. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
3. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or required. Care shall be taken to ensure a good alignment both horizontally and vertically.
4. Pipe shall have a firm bearing along its entire length.
5. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the tabulation titled PIPE DEFLECTION ALLOWANCES.

PIPE DEFLECTION ALLOWANCES

Maximum permissible deflection, in.*

<u>Size of pipe, in.</u>	<u>push-on joint</u>	<u>Mechanical joint</u>
4	19	31
6	19	27
8	19	20
10	19	20
12	19	20
14	11	13-1/2
16	11	13-1/2
18	11	11
20	11	11
24	11	9
30	11	9
36	11	8
42	7-1/2	7-1/2
48	7-1/2	7-1/2
54	5-1/2	--

*Maximum permissible deflection for 18-ft. lengths; maximum permissible deflections for other lengths shall be in proportion of such lengths to 18 ft.

6. When mechanical joint, push-on joint, or similar pipe is laid, the bell of the pipe shall be cleaned of excess tar or other obstructions and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

B. Castings

1. Castings to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned.
2. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.

C. Temporary Plugs

1. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

D. Appurtenances

1. All valves, fittings and appurtenances shall be set and jointed as indicated on the drawings.

3.04 ASSEMBLING

A. Push-On Joints

1. Make up by inserting the gasket into the groove of the bell and applying a thin film of special nontoxic gasket lubricant uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe.
2. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

B. Bolted Joints

1. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces.
2. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.

C. Mechanical Joints

1. Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be

cleaned. The gasket, bell, and spigot shall be lubricated by being washed with soapy water.

2. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated.
3. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket.
4. After all bolts have been inserted and the nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension, preferably by means of a torque wrench.
5. The correct range of torque as indicated by a torque wrench and the length wrench (if not a torque wrench) used by an average man to produce such range of torque, shall not exceed the values specified in the tabulation titled TORQUE RANGE VALUES.

TORQUE RANGE VALUES

Nominal pipe size, <u>in.in.</u>	Bolt diameter, <u>ft.-lb.</u>	Range of torque, <u>in.</u>	Length of wrench, <u>in.</u>
3	5/8	40-60	8
4 thru 24	3/4	60-90	10
30, 36	1	70-100	12
42, 48	1-1/4	90-120	14

If the effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be over stressed to tighten a leaking joint.

D. Sleeve-Type Couplings

1. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8-inches
2. Soapy water may be used as a gasket lubricant.
3. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint.
4. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid.
5. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.
6. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.

7. The correct torque as indicated by a torque wrench shall not exceed the values indicated in the following table:

TORQUE

Nominal pipe size, <u>in.</u>	Bolt diameter, <u>in.</u>	Maximum torque, <u>ft.-lb.</u>
3-24	5/8	75
30-36 (1/2 in. mid ring)	5/8	65
30-36 (3/8 in. mid. ring)	5/8	70
30-48	3/4	80
48-72	3/4	70

8. After assembly and inspection and before being backfilled, all exterior surfaces of buried sleeve-type couplings, including the middle and follower rings, bolts, and nuts, shall be thoroughly coated with an approved heavy-bodied bituminous mastic. Care shall be taken and appropriate devices used to ensure that the undersides, as well as the more readily accessible parts, are well coated.

3.05 SOCKET PIPE CLAMPS, TIERODS, AND BRIDLES

- A. Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, suitable socket pipe clamps, tie rods, and bridles shall be provided. Bridles and tie rods shall be at least 3/4 in. diameter except where they replace flange bolts of smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The socket clamps and tie rods or bridles shall be coated with an approved bituminous paint after assembly or, if necessary, prior to assembly.

3.06 PIPING SUPPORT

- A. Where necessary, bends, tees, and other fittings in pipelines buried in the ground shall be backed up with Class B concrete placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then suitable bridle rods, clamps, and accessories to brace the fitting properly shall be provided. Such bridle rods, etc., shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, prior to assembly.

3.07 CLEANING

- A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

3.08 PRESSURE AND LEAKAGE TESTS

- A. Except as otherwise directed, all pipelines shall be given combined pressure and leakage tests in sections of approved length.

- B. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gages, relief valves, and other necessary equipment; and all labor required, to test the pipe specified in this Section.
- C. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires. However, pipelines in excavation or embedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete and exposed piping shall be tested prior to field painting.
- D. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants or blow offs are not available at high points for releasing air the Contractor shall make the necessary excavations and do the necessary backfilling and make the necessary taps at such points and shall plug said holes after completion of the test.
- E. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- F. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe but not to exceed 200 psi. Care shall be taken not to apply this pressure to items of equipment known to be incapable of withstanding such pressure.
- G. If the Contractor cannot achieve the specified pressure and maintain it for a period of one hour with no additional pumping, the section shall be considered as having failed to pass the test.
- H. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test and is considered acceptable by the Engineer.
- I. If, in the judgment of the Engineer, it is impractical to follow the foregoing procedure exactly for any reason, modifications in the procedure may be made as required and approved by the Engineer, but in any event the Contractor shall be fully responsible for the ultimate tightness of the line within the above leakage and pressure requirements.

END OF SECTION

SECTION 02619

VALVES, HYDRANTS, AND FITTINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes

1. Requirements to furnish and install valves, hydrants and miscellaneous piping appurtenances, as indicated on the Drawings and as herein specified.
2. The Drawings and Specifications direct attention to certain features of the equipment, but do not purport to cover all the details of their design. The equipment furnished shall be designed and constructed equal to the high quality equipment manufactured by such firms as are mentioned hereinafter, or as permitted by the Engineer. The Contractor shall furnish and install the equipment complete in all details and ready for operation.

B. Related Sections

1. Section 02215 - Aggregate Materials
2. Section 02200- Earth Excavation, Backfill, Fill and Grading
3. Section 02618 - Ductile Iron Pipe and Fittings
4. Section 03300 - Cast-in-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A48, Standard Specification for Gray Iron Castings
2. A536, Standard Specification for Ductile Iron Castings

B. American Water Works Association (AWWA)/American National Standards Institute (ANSI)

1. ANSI/ASME B2.4-1966 (R1974), Hose Coupling Screw Threads.
2. ANSI/ASME B1.20.7, Hose Coupling Screw Threads
3. ANSI/AWWA C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
4. ASNI/AWWA C502, Dry-Barrel Fire Hydrants
5. ANSI/AWWA C504, Rubber-Sealed Butterfly Valves

6. ANSI/AWWA C509, Resilient-Seated Gate Valves for Water-Supply Service
7. AWWA C550, Protective Epoxy Interior Coatings for Valves and Hydrants

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – Submittals

1. Manufacturer's specifications, catalog data, descriptive matter, illustrations, diagrams etc.
2. Operating instructions and parts list.

1.04 QUALITY ASSURANCE

A. Contractor is responsible for verifying outside diameter of pipe to be tapped.

- #### B. Coatings in contact with water, which is contiguous with any part of municipal water system, are suitable for use in contact with potable water, provided governing authorities approve and harmful chemicals, taste or odor is not imparted to water when cured.

PART 2 PRODUCTS

2.01 RESILIENT SEAT GATE VALVES

- #### A. Manufactured by American Flow Control, Birmingham AL; Kennedy Valve, Elmira, N.Y. or acceptable equivalent.

B. General

1. Gates shall conform to all applicable sections of AWWA C509.
2. Valve bodies shall be manufactured of ductile iron.
3. Gate valves shall be open **LEFT** (counter clockwise).
4. All valves shall be allowed upper replacement of upper “O” rings while the valve is under pressure in a fully-opened position.
5. Exterior surfaces of all valves shall be coated with a minimum of three applications of an approved bituminous solution, on a rust-free casting, prior to shipment. Valve interiors shall have a two-part thermostat epoxy-protective coating system and meet all requirements of AWWA C550. The epoxy coating shall not impart taste or odors to the water. The coating shall be a product acceptable to the NSF for use in potable water and shall be so listed in the most current NSF summary of approved products (ANSI/NSF Standard 61). The coating shall be applied and cured in strict conformance with the coating manufacturer’s cautions and instructions. The coating shall be applied by the

valve manufacturer under controlled factory conditions, and field application is strictly prohibited.

C. All valves shall be designed for 250 psi working water pressure.

D. Buried Valves:

1. Buried valves shall be of the inside-screw type with mechanical-joint ends. An operating nut and extension stem shall be in lieu of hand wheel.
2. The Contractor shall provide the gate boxes and 2-in. square operating nut at the upper end with coupling connected to the valve stem as required.

2.02 BUTTERFLY VALVES (NOT USED)

A. Manufactured by Mueller Co., Decatur, IL; H. Pratt Co., Aurora, Ill., Clow Valve Co., Oskaloosa, IA, or acceptable equivalent.

B. Valve Provisions:

1. Valves shall conform to the requirements as specified in the AWWA Standard for Rubber-Seated Butterfly Valves AWWA C504, except as modified or supplemented herein.
2. The valve design shall utilize a continuous rubber lining on the internal body surfaces and extending over the flanges. A disk which seats at an angle to the axis of the pipe will not be acceptable.
3. Mechanical-joint-end type valves shall be utilized, and shall be constructed of ASTM A536, grade 65-45-12 ductile iron.
4. Valves shall be designed for 250 psi working pressure.
5. Butterfly valves shall be open **LEFT** (counter clockwise).
6. The number of turns will be determined by the Owner.

C. The valve shall utilize body mechanical joint ends in accordance with AN Standard of Rubber Gasket Joints for Cast Iron and Ductile Iron pressure pipe and fittings (A21.11).

D. Seat Provisions:

1. The valve shall utilize a molded natural rubber or synthetic rubber seat on the disk or in the body, and be mechanically fastened, not penetrated by the shaft. Type 316 stainless steel shall be utilized in the mating-seat. The seat shall be replaceable on 12-in. through 24-in. without removing the disk. It shall be mounted securely for complete immobility under operating conditions.
2. If the seat is on the disk, use a Class 40 cast iron disk conforming to ASTM A48, or a Grade 60-40-18 ductile iron conforming to ASTM A536.

3. If the seat is on the body, use a Class 40 cast iron disk conforming to ASTM A48, or a Grade 60-40-18 ductile iron conforming to ASTM A536, with a Type 316 stainless-steel seating edge, or all Type 316 stainless steel. The stainless-steel edge on cast iron or ductile iron disks shall be either mechanically secured or heat shrunk to the edge of the disk or welded overlay.
- E. Disk Provisions: The disk shall rotate 90 degrees from full open to full close position.
 - F. Shaft Provisions: The shaft shall be manufactured from either Type 304 or Type 316 stainless steel. It must be a one-piece unit extended completely through the valve disk.
 - G. Miscellaneous Provisions: Type 304 stainless steel, taper pins, lock washers and nuts shall be utilized. The packing gland shaft seal shall be a one-piece cast-iron gland follower with bronze nuts. It shall be self-adjusting, split V-type, packing.
 - H. Valve Operator Provisions: Buried valves shall be provided with gate boxes and operating wrenches as hereinafter specified. Where necessary, valves shall be furnished with steel extension stems or universal joint operating rods with 2-in. square operating nuts at the upper end and a suitable coupling to connect to the valve stem.
 - I. Buried or Submerged Service Provisions: Valves shall have permanent chevron "V" type packing requiring no adjustment, with self-compensating and self-adjusting seals, under pressure, for buried and submerged service.

2.03 TAPPING SLEEVES (NOT USED)

- A. Tapping sleeves shall be American Darling model 1004, manufactured by American Flow Control, Birmingham, Ala.; or an approved equivalent.
- B. Tapping sleeves shall be of the mechanical joint type. The valve shall be flanged by mechanical joint outlet with non-rising stem and designed for vertical burial. Tapping valves shall be rated at 200 PSI working pressure and shop tested at 300 PSI. Bolts on bonnet and stuffing box shall be 316 stainless steel, stuffing boxes shall be o-ring type. The operating nut shall be 2-inches square. Gaskets shall cover the entire flange surface. Valves shall open **LEFT**, (counter clockwise).

2.04 HYDRANTS (NOT USED)

- A. The Owner has standardized on American Darling Model No. B-62B Quickfix type of thread – NST as manufactured by American Flow Control.
- B. Provisions:

1. Hydrants shall have a minimum working pressure of 200 PSI. Hydrant design shall be of positive automatic drain type to prevent freezing.
2. Hydrant design shall be in accordance with AWWA C502, be suitable for buried depth as indicated and be of positive automatic drain type to prevent freezing.
3. The hydrant shall have a 5 1/4-inch valve opened by turning the operating unit in the counter clockwise direction. The hydrant shall have one 4-1/2-in. pumper and two 2-1/2-in. hose connections. The hose and pumper connections shall have National Standard Thread. The operating nuts shall be pentagonal in shape, 1-1/2-in. from point to opposite flat and shall open **LEFT** (counter clockwise). The hydrant shall be the hub or mechanical-joint type having a 6-in. pipe connection.
4. The rods shall be permanently sealed from contact with water. The hydrant valve shall seal against the bronze hydrant seat.
5. The upper barrel shall be ductile iron with markings identifying size, model and year of the hydrant manufacture.
6. The lower barrel shall be ductile iron.
7. The upper barrel shall connect to the lower barrel with a breakable traffic flange and 8 bolts and nuts. This connection shall allow 360 degree rotation of the upper nozzle section.
8. The hydrant shall have a bronze drain ring securely held between the barrel and base flange. It shall provide bronze to bronze threaded connection for hydrant seal. The bronze drain ring shall serve as a non-corrosive multi-port drain.

2.05 VALVE BOXES

A. Provisions:

1. Valve boxes shall be Buffalo telescoping, heavy pattern type with the lower part manufactured of cast iron and the upper part of steel or cast iron. The valve box shall be designed and constructed to prevent direct transmission of traffic loads to the pipe or valve. Boxes shall be adjustable through at least 6-in. vertically without reduction of lap between sections to less than 4-in. inside diameter of boxes for valves at least 4-1/2 in. and at least 3-in. for stops, and lengths as necessary for depths of the valves or stops with which the boxes are to be used. The top of the cover shall be flush with the top of the box rim. The cover shall have the words "SEWER" cast into the top for all gates.

2.06 T-HANDLE OPERATING WRENCHES

- ### A. Provisions:
- A T-handle operating wrenches shall be provided in the number and lengths required, to permit operation of all valves and stops by operators of average height working in normal positions.

PART 3 EXECUTION

3.01 VALVES

- A. Erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect the material for defects in workmanship and material. Clean out debris and foreign material from valve openings and seats, test-operating mechanisms to check proper functioning, and check nuts and bolts for tightness. Repair, at no additional compensation, valves and other equipment that do not operate easily or are otherwise defective.
- B. Appropriate blocking shall be placed under each valve to insure against settlement. Blocking with wood is not acceptable.
- C. Valves installed with stems below the horizontal will not be allowed.
- D. Set plumb and support valves adequately in conformance with instructions of manufacturer.
- E. Provide valves with extension stems where required for convenience of operation. Provide extension stems for valves installed underground and elsewhere so that the operating wrench does not exceed 8 ft. in length.
- F. Conduct a final walk through with Owner and Engineer to ensure that all valves are open unless otherwise noted on the contract drawings or directed by the engineer.

3.02 HYDRANTS

- A. Set hydrants plumb, and center buried valve and valve box. Tamp earth fill carefully around the valve box to a distance of 4 ft. on all sides of the box, or to undisturbed trench face, if less than 4 ft. Install at least the same depth of cover on hydrant and connecting pipe as on the distributing main. Set the hydrant upon a slab of stone or concrete not less than 4-in. thick and 14-in. square. Firmly wedge side of hydrant opposite pipe connections against vertical face of trench with concrete thrust block. Place not less than 7 cu. ft. of crushed stone around the base of the hydrant at the location of drain holes. Backfill around hydrants as specified under Section 02200. Clean hydrant and valve interiors of all foreign matter before installation and inspect in opened and closed positions. Care must be taken to keep the drain ports clear.
- B. Conduct a final walk through with the Owner and Engineer to ensure that all hydrant valves are open

3.03 VALVE BOXES

- A. Provide a valve box for each buried stop and valve. Install as detailed on the Drawings

3.04 PAINTING

- A. Touch-up abraded areas of shop coat with paint of the same type as shop coat, even to the extent of applying entire coat if necessary, and clean deteriorated surfaces before applying touch-up coat.
- B. Shop coat exposed ferrous surfaces, not painted, with grease or other suitable protective coating. Uncoated surfaces in contact with potable water shall not be coated.

END OF SECTION

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SECTION 02620

HIGH DENSITY POLYETHYLENE PIPE

PART 1 GENERAL

1.01 SCOPE

- A. This specification defines the characteristics and properties of high-density polyethylene (HDPE) pipe. This specification governs the material, pipe, fittings, butt fusion, and general construction practice for HDPE piping systems.

1.02 REFERENCES

- A. American Society for Testing and Materials:
1. D638 - Standard Test Method for Tensile Properties of Plastics
 2. D696 - Standard Test Method for Coefficient of Thermal Expansion of Plastics Between (-30°C) and 30°C
 3. D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
 4. D790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 5. D1238 - Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
 6. D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique
 7. D1603 - Standard Test Method for Carbon Black in Olefin Plastics
 8. D1693 - Standard Test Method for Environmental Stress Cracking of Ethylene Plastics
 9. D1928 - Standard Practice for Preparation of Compression-Molded Polyethylene Test Sheets and Test Specimens
 10. D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 11. D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping
 12. D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
 13. D3350-02a Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
 14. D 3261 - Standard Specification for Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
 15. D 3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

16. F 714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

- B. American Water Works Association (AWWA):
 - 1. C906 – Polyethylene (PE) Pressure Pipe and Fittings, 4 in. Through 63 in., For Water Distribution
- C. National Sanitation Foundation (NSF):
 - 1. Standard 14, National Sanitation Foundation Standard for Plastic Piping System Components and Related Materials.
 - 2. PPI TR31-9/79 - Underground Installation of Polyolefin Piping

1.03 RELATED SECTIONS

- A. Section 01600 – Materials and Equipment
- B. Section 02200 - Earth Excavation, Backfill, Fill and Grading

PART 2 PRODUCTS

2.01 MATERIAL

- A. Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density PE 3408 polyethylene resin. The material shall be listed by PPI (Plastics Pipe Institute, a division of the Society of the Plastics Industry) in PPI TR-4 with a 73°F hydrostatic design basis of 1,600 psi and a 140°F hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D2837 testing.

2.02 PIPE AND FITTINGS

- A. Pipe. Pipe supplied under this specification shall have a nominal IPS (Iron Pipe Size) OD unless otherwise specified. The DR (Dimension Ratio) and the pressure rating of the pipe supplied shall be as specified by the engineer. The pipe shall be produced from approved HDPE pipe grade resin with the nominal physical properties outlined in Section III. Pipe having a diameter 3” and larger will be made to the dimensions and tolerances specified in ASTM F 714.
- B. APPROVED PIPE MANUFACTURERS
 - 1. Chevron Phillips Chemical Co., The Woodlands, TX
 - 2. ISCO Industries, Louisville, KY
 - 3. Approved equal.
- C. The pipe shall contain no recycled compound except that generated in the

manufacturer's own plant. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

- D. The pipe will be extruded from resin meeting the specifications of ASTM D3350 with a minimum cell classification of 345464C.
- E. Fittings. HDPE fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor. The fittings shall be manufactured from the same base resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.

2.03 QUALITY AND WORKMANSHIP

- A. The pipe and/or fitting manufacturer's production facilities shall be open for inspection by the owner or his designated agents with a reasonable advanced notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to standards required by this specification. Pipe which has been tested by the manufacturer and falls outside of the appropriate limits set forth in this specification will be cause for rejection.
- B. QA Records. QA/QC records shall be maintained intact for a minimum of one year from the date of production.

2.05 PIPE MARKING

- A. During extrusion production, the HDPE pipe shall be continuously marked with durable printing including the following information:
 - 1. Nominal Size
 - 2. Dimension Ratio
 - 3. Pressure Class, psi
 - 4. Manufacturer's Name and Product Series
 - 5. Cell Class
 - 6. ASTM Basis
 - 7. "NSF-PW"
 - 8. Pipe Test Category
 - 9. Plant Code & Extruder
 - 10. Production Date
 - 11. Operator Number (Shift Letter optional)
 - 12. Resin Supplier Code

- B. For pipe diameters greater than or equal to 3” IPS, PE345464C shall be used as a cell class and F714 shall be used as the ASTM Basis. An example of the print string will read as follows:

14”IPS DR21 PC80 Driscopipe 4100 PE345464C ASTM F714 NSF-PW
C3 PR6 24Mar02 14A P

2.06 PIPE PACKAGING, HANDLING, & STORAGE

- A. In accordance with specification Section 01600.
- B. The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer’s recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method. Fused segments of pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

PART 3 EXECUTION

3.01 JOINING

- A. Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer’s recommendations. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer. Properly executed electrofusion fittings may be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications or fabrications where shear or structural strength is important. Mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be used to mechanically connect HDPE pipe. Refer to the manufacturer’s recommendations.

3.02 TRENCHING

- A. Trenching shall be done in accordance with specification Section 02200.

END OF SECTION

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SECTION 02622

POLYVINYL CHLORIDE GRAVITY SEWER PIPE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing, installing and testing polyvinyl chloride (PVC) gravity pipe and fittings.

B. Related Sections

1. Section 02200 - Earthwork
2. Section 02215 - Aggregate Materials

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications

1. D3034, Specification for Type PSM Poly (vinyl chloride) (PVC) Sewer Pipe and Fittings.
2. D3212, Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastometric Seals.
3. F477, Specification for Elastometric Seals (Gaskets) for Joining Plastic Pipe.
4. F679, Specification for Poly (vinyl chloride) (PVC) Large - Diameter Plastic Gravity Sewer Pipe and Fittings.

1.03 SUBMITTALS

A. Shop Drawings

1. In accordance with SECTION 01300 - SUBMITTALS.
2. Submit for review shop drawings showing pipe dimensions, joints, joint gaskets, and other details for each size of pipe to be furnished for the project.
3. All pipe furnished under the contract shall be manufactured only in accordance with the Specifications and the reviewed drawings.

B. Samples

1. Submit samples of products if requested by the Engineer.

1.04 QUALITY ASSURANCE

A. Certifications

1. All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to the herein-mentioned ASTM specifications.
2. Pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such tests as he deems necessary.
3. All tests shall be made in accordance with the methods prescribed by the herein-mentioned ASTM specifications, and the acceptance or rejection shall be based on the test results.
4. Assist the Engineer in inspecting the pipe upon delivery.
5. Pipe not conforming to the requirements of this contract will be rejected and shall be immediately removed from the site by the Contractor.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection

1. All pipe shall be stored at the site until installation in accordance with the manufactures recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe, Fittings, And Specials

1. All gravity sewer pipe shall be a minimum of 8 inches in diameter.
2. Pipe 15” in diameter and smaller shall be PVC SDR 35, in conformance with ASTM D3034 unless otherwise directed.
3. Pipe 18” in diameter and larger shall be PVC C905, DR 32.5, in conformance with ASTM F679 unless otherwise directed.

B. Straight Pipe

1. Lengths of not more than 13 ft..

C. Y-branches

1. Lengths of not more than 3 ft., unless otherwise permitted by the Engineer.
2. Saddle Y-branches will not be allowed.

D. Specials

1. Conform to the specifications for straight pipe as applicable and to the details indicated on the drawings or bound into the back of the specifications.

E. Joints

1. Conforming to ASTM D3212.
2. Push-on bell and spigot joints using elastomeric ring gaskets

F. Gaskets

1. Conforming to ASTM F477.
2. Securely fixed into place in the bells so that they cannot be dislodged during joint assembly.
3. Composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and groundwater, and which will endure permanently under the conditions of the proposed use.

G. Lubricant

1. In accordance with manufacturers requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Inspection of Pipe

1. Inspect each pipe unit before being installed.
2. No single piece of pipe shall be laid unless it is generally straight and undamaged.
3. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 in. per ft. of length.
4. If a piece of pipe fails to meet this required check for straightness, it shall be rejected and removed from the site.
5. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

B. Handling of Pipe

1. Each pipe unit shall be handled into its position in the trench, by such means as acceptable to the Engineer. Care shall be taken to avoid damaging the pipe and fittings.

3.02 INSTALLATION

A. Placement

1. Except as otherwise indicated on the drawings, support pipe with compacted crushed stone in accordance with Specification SECTION 02215. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
2. Provide suitable depressions in crushed stone to accept pipe bells, so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material.
3. Clear pipe and fittings of debris, dirt, etc., before being installed, keep clean until accepted in the completed work.
4. Install pipe and fittings to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to ensure true alignments and

gradients. Unless otherwise instructed, minimum acceptable pipe slope shall be as follows:

Pipe Size	Slope
8"	0.0040 ft/ft
10"	0.0028 ft/ft
12"	0.0022 ft/ft
15"	0.0017 ft/ft
18"	0.0012 ft/ft
24"	0.0008 ft/ft
36"	0.0005 ft/ft

B. Joining Pipe

1. Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade.
2. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
3. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation.
4. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket.
5. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints.
6. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.
7. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.
8. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units.
9. Gasket installation and joint assembly shall follow the directions of the manufacturers of the joint material and of the pipe, all subject to review by the Engineer. The resulting joints shall be watertight and flexible.
10. Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.

C. Rejecting Pipe

1. Pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM Specifications as hereinbefore specified. If the pipe is unsatisfactory, as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same

shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.

D. Bedding Pipe

1. After each pipe has been properly placed, enough crushed stone shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment.
2. Bell holes (depressions) , provided for jointing, shall be filled with crushed stone and compacted, and then crushed stone shall be placed and compacted to complete the pipe bedding, as indicated on the drawings.

E. Protecting Pipe

1. Take all necessary precautions to prevent flotation of the pipe in the trench.
2. Close the open ends of the pipe with temporary watertight plugs, at all times pipe installation is not in progress.
3. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe.
4. Pipelines shall not be used as conductors for trench drainage during construction.

F. Backfilling Pipelines

1. In accordance with SECTION 02200.

3.03 ALLOWABLE PIPE DEFLECTION

- A. Pipe provided under this specification shall be installed not exceeding a maximum deflection of 7.5 percent. Deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
- B. Upon completion of a section of sewer, including placement and compaction of backfill, the Contractor shall measure the amount of deflection by pulling a specially designed gauge assembly through the completed section. The gage assembly shall be in accordance with the recommendations of the pipe manufacturer and be acceptable to the Engineer.
- C. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem as the Engineer may require without additional compensation.

3.04 CLEANING

- A. Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, clean out the pipeline and manholes, being careful to prevent soil, water, and debris from entering any existing sewer.

END OF SECTION

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SECTION 02930

LOAMING AND SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for loaming, fertilizing, seeding, and related work in areas disturbed in the process of performing the Work under this contract.

1.02 SUBMITTALS

- A. In accordance with SECTION 01300 submit the following:

1. Submit with seed, certificates confirming seed mixture, purity, germinating value, and crop year identification.
2. Submit test samples of loam.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Fertilizer:

1. Delivered mixed as specified in standard size, unopened containers showing weight, analysis, and name of manufacturer.
2. Store in weather proof place.

- B. Seed:

1. Delivered in original unopened containers with mixture listed.

PART 2 PRODUCTS

2.01 LOAM

- A. Fertile, natural topsoil, typical of locality, without admixture of subsoil, refuse or other foreign materials, and obtained from well-drained arable site. Mixture of sand, silt and clay particles in approximately equal proportions. Free of stumps, roots, heavy or stiff clay, stones large than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other deleterious matter.
- B. Not less than 4 percent nor more than 20 percent organic matter as determined by loss on ignition of oven-dried samples.

- C. Loam test samples dried to constant weight at temperature of 230 degrees. F., plus or minus nine degrees.
- D. Use loam, having prior vegetative growth that did not contain toxic amounts of either acid or alkaline elements.

2.02 LIME, FERTILIZER AND SEED

- A. Ground agricultural limestone containing not less than 85 percent of total carbonates.
- B. Complete fertilizer, at least 50 percent of nitrogen derived from natural organic sources of ureaform and containing following percentages by weight:

Nitrogen 10% Phosphorus 10% Potash 10%

- C. Turf grass seed, clean, high in germinating value and latest year's crop mixture as follows:

Name	Minimum Proportion by Weight	Percent Purity	Percent Germination
Kentucky bluegrass	20%	87%	85%
Merion Kentucky bluegrass	20%	87%	85%
Red Chewings fescue	45%	98%	85%
Italian rye	15%	98%	90%

PART 3 EXECUTION

3.01 GENERAL

- A. Supply suitable quantities of water, hose and appurtenances.

3.02 LOAM

- A. Spread loam on areas to 6-inch depth after compaction, fine grade and compact.

3.03 LIME, FERTILIZER AND SEEDING

- A. Apply lime by mechanical means at rate of 3000 pounds per acre.

- B. Apply fertilizer at rate of 1200 pounds per acre.
- C. Remove weeds or replace loam and reestablish finish grades, if any delays in seeding lawn areas and weeds grow on surface or loam is washed out prior to sowing seed and without additional compensation. Sow seed at rate of 175 pounds per acre on calm day, by mechanical means. "Hydro-Seeding" not permitted unless otherwise permitted or required by Engineer. Sow one-half of seed in one direction, and other half at right angles to original direction. Rake seed lightly into loam, to depth of not more than 1/4 inch and compact by means of an acceptable lawn roller weighing 100 to 150 pounds per linear foot of width.
- D. Water lawn areas adequately at time of sowing and daily thereafter with fine spray, and continue throughout maintenance and protection period.
- E. Seed during approximate time periods of April 1 to May 15 and August 15 to October 1, and only when weather and soil conditions are suitable for such work, unless otherwise permitted.

3.04 MAINTENANCE OF SEEDED AREAS

- A. Maintain lawn areas and other seed areas at maximum height of 2-1/2 inches by mowing at least three times. Weed thoroughly once and maintained until time of final acceptance. Reseed and refertilize with original mixtures, watering or whatever is necessary to establish over entire area of lawn and other seeded areas a close stand of grasses specified, and reasonably free of weeds and undesirable coarse native grasses.
- B. Begin maintenance immediately after each portion of lawn is seeded and continue for minimum of 45 days.
- C. Repair or replace all seeded areas which, in judgment of Engineer, have not survived and grown in satisfactory manner, for a period of one year after acceptance.
- D. Seeding replacement, same seed mixture as specified and furnished and installed as specified.

3.05 TEMPORARY COVER CROP

- A. Sow a temporary cover crop of buckwheat, domestic rye grass or other acceptable seed if there is insufficient time in the planting season to complete seeding, fertilizing, and permanent seeding at the option of Contractor or order of Engineer. Cut and water cover crop as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into soil, the areas shall be fertilized and permanent seed crop sown as specified.

END OF SECTION

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DIVISION 03

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing and installing forms, reinforcing steel, concrete and expansion and/or construction joints

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A185, Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
2. A615, Specification for deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. C31, Practice for Making and Curing Concrete Test Cylinders in the Field.
4. C33, Specification for Concrete Aggregates.
5. C39, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
6. C42, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
7. C94, Specification for ready Mixed Concrete.
8. C143, Test Method for Slump of Hydraulic Cement Concrete.
9. C150, Specification for Portland Cement.
10. C172, Practice for Sampling Freshly Mixed Concrete.
11. C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. C260, Test Method for Air-Entraining Admixtures for Concrete.
13. C494, Specification for Chemical Admixtures for Concrete.
14. C920, Specification for Elastomeric Joint sealants.
15. D994, Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
16. D1056, Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
17. D1751, Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

B. American Concrete Institute (ACI):

1. ACI 301, Specification for Structural Concrete for Buildings.
2. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
3. ACI 305, Recommended Practice for Hot Weather Concreting.
4. ACI 306, Recommended Practice for Cold Weather Concreting.

5. ACI 315, Building Code Requirements for Reinforced Concrete.
6. ACI 347, Guide to Formwork for Concrete.

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice.

1.03 SUBMITTALS

A. Submit Shop Drawings in accordance with SECTION 01300 for the following:

1. Reinforcing Steel
 - a. Furnish in detail and completeness that all fabrication and placement at the site can be accomplished without the use of contract drawings for reference.
 - b. Include number of pieces, sizes, and grade of reinforcing steel, accessories, and any other information required for fabrication and placement.
 - c. Show joint layout and design
 - d. Check structural and site drawings for anchor bolts, anchors, inserts, conduits, sleeves, and any other items which are required to be embedded in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.
2. Concrete mix designs.
3. Grout manufacturer/design mix (if included in this section)
4. Manufacturer's data for ancillary materials such as joint fillers and sealants, epoxy bonding compound.

1.04 QUALITY ASSURANCE

A. Selection of testing laboratory in accordance with SECTION 01410.

B. Sample and Test Concrete as follows:

1. Test Specimens: Make, cure and have tested, a minimum of one set of four test specimens from the concrete of each day's pour and for each fifty cubic yards of concrete cast in accordance with ASTM C172, C31 and C39. One cylinder shall be broken after seven days and three cylinders after twenty-eight day.
2. Slump: A slump test shall be made for each truckload of concrete in accordance with ASTM C143. Slumps greater than design mix limit will be grounds for rejection of the concrete.
3. Air Content: An air content test shall be made from each day's pour of concrete by the pressure method in accordance with ASTM C231. Air contents above or below the limits specified will be grounds for rejection of the concrete.
4. In the event the compressive strength of the cylinders, when tested, is below the specified minimum, the Engineer may require test cores of the hardened structure to be taken by the Testing Laboratory in accordance with ASTM C42. If such test indicates that the core specimen is below the required strength, the concrete in question shall be removed and replaced without cost to the Owner. Any other work damaged as a result of this concrete removal shall be replaced with new materials to the satisfaction of the Engineer at no additional cost to the Owner.

The cost of coring will be deducted from the contract amount. Where the Testing Laboratory has taken core cylinders and the concrete proves to be satisfactory, core holes shall be filled in a manner satisfactory to the Engineer at no additional cost to the Owner.

5. The Contractor shall coordinate the date and location of tests with the Engineer before any concrete work is started.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Reinforcing steel.

1. Transport to the site, store, and cover in a manner which will ensure that no damage shall occur to it from moisture, dirt, grease, or any other cause that might impair bond to concrete or chip protective epoxy coating.
2. Store on the site at all times, a supply of approved reinforcing steel to ensure that there will be no delay of the work.
3. Identification of steel shall be maintained after bundles are broken.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement.

1. In accordance with ASTM C150, Type II of U.S. manufacture.
2. Only one brand of cement shall be used on the project.

B. Aggregates.

1. Fine aggregate, in accordance with ASTM C33, clean and graded from 1/4 inch to fines.
2. Coarse aggregate, in accordance with ASTM C33, clean and graded from 1/4 inch to maximum sizes hereinafter specified.

C. Air Entraining Agent.

1. In accordance with ASTM C260.

D. Water Reducing Agent.

1. In accordance with ASTM C494 Type A.

E. Microsilica Admixture.

1. Packaged in easily dispersing form.

F. Water.

1. Clean and potable,
2. Free of impurities detrimental to concrete.

G. Reinforcing Bars.

1. New, deformed billet steel bars, in accordance with ASTM A615, Grade 60.

H. Welded Wire Fabric

1. In accordance with ASTM A185.

I. Accessories.

1. Reinforcement accessories, consisting of spacers, chairs, ties, and similar items shall be provided as required for spacing, assembling, and supporting reinforcement in place.
2. All accessories shall be dielectric coated steel or approved plastic accessories, conforming to the applicable requirements of the CRSI Standards.

J. Tie wire.

1. 16 gauge or heavier black annealed wire.

K. Form Ties and Spreaders.

1. Standard metal form clamp assemble and plastic cone, of type acting as spreaders and leaving no metal within 1 inch of concrete face.
2. Provide form tie with water stop for all walls to be in contact with earth or liquid.
3. Inner tie rod shall be left in concrete when forms are removed.
4. No wire ties or wood spreaders will be permitted. Use ½" x 1" C.T. plastic cones for sinkages.

L. Form Coatings.

1. Non-grain raising and non-staining type that will not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied to concrete surface.
2. "Nox-Crete Form Coating" as manufactured by Nox-Crete Company, or approved equal.
3. Coatings containing mineral oils or the non-drying ingredients will not be permitted.

M. Grout.

1. High-strength, non-shrink grout with saltwater resistance.
2. Five Star Special Grout 120 or equivalent.

2.02 CONCRETE STRENGTHS AND PROPORTIONS

- A. Cast-in-place concrete shall have the minimum compressive strength at 28 days as indicated on the Drawings.
- B. The exact proportions for the mix, including amounts admixture (if any), and water, shall be determined by the concrete supplier.
- C. The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement with the method of placing employed not he work, but without permitting the materials to segregate or excess free water to collect on the surface.

D. Air-Entrainment: The air content in all concrete shall be maintained at 5 to 7 percent.

2.03 PREMOLDED JOINT FILLER

A. Bituminous Type.

1. In accordance with ASTM D994 or D1751.

B. Sponge Rubber Type.

1. Neoprene, closed-cell, expanded in accordance with ASTM D1056, Type 2C5, with a compression deflection, 25 percent deflection (limits), 17 to 24 psi (119 to 168 kPa) minimum.

2.04 POURABLE JOINT FILLERS

A. Filler for Nonpotable Water Structures

1. Specific Gravity: Greater than 1.0 for cured, in-place filler.
2. Vertical and Sloped Joints: Furnish gun grade material that will remain as placed in joints and will not run down slope.
3. Suitable for continuous immersion and exposure to liquid being contained in the structure.

2.05 JOINT SEALANTS

A. In slabs.

1. In accordance with ASTM C920 for poured 2-component polyurethane sealant.
2. Sikaflex-2c, as manufactured by Sika Corporation or approved equivalent.

B. In walls.

1. Type II, Class A, compound conforming to Interim Federal Specification TT-S-00227E (3) (COM-NBS) for Sealing Compound; Elastomeric Type, Multi-Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).
2. Sikaflex-1a, as manufactured by Sika Corporation or approved equivalent.

2.06 EPOXY BONDING COMPOUND

- A. The epoxy bonding compound shall be a three-component, solvent-free, moisture-tolerant, epoxy modified, cementitious product specifically formulated as a bonding agent and anti-corrosion coating. The product shall have suitable contact time, fluidity, and application temperature for this type of application.

PART 3 EXECUTION

3.01 FORMWORK

A. Falsework for Forms

1. Build and maintain necessary false work for the forms.

B. Construction of Forms

1. General
 - a. Construct in accordance with ACI 347.
 - b. Construct of sound material, to the correct shape and dimensions, mortar tight, of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of line or position.
2. Embedded Items
 - a. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
 - b. Do not embed wood, other than necessary nailing blocks, in concrete.
 - c. Extended complete cooperation to suppliers of embedded items in their installation.
 - d. Secure information for embedded items from other trades as required.
 - e. Securely anchored embedded items in correct location and alignment prior to placing concrete.
3. Openings for Items Passing Through Concrete
 - a. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 - b. Coordination work of this nature in order that there will be no unnecessary cutting and patching of concrete.
 - c. Cutting and repairing of concrete as a result of failure to provide for such openings shall be paid for by the Contractor at no additional expense to the Owner.

C. Removing Forms and False work

1. Forms shall not be removed for at least 72 hours after concrete has been placed.
2. Forms shall not be removed until the concrete has attained sufficient strength to insure stability.

3.02 REINFORCING STEEL

A. General

1. Place reinforcing steel in accordance with the drawings and approved shop drawings and the applicable requirements of the CRSI, Manual of Practice.
2. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.

B. Reinforcing Steel Supports

1. Support bars on approved plastic or dielectric-coated metal chairs or spacers, accurately placed and securely fastened to forms or steel reinforcement in place.
2. Supply additional bars, whether specifically shown on the drawings or not, where necessary to securely fasten reinforcement in place.
3. Support legs of accessories in forms without embedding in form surface.
4. Spacing of chairs and accessories shall conform to CRSI, Manual of Standard Practice. Accurately space hoops and stirrups and wire to the reinforcement.
5. Permit no loose wood inside forms.
6. Lifting of welded wire fabric into proper position while concrete is being poured rather than supporting fabric on chairs will not be permitted.

C. Placing and Tying

1. Set in place, space, and rigidly and securely tie or wire with tie wire at all splices and at all crossing points and intersections in the positions shown, or as directed.
2. Rebending of bars on the job to accommodate the job to accommodate existing conditions will not be permitted without the written approval of the Engineer
3. Points ends of wire ties away from forms.

D. Spacing

1. Minimum center to center distance between parallel bars shall be in accordance with the details on the drawings, or, where not shown, the clear spacing shall be 2 times the bar diameter but in no case less than 1½ inches or less than 1½ times the maximum size aggregate.

E. Splices

1. Maximum 50% of steel spliced occurring within lap length.
2. Top bars shall be 1.3 times values given in 3.01.D.5.c.
3. Splice lengths.
 - a. #6 bars and smaller: 50-bar diameter
 - b. #7 bars and larger: 60-bar diameter

F. Concrete Covering

1. In accordance with ACI 315, except where shown otherwise on drawings.

3.03 CONCRETE

A. Mixing of Concrete

1. All concrete shall be ready-mixed concrete, and shall be mixed and delivered in accordance with ASTM C 94. The batch plant of the concrete producer shall be certified for compliance with the standards established by the National Ready-Mixed Concrete Association.
2. In the event concrete is mixed at a central batching plant, the delivery shall be arranged so that intervals between batches are kept to a minimum, and in any event not more than thirty (30) minutes. Trucks shall be in first class condition and kept in constant rotation during delivery.

3. Concrete shall be placed within 90 minutes after cement has been mixed with aggregate or 45 minutes after addition of water and admixtures.
 4. No admixtures, except those mentioned in paragraph 2.1 shall be used. Calcium chloride will not be permitted.
 5. Truck delivery slips of all concrete delivered to the job shall indicate the quantity and quality of concrete, additives, date and time of batching and delivery, and the location of placement. Delivery slips shall be forwarded to the Engineer at the end of each pour.
- B. Cold Weather Concreting.
1. In accordance with ACI 306.
 2. Concrete shall not be mixed or placed when the temperature is below 40 degrees F, or when conditions indicate that the temperature will fall below 40 degrees F within 72 hours unless precautions are taken to protect the concrete.
 3. Concrete temperature shall be maintained, when deposited, at not less than 60 degrees F. Reinforcement, forms, and ground which concrete will contact must be completely free of frost.
 4. Concrete and formwork must be kept at a temperature of not less than 50 degrees F. for not less than 96 hours after placing.
 5. Calcium chloride shall not be used.
- C. Hot Weather Concreting.
1. In accordance with ACI 305.
 2. The maximum temperature of the concrete, when deposited, shall be 85 degrees F. If the weather causes the placing temperature to exceed 85 degrees F., the mix shall be cooled by methods approved by the Engineer.
 3. No concrete shall be deposited when the air temperature is greater than 90 degrees F.
- D. Conveying and Placing Concrete.
1. In accordance with ACI 304.
 2. Notification: Before placing concrete, forms shall be thoroughly inspected. All chips, dirt, etc., shall be removed, all temporary bracing and cleats taken out, all openings for pipes, etc., properly boxed, all forms properly secured in their correct position and made tight, all reinforcement, anchors, and embedded items secured in their proper places. Concrete which may be on the forms or reinforcement, and which is set and dry, shall be cleaned off, and the forms and steel washed off before proceeding. Remove all foreign matter from forms and excavations.
 3. Water shall be removed from place of deposit before concrete is placed unless otherwise permitted by the Engineer. Any flow of water into an excavation shall be diverted through proper side drains into a sump, or shall be removed by other approved methods which will avoid washing away the freshly deposited concrete.
 4. Soil on which concrete will be poured shall be thoroughly wetted (except in freezing weather).

5. Anchors and Embedded Items: Anchors, bolts, sleeves, inserts, wood blocking, and any other items to be embedded in concrete shall be accurately secured in position before the concrete is placed. Aluminum shall not be embedded in concrete.
6. Handling and Depositing
 - a. Before any concrete is placed, notify all whose work is in any way connected with or influenced by the concrete work, and give them reasonable time to complete all portions of their work that must be completed before concrete is deposited.
 - b. Immediately before concrete is placed, inspect all forms to insure that they are in proper position, sufficiently rigid, thoroughly clean, properly oiled and free from foreign materials, and that all reinforcement is in proper position.
 - c. Concreting, once started, shall be carried on as a continuous operation until the section of approved size and shape is completed.
 - d. Concrete shall be conveyed as rapidly as practicable from the mixer to the place of final deposit by methods that prevent the separation or loss of ingredients. It shall be deposited, as nearly as practicable, in its final position to avoid rehandling or flowing.
 - e. Concrete shall not be dropped freely where reinforcement will cause segregation, nor shall it be dropped freely more than six (6) feet. Concrete shall be deposited to maintain a plastic surface approximately horizontal.
 - f. Concrete that has partially hardened shall not be deposited in the work.
7. Pumping
 - a. Concrete may be placed by pumping if first approved in writing by the Engineer for the location proposed.
 - b. Equipment for pumping shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end without separation of materials.
 - c. The concrete mix shall be designed to the same requirements as herein before specified, and may be richer in lubricating components in order to allow proper pumping.
 - d. Concrete shall not be pumped through aluminum pipes.
8. Vibrating and Compacting
 - a. All concrete shall be thoroughly consolidated and compacted by suitable means during the operation of placing, and shall be thoroughly worked around reinforcement, embedded items, and into the corners of the forms. All concrete against forms shall be thoroughly spaded. Internal vibrators shall be used under experienced supervision, and shall be kept out of contact with reinforcement and wood forms. Vibrators shall not be used in a manner that forces mortar between individual form members.
 - b. Vibrators shall be flexible electric type or approved compressed air type, adequately powered and capable of transmitting to the concrete not less than seven thousand (7,000) impulses per minute. Vibration shall be sufficiently intense to cause the concrete to flow or settle readily into place without separation of the ingredients. A sufficient number of vibrators shall be employed so that complete compaction is secured throughout the entire

volume of each layer of concrete. At least one (1) vibrator shall be kept in readiness as a spare for emergency use. Vibrators shall be such that the concrete becomes uniformly plastic with their use.

- c. Vibration shall be close to the forms but shall not be continued at one spot to the extent that large areas of grout are formed or the heavier aggregates are caused to settle. Care shall be taken to not disturb concrete that has its initial set.
- d. Where conditions make compacting difficult, or where the reinforcement is congested, batches of mortar containing the same proportions of cement to sand as used in the concrete shall first be deposited in the forms, to a depth of at least one inch.
- e. The responsibility for providing fully filled out, smooth, clean, and properly aligned surfaces free from objectionable pockets shall rest entirely with the Contractor.

3.04 CONSTRUCTION JOINTS

- A. Construction joints shall be located a maximum of 40 feet apart. If, for any reason, the contractor feels a change is necessary, he shall prepare a placing plan and submit it to the Engineer for approval.
- B. Where a joint is to be made, the surface of the concrete shall be sandblasted or thoroughly picked, thoroughly cleaned, and all laitance removed. In addition to the foregoing, joints shall be thoroughly wetted, but not saturated, and slushed with a coat of grout immediately before the placing of new concrete.
- C. Approved keys shall be used at all joints, unless detailed otherwise.
- D. Forms shall be retightened before placing of concrete is continued. There shall be an interval of at least 48 hours between adjacent pours.
- E. Bonding Concrete at Construction Joints
 1. To new concrete construction joints:
 - a. Thoroughly clean and saturate joint with water.
 - b. Cover horizontal wall surfaces as specified in this Section, and immediately place concrete.
 - c. Limit concrete lift placed immediately on top of bonding compound to 12 inches thick.
 - d. Thoroughly vibrate to mix and consolidate bonding compound and concrete together.
- F. Bonding new concrete to old concrete:
 1. Mechanically roughen existing concrete surfaces to a clean, rough surface using appropriate mechanical means to remove the existing concrete surface, and provide a minimum roughness profile of ¼-inch.

2. Saturate surface with water for 24 hours, cover with epoxy bonding compound and place concrete as specified for new concrete.

G. Expansion Joints

1. Expansion joints shall be located as shown on contract drawings.
2. The joint shall include a joint filler, a bond breaker and joint sealant and installed as indicated on contract drawings.

H. Joint Sealants.

1. Prepare surface in accordance with manufacturers directions.
2. Apply primer as recommended by sealant manufacturer.
3. Install sealant with the proper tools and methods as directed by the sealant manufacturer.

I. Patching

1. Immediately after stripping forms, patch minor defects, form-tie holes, honeycombed areas, etc., before concrete is thoroughly dry.
2. Repair gravel pockets by cutting out to solid surface, form key, and thoroughly wet before placing patching mortar consisting of 1 part cement to 2 parts fine sand; compact into place and neatly finish. Honeycombed areas or gravel pockets which, in the Engineer's opinion are too large and unsatisfactory for mortar patching as described above, shall be cut out to solid surface, keyed, and packed solids with matching concrete to produce firm bond and surface.
3. The Contractor shall do all the cutting as required by himself or other trades. All such work shall be of the minimum size required. No excessive cutting will be permitted, or shall any structural members or reinforcement be cut.
4. The Contractor shall do all patching after work by other trades has been installed, where required, using Portland Cement Mortar 1:2 mix.

J. Protection and Curing

1. Protect concrete from injurious action of the elements and defacement of any nature during construction operations.
2. Keep concrete in a thoroughly moist condition from the time it is placed until it has cured, for at least (7) days.
3. Carefully protect exposed concrete corners from damage.
4. Allow no slabs to become dry at any time until curing operations are complete. In general, slabs shall be cured with non-staining curing paper, hosing or fog spray; vertical surfaces shall be curing with Burlene or fog spray or an approved curing compound.
5. Protect fresh concrete from drying winds, rain, damage, or spoiling. Curing paper shall be lapped 4 inches minimum at joints and sealed with waterproof tape.

K. Concrete Finishes

1. Unexposed Surfaces: All unexposed surfaces shall have any form finish, at the Contractor's option.
2. Wearing Surface Finish: Float the surface by hand using a wooden or magnesium float. Finish with a flexible bristle broom. Permit surface to harden sufficiently

to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

3. Addition of Material: The addition of cement, sand, water, or mortar to slab surfaces while finishing concrete is strictly prohibited.

L. Defective Work

1. The following concrete work shall be considered defective and may be ordered by the Engineer to be removed and replaced at Contractor's expense:
 - a. Incorrectly formed.
 - b. Not plumb or level.
 - c. Not specified strength.
 - d. Containing rock pockets, voids, honeycomb, or cold joints.
 - e. Containing wood or foreign matter.
 - f. Otherwise not in accordance with the intent of the Drawings and Specifications.

END OF SECTION

DIVISION 05

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SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to fabricate, furnish, erect, set, fasten and install miscellaneous metalwork as indicated on the Drawings and as specified.

B. Related Sections

- a. Section 03300 – Cast In Place Concrete
- b. Section 03600 – Grout
- c. Section 05510 – Aluminum Stairs and Ladders
- d. Section 05520 – Aluminum Handrails and Railings
- e. Section 05530 – Metal Grating
- f. Section 09900 – Painting
- g. Section 15050 – Pipe Penetrations

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A36, Specification for Carbon Structural Steel.
2. A48, Specification for Gray Iron Castings.
3. A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded Seamless.
4. A123, Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
5. A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
7. A276, Specification for Stainless Steel Bars and Shapes.
8. A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
9. A325, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
10. A489, Specification for Carbon Steel Lifting Eyes.
11. A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. A501, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
13. B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
14. B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

15. B308, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
16. B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
17. B632, Specification for Aluminum-Alloy Rolled Tread Plate.
18. B660, Standard Practices for Packaging/Packing of Aluminum and Magnesium Products.
19. F436, Specification for Hardened Steel Washers.
20. F468, Specification for Nonferrous Bolts, Hex Cap Screws, Studs for General Use.
21. F593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
22. F594, Specification for Stainless Steel Nuts.
23. F844, Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

1.03 SUBMITTALS

A. In accordance with Section 01300 submit the following:

1. Manufacturer's technical data sheets for the following:
 - a. Bitumastic coating.
 - b. Grout.
 - c. Chemical Anchors
2. Shop Drawings:
 - a. Details of the fabrication and erection of each metal fabrication indicated on the Drawings.
 - b. Plans, elevations, sections, and details of metal fabrications and their connections.
 - c. Anchorage and accessory items.
 - d. The shop drawings shall furnish the required information in sufficient detail and completeness that the work may be accomplished without the use of the Contract Drawings as a reference.
3. Welding Certificates: Copies of certificates for welding procedures and personnel.
4. Qualification Data: Firms and persons specified in the "Quality Assurance" Article shall demonstrate their capabilities and experience. Firms shall include a list of at least three (3) recently completed projects with project names and addresses. The name, address, and phone number of a contact (architect, engineer, or owner) shall be provided for each project in the list, as well as any other required information hereinafter or hereinbefore specified.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications:

1. Fabrication Company to be experienced in the production of metal fabrications similar to those indicated for this Project, with a record of successful in-service performance.
2. Fabrication Company to possess sufficient production capacity to produce the work required and complete the work within the duration of the contract.

B. Welding:

1. Procedures and personnel shall be qualified according to the latest revisions of the following American Welding Society designation:
 - a. AWS D1.1, Structural Welding Code - Steel.
 - b. AWS D1.2, Structural Welding Code - Aluminum.
 - c. AWS D1.6, Structural Welding Code - Stainless Steel.
 - d. Certification shall be provided stating that each welder has passed the AWS qualification tests for the welding processes involved and has maintained that certification as required by AWS.

1.05 DELIVERY STORAGE AND HANDLING

A. Aluminum to be delivered to the fabricator in accordance with ASTM B 660, complying with the commercial packing and preservation requirements.

B. Epoxy Adhesive

1. Store epoxy cartridges on pallets or shelving in a covered storage area.
2. Control temperature above 60 degrees F and dispose of cartridges if shelf life has expired.

C. Vinyl Ester Products

1. Store components on pallets or shelving in a covered storage area with locking door.
2. Control temperature within 41 to 77 degrees F and dispose of product if shelf life has expired.

1.06 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit within reinforced concrete walls and other construction, dimensions shall be verified by field measurements before fabrication. The fabrication schedule shall be coordinated with the Construction Progress Schedule to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, proceed with fabricating metal fabrications upon receipt of Engineer reviewed and approved shop drawings, without field measurements. Allowance shall be made for trimming and fitting.

1.07 SCHEDULING

A. Installation of anchorages for metal fabrications shall be coordinated with the Contractor. Setting drawings, templates, and instructions for installing anchorages, including sleeves, concrete inserts, anchor bolts, items with integral anchors, and any items that are to be embedded in concrete shall be provided to the Contractor. Items

to be embedded in concrete shall be delivered to Project site sufficiently in advance to allow time for installation, as determined by the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel, in accordance with the following ASTM Designations unless otherwise indicated:

1. Steel plates and structural shapes ASTM A36.
2. Steel Pipe A501 or A53, Type E or S,
Grade B
3. Structural Steel Tubing A500, Grade B
4. Steel Bolts and Nuts:
 - a. Carbon Steel A307 or A36
 - b. High-Strength A325, Type 3
 - c. Galvanized Steel Bolts and Nuts A307 or A36, with A153
Zinc Coating, and ANSI B1.1
 - d. Eyebolts A489
 - e. Threaded Rods A36
 - f. Flat Washers (Unhardened) F844; use A153 for Zinc
Coating
 - g. Flat Washers (Hardened) F436

B. Stainless Steel, Type 316 and in accordance with the following ASTM designations unless otherwise indicated:

1. Bars and Shapes A276, AISI Type 316
2. Plate, Sheet, and Strip A167, AISI Type 316
3. Bolts and Threaded Rods F593, AISI Type 316,
4. Nuts F594, AISI Type 316,
5. Welding Rods and Bare Electrodes: Compatible with the material to be welded per the AWS D1.6 specifications.

C. Aluminum, in accordance with the following ASTM designations and alloy and temper designations of The Aluminum Association:

1. Structural shapes B 308, 6061-T6 mill finish.
2. Extruded shapes B 221, 6061-T6 mil finish
3. Structural Plates B 209, 6061-T6 mil finish
4. Sheets Alclad 3003-H14 and 3003
5. Bolts and nuts F468, 2024-T4
6. Aluminum Tread Plate:
 - a. In accordance with ASTM B 632, 6061-T6.
 - b. Provide a clear, Class II, anodized finish in accordance with Aluminum Association Designation AA-A31, 0.4 mils thick minimum.
7. Structural Aluminum Tubes ASTM B 429, 6063-T52, mill finish.

8. Welding Rods and Bare Electrodes:
 - a. Compatible with the material to be welded per the AWS D1.2 specifications.
 - b. Aluminum items to be anodized shall not be welded using 4043 weld rod.

D. Cast Iron

1. In accordance with ASTM A48, Class 35.

2.02 GROUT

- A. In accordance with SECTION 03600.

2.03 FASTENERS

- A. Provide Stainless steel fasteners for all connections unless indicated otherwise

B. Bolts:

1. Stainless steel in accordance with ASTM F 593, Alloy Group 2, Type 316,
2. CW with hexagonal heads shall be provided for connections.

C. Nuts:

1. Stainless steel in accordance with ASTM F 594, Alloy Group 2, Type 316,
2. CW with hexagonal heads, and thread designation to match stainless steel bolts shall be provided for connections.

D. Washers:

1. In accordance with ASTM F 436, except that the material shall be Type 316 stainless steel in accordance with ASTM A 276.

E. Stainless steel fasteners for framing connections

1. Provide bolts, nuts, and washers of the size and quantity as indicated on the Drawings. One nut shall be provided per each bolt unless otherwise indicated on the Drawings. A washer shall be provided at the contact surface between framing members or clips and the heads of bolts and nuts, minimum two (2) washers per bolt.

F. Machine Screws:

1. Stainless steel in accordance with ASME B18.6.3, Type 316.

2.04 ALUMINUM COVERS

- A. Composed of aluminum tread plate, thickness to suit existing angle support depth. Contractor to assume 1/4-plate thickness for bidding. Confirm required thickness in field.

2.05 ALUMINUM FRAMING AND SUPPORTS FOR COVERS AND GRATING

- A. Fabricated from structural aluminum shapes, structural aluminum tubes, and aluminum extrusions, of the size and quantity as indicated on the Drawings.

2.06 ALUMINUM STAIRS AND LADDERS

- A. In accordance with SECTION 05510.

2.07 ALUMINUM HANDRAILS AND RAILINGS

- A. In accordance with SECTION 05520.

2.08 METAL GRATINGS

- A. In accordance with SECTION 05530

2.09 ABRASIVE NOSINGS

- A. Aluminum.
 - 1. In accordance with ASTM B221 for extrusions.
 - 2. Class 30 for cast aluminum tread plate.
- B. Abrasive, Two (2) part Epoxy combined with aluminum oxide grit.
- C. Manufactured by Balco Inc, Wichita, KS or equal.

2.10 PIPE BOLLARDS

- A. Fabricated from Schedule 40, welded, galvanized steel pipe in accordance with ASTM A53
- B. Provide size and quantity indicated on the Drawings.

2.11 ALUMINUM ACCESS HATCH

- A. General
 - 1. Provide size and quantity indicated on the Drawings. The door leaf shall be 1/4-inch aluminum diamond pattern plate to withstand a live load of 300 pounds per square foot and an AASHTO HS20 loading unless specified or indicated otherwise on the Contract Drawings.
- B. Construction

1. Channel frame shall be 1/4-inch aluminum with an anchor flange around the perimeter.
2. Door(s) shall be 1/4-in. aluminum diamond plate, reinforced to withstand a 25-foot column of stationary water
3. Stainless steel cam locks shall be provided to work in conjunction with a 9/16-in. diameter EPDM compression gasket, mounted to the underside of the door. Door shall open to 90 degrees and automatically lock with a T-316 stainless steel hold-open arm with an aluminum release handle.
4. All hardware shall be stainless steel.
5. Factory finish shall be mill finish with bituminous coating applied to exterior portions of the frame which will be in contact with concrete.

C. Warrantee

1. Manufacturer shall guarantee against defects in materials and/or workmanship for lifetime of the hatch.

D. Manufacturer

1. The access hatch shall be type F1H as manufactured by the Halliday Products of Orlando, Florida or be an acceptable equivalent product.

E. Fall Protection Grating System

1. . Furnish and install on all vault access doors fall protection grating system. Door manufacturer shall install the grating system when the door is fabricated or field install (by others) on existing doors already in use. If field installation is necessary, grating system shall be installed per the manufacturer's instructions.
2. Performance characteristics:
 - a. Grating panel(s) shall be high visibility in color.
 - b. Grating panel(s) shall lock automatically in the full open position.
 - c. Grating system shall have a twenty-five year warranty.
 - d. Grating panel(s) shall have a provision for locking to prevent unauthorized opening.
3. Grating: Panels shall be aluminum with a powder coat paint finish and designed to meet OSHA OSHA 29 CFR 1926.502(c) requirements for fall protection.
4. Hold open feature: A Type 316 stainless hold open device shall be provided to lock the cover in the fully open 90 degree position.
5. Hardware: All hardware shall be Type 316 stainless steel.

2.12 ALUMINUM PLATE COVERS AND FRAMES

A. General

1. The plate covers and frames shall be of the sizes indicated on the Drawings.
2. The frames shall be aluminum angles of the sizes indicated with welded strap anchors for securing the frames in the concrete.
3. The frames shall have mitered corners with welded joints ground smooth where exposed.

B. Plate Cover:

1. Aluminum in accordance with ASTM B209, Alloy 6061-T6, tread plate,
2. Thickness minimum 1/4 inch with acceptable nonskid surface, reinforced with aluminum bars welded to the underside of the cover in accordance with the details.
3. The covers shall be made to fit neatly and accurately in the frames.
4. Plate covers shall have 1-in. diameter finger holes to facilitate removal. All edges of holes cut in the plate covers shall be ground smooth.

C. Hinged Plate Cover:

1. Furnished with heavy duty stainless steel, plain bearing hinges with stainless-steel pins.
2. Fastened to the covers and frames with stainless-steel machine screws.
3. Provided with flush lift handles fabricated from 1/2-in. diameter aluminum rod, alloy 6061-T6511.

D. Gasketed Plate Cover:

1. Continuous, compressible neoprene seals between the cover and frame at the perimeter.
2. Secured to the frames with countersunk, flathead, stainless-steel machine screws spaced approximately 6 in. on centers.

2.13 WALL SLEEVES

- A. In accordance with SECTION 15050.

2.14 ANCHOR BOLTS

- A. To be Stainless Steel.
- B. Configuration and specific type as specified, as listed in the associated equipment specifications and as detailed on the Contract Drawings.
- C. Provide Antiseizing Lubricant for all stainless steel threads.
- D. Anchor Bolt Sleeves

1. High Density Polyethylene Plastic:
 - a. Single unit construction with deformed sidewalls such that the concrete and grout lock in place.
 - b. The top of the sleeve shall be self-threading to provide adjustment of the threaded anchor bolt projection.
 - c. Material requirements:
 - 1) Plastic: High density polyethylene.
 - 2) Density: ASTM D 1505
 - d. Manufacturer:
 - 1) Sinco West, Simi Valley, CA

- 2) Or equal
2. Fabricated Steel Sleeve
 - a. A 36 steel.

E. Neoprene Gasket

1. ASTM D 1056 RE-41-E, soft, closed-cell, neoprene gasket material, suitable for exposure to sewage and sewage gases, unless otherwise shown.
2. Thickness: Minimum 1/4 inch.
3. Furnish without skin coat.
4. Furnish two spare gaskets for each location shown requiring neoprene gaskets, and furnish one roll of 4-inch wide by 50-foot long neoprene gasket material with 1 pint of manufacturer's recommended adhesive.
5. Manufacturers and Product:
 - a. Rubatex Division of Great American Industries, Bedford, VA; Rubatex No. R-411-N.
 - b. Garlock Manufacturing, San Francisco, CA.
 - c. Or equal.

2.15 CHEMICAL ANCHORING SYSTEMS

A. Epoxy Anchors

1. Anchor Rod: Stainless steel threaded rod free of grease, oil or other deleterious material with a 45-degree chisel point.
2. Epoxy Adhesive:
 - a. ASTM C 881, Type 1, Grade 3, Class A, B, or C.
 - b. Two-component, 100 percent solids, nonsag, paste, insensitive to moisture, designed to be used in adverse freeze/thaw environments and gray in color.
 - c. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
3. Mixed Epoxy Adhesive: Nonsag paste consistency, with ability to remain in a 1-inch diameter overhead drilled hole without runout, having the following properties:
 - a. Slant Shear Strength, ASTM C 881, No Failure In Bond Line, Dry/Moist Conditions: 5,000 psi.
 - b. Compressive Strength, ASTM D 695: 14,000 psi, minimum.
 - c. Tensile Strength, ASTM D 695: 4,500 psi.
 - d. Heat Deflection Temperature, ASTM D 648 E2: 135 degrees F, minimum.
4. Epoxy Adhesive Packaging:
 - a. Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper mixing ratio, and fit into a manually or pneumatically operated caulking gun.
 - b. Cartridge Markings: Include manufacturer's name, batch number, mix ratio by volume, product expiration data, ANSI hazard classification, and appropriate ANSI handling precautions.
5. Manufacturer's and Products:

- a. Adhesives Technology Corp.; Anchor-It Fastening Systems, HS 200 Epoxy Resin.
- b. ITW Ramse/Red Head; Epcon Ceramic 6 Epoxy Anchor System.
- c. Covert Operations; CIA Epoxy Anchors with viscosity to suit application.
- d. Rawplug Co., Inc.; Rawl/Sika Foil Fast Epoxy Injection Gel System.

B. Adhesive Anchors

1. Two-component vinyl ester adhesive, insensitive to moisture, designed to be installed in adverse freeze/thaw environments.

2.16 LOOSE LINTELS

- A. Provide loose lintels as indicated on the Drawings. Fabricated from structural steel shapes and plates. Provide lintels hot-dip galvanized after fabrication.
- B. Provide galvanized steel loose lintels for wall openings up to 5'-0" wide. Provide galvanized steel lintels and anchor to precast concrete inner lintels for wall openings over 5'-0" wide. Space anchors at maximum 4'-0" on centers with minimum of 2 anchors per lintel.

2.17 GUARD CHAINS

- A. Provide removable guard chains at openings in railings and double leaf access hatches.
- B. Chain to be proof coil steel chain made from open hearth basic steel, hot-dip galvanized after fabrication and contain twelve ¼ inch welded links per foot.
- C. Provide galvanized steel eyes and s hooks for securing the chain at openings.

2.18 WHEEL GUARDS

- A. 12 inch diameter, 20 inches high, cone shaped, with grout hole near top of guard.
- B. Cast Iron construction.
- C. Type R-4983B, manufactured by Neenah Foundry, Neenah, WI or equal.
- D. Provide with matching corner guards.

2.19 LIFTING HOOKS

- A. Supported from concrete:

1. Fabricated of 3/4-inch diameter steel rod bent in U shape and threaded at ends to receive nuts.
2. Fasten hook to 1/2-inch by 4-inch by 11-inch steel anchor plate.
3. Provide hooks hot-dip galvanized after fabrication.

B. Supported from steel:

1. Fabricated of 3/4-inch diameter steel rod bent in U shape and threaded at both ends to receive nuts.
2. Provide hooks hot-dip galvanized after fabrication.

2.20 TRENCH DRAIN COVERS

A. Gray cast iron trench drain solid covers and frames where indicated on the Drawings in accordance with ASTM A48, class 35 heavy duty use. Provide castings of uniform quality, free from blow holes, shrinkage defects, swells, cracks or other defects. Casting to be free of fins, burrs and slag.

1. Covers: Solid with checkered pattern top.
2. Bolt trench drain covers to frames with stainless steel cap screws.
3. Trench drain cover assembly to support AASHTO H20 rated load.

2.21 MISCELLANEOUS ITEMS

A. Provide hangers, supports, brackets, anchors, bolts and other miscellaneous metalwork not previously specified, of the shape, size, material and detail indicated on the Drawings for the purpose intended.

2.22 FABRICATION

A. General

1. Metals shall be sheared and punched cleanly and accurately. Burrs shall be removed.
2. Exposed edges shall be rounded to a radius of approximately 1/32 inch, unless otherwise indicated. Bent-metal corners shall be formed to the smallest radius possible without causing grain separation or otherwise impairing the work.
3. Corners and seams shall be welded continuously to comply with the following:
 - a. Materials and methods shall be used that minimize distortion and develop strength and corrosion resistance of the base metals.
 - b. Fusion shall be obtained without undercut or overlap.
 - c. Welding flux shall be removed immediately.
 - d. At exposed connections, exposed welds and surfaces shall be finished smooth and blended so that no roughness is apparent and the contour of the welded surface matches that of the adjacent surface.
4. Joints that will be exposed to weather shall be fabricated in a manner to exclude water. Drain holes shall be provided where water may accumulate.

5. Fabrications exposed to view in the completed Work, shall be provided with smooth, flat surfaces without blemishes.
6. Fabrications with exposed pitting, seam marks, roller marks, rolled trade names, or roughness shall not be used.

B. Shop Assembly:

1. Items shall be preassembled in shop to greatest extent possible to minimize field splicing and assembly.
2. Units shall be disassembled only as necessary for shipping and handling limitations.
3. Connections shall maintain the structural value of joined pieces through the use of properly sized holes, proper spacing and gage distances, tolerances, and other requirements as determined in the applicable codes listed elsewhere in this specification.
4. Units shall be clearly marked for reassembly and coordinated installation.

2.23 FINISHES

A. Fabrications shall be finished after shop assembly.

B. Anodized aluminum finishes to be in accordance with the Aluminum Association's standards for Anodized Architectural Aluminum as published by the American Architectural Manufacturer's Association (AAMA).

C. Anodized finishes damaged in the field during installation or transit shall be repaired using brush anodizing to restore the coating to its specified Class and thickness.

D. Galvanizing

1. Items of miscellaneous ironwork and steel work indicated on the Drawings or specified to be galvanized shall be zinc-coated by the hot-dip process in accordance with ASTM Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip, Designation A123; or ASTM Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Designation A153, as appropriate.

E. Aluminum Surfaces in Contact with Concrete

1. Paint-on coating suitable for embedment in, or surface mounting to, concrete to prevent adverse reaction between aluminum and concrete surfaces.
2. Apply one coat of the following;
 - a. Coal Tar 46-465 H. B. Tnemecol, Tnemec Company, North Kansas City, MO.
 - b. Bitumastic Super Service Black, KOP-COAT, Inc., Pittsburgh, PA.
 - c. Tarmastic 100 Porter Coatings Division, Porter Paint Co., Louisville, KY.
 - d. Or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Field Assembly:

1. Metal fabrications shall be cut, reinforced, drilled, and tapped cleanly and accurately to receive finish hardware, screws, and similar items.
2. Exposed work shall be formed true to line and level, with accurate angles and surfaces, and straight rounded edges.
3. Sharp or rough areas shall be removed on exposed traffic surfaces.
4. Exposed connections shall be formed with hairline joints, flush and smooth, using concealed fasteners where possible.
5. Exposed fasteners of type indicated on the Drawings shall be used; when not indicated, Phillips flat-head (countersunk) screws or bolts shall be used. Joints shall be located where least conspicuous.

B. Erection Tolerances

1. Maximum Variation from Plumb: 1/4 inch per story, noncumulative.
2. Maximum Offset from True Alignment: 1/4 inch.

C. Anchorage:

1. Coordinated type of anchorage with supporting structure.
2. Anchoring devices shall be fabricated and spaced to secure metal fabrications in place and to support indicated loads.

D. Fastening to In-Place Construction:

1. Anchorage devices and fasteners shall be provided where necessary for securing metal fabrications to in-place construction.

E. Cutting, Fitting, and Placement:

1. Cutting, drilling, and fitting for the installation of metal fabrications shall be performed as required.
2. Metal fabrications shall be set accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

F. Temporary bracing or anchors shall be provided in formwork for items that are to be built into concrete.

G. Exposed connections shall fit together to form hairline joints. Welded connections that can not be made in the shop due to shipping limitations shall be made in the field. Do not weld, cut, or abrade surfaces of exterior units that have been anodized after fabrication and are for bolted or screwed field connections.

H. Field Welding: Comply with the following requirements:

1. Materials and methods shall be used that minimize distortion and develop strength and corrosion resistance of base metals.
2. Fusion shall be obtained without undercut or overlap.
3. Welding flux shall be removed immediately.
4. At exposed connections, welds and surfaces shall be finished smooth and blended so that no roughness shows after finishing and the contour of the welded surface matches that of adjacent surface.

3.02 SETTING BEARING AND LEVELING PLATES

- A. Concrete bearing surfaces shall be cleaned of bond-reducing materials, and roughened to improve bond to surfaces. The bottom surface of plates shall be cleaned.
- B. Bearing and leveling plates shall be set on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, anchor bolts shall be tightened. Wedges and shims shall not be removed but, if protruding, shall be cut off flush with the edge of bearing plate before packing with grout.
 1. Provide grout in accordance with SECTION 03600.
 2. Grout shall be solidly packed between bearing surfaces and plates to ensure that no voids remain.

3.03 ANCHOR BOLTS (CAST IN PLACE)

- A. Accurately locate and hold anchor bolts in place with templates at the time concrete is placed.
- B. Use sleeves for location adjustment and provide two nuts and one washer per bolt of same material as bolt. Minimum bolt size: 1/2-inch diameter by 12 inches long, unless otherwise shown.
- C. All anchors and anchor bolts shall be properly located and shall be built into the connecting work when the work is built. Expansion bolts shall be inserted into drilled holes.

3.04 ANCHORING SYSTEMS (CURED CONCRETE)

- A. Begin installation only after concrete or masonry receiving anchors have attained design strength.
- B. Do not install an anchor closer than six times its diameter to either an edge of concrete or masonry, or to another anchor, unless specifically shown otherwise.
- C. Install in accordance with manufacturer's specific quality control submittal instructions. Hole diameters are critical to installation, use only drills recommended by anchor manufacturer. Follow manufacturer's safe handling instructions.

- D. Epoxy or Adhesive Anchors: Do not install when temperature of concrete is below 40 degrees F or above 100 degrees F, unless stated otherwise in manufacturer's written instructions.
- E. Follow specific manufacturer safe handling practices when handling and installing concrete anchors.

3.05 FASTENER SCHEDULE:

<u>Service Use and Location</u>	<u>Product</u>	<u>Remarks</u>
Anchor Bolts Cast Into Concrete for Equipment Bases:		
Dry Areas	Stainless steel bolts, unless otherwise specified with equipment	
Submerged or Wet Areas	Stainless steel bolts with fusion bond coating unless otherwise specified with equipment	See Section 09900, Painting and Protection Coating
Anchor Bolts Cast Into Concrete for Metal Fabrications and Structural Components.		
Dry or Protected Areas Exterior, Wet, Washdown, and Chemical Handling Areas	Stainless steel bolts with fusion bond coating	See Section 09900, Painting
Anchors for Metal Components to Concrete: e.g. Electrical Panels and Equipment:		
Dry Areas	Stainless steel wedge or expansion anchors	
Wet and Damp Areas	Epoxy or adhesive stainless steel anchors	
Submerged or Buried in Earth	Epoxy or adhesive stainless steel anchors	
Connections for Structural Steel Components:		
Exterior and Interior	High-strength zinc-coated steel bolts	See Section 05120, Structural Steel
Connections for Steel Fabrications:		
Exterior and Interior	Zinc-coated steel bolts	See Section 05120, Structural Steel
Connections for Aluminum Components:		
Exterior and Interior	Stainless steel bolts	
All Others:		
Exterior and Interior	Stainless steel fasteners	

- A. Do not use epoxy anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

3.06 WHEEL GUARDS

- A. Anchor to structure in accordance with manufacturers instructions.
- B. Fill guard completely with grout.
- C. Paint safety yellow in accordance with SECTION 09900.

3.07 ABRASIVE NOSINGS

- A. Provide abrasive nosings on concrete steps not being supplied or coated with another type of nosing or nonskid material.

3.08 ACCESS COVERS AND HATCHES

- A. Accurately position prior to placing concrete, such that covers and hatches are flush with floor surface.
- B. Protect from damage resulting from concrete placement. Thoroughly clean exposed surfaces of concrete spillage to obtain a clean, uniform appearance.

3.09 PIPE BOLLARDS

- A. Anchored in place with concrete footings as detailed in the Contract Drawings. Bollards shall be supported and braced in position until their footings are cured.
- B. Fill pipe solidly with 3,000 psi concrete, mounding the top surface.
- C. Paint bollards Safety Yellow in accordance with:
 - 1. Exterior Steel - Non-Immersion
 - a. Shop Surface Preparation: SSPC SP6 Commercial Blast Cleaning
 - b. Shop Primer Coat: Series 91-K97 Organic Zinc
 - 1) Dry Film Thickness: 2.5 to 3.5 mils
 - c. Full Field Prime Coat: Series 66-color Hi-Build Epoxoline
 - 1) Dry Film Thickness: 3.0 to 5.0 mils
 - d. Finish Coat: Series 73-color Endura-Shield
 - 1) Dry Film Thickness: 2.5 to 5.0 mils
 - e. Total Dry Film Thickness: 8.0 to 13.5 mils.

3.10 LADDERS

- A. Anchor uprights to wall with angles or bent plates, weld to uprights and expansion bolt to wall. Ground smooth all welds.
- B. Provide safety cages or fall prevention system as indicated.

3.11 LIFTING HOOKS

- A. Supported from Concrete:
 - 1. Coordinate installation with concrete placement.
- B. Support for Steel:

1. Place lifting hooks in punched holes in bottom flange of steel beams and secure in place by nuts.

3.12 ANGLE PROTECTION

- A. Provide galvanized structural steel angels and strap anchors as indicated and specified.

3.13 MISCELLANEOUS ITEMS

- A. Metal Fabrication Subcontractor shall furnish items to be embedded in the Work to the Contractor for installation.

3.14 ALUMINUM WORK PROTECTION

- A. Areas where the coating has been damaged by abrasion or other cause shall be cleaned and repainted as directed so that the aluminum will have a complete protective film when brought into contact with the material against which it is being protected. Before application of coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances, and shall be immersed in or swabbed with an acceptable solvent. Next, the surfaces shall be rinsed with clear water and thoroughly dried.
- C. Protect against electrolysis where aluminum is to be used in conjunction with dissimilar metals.
- D. Where a shop coating of methacrylate lacquer has been specified on aluminum work to protect the surface from stain, the protective coating of lacquer worn off due to handling or erection shall be replaced in the field by a new coating of lacquer of the same type.
- E. During construction, care shall be taken to prevent damage to the aluminum work from splashing or by the accumulation of paint, concrete, mortar, or other similar materials.

3.15 CLEANING AND TOUCHUP

- A. Painted Surfaces: Clean and touchup paint field welds, bolted connections, and abraded areas of shop paint as specified in SECTION 09900 or as approved by the Engineer.
- B. Anodized Surfaces: Clean field welds, bolted connections, and abraded areas and repair anodizing to match the quality of the coating provided by the shop.
- C. After aluminum has been erected, it shall be cleaned with mild soap and water, followed by a clear water rinse.

END OF SECTION

SECTION 05510

ALUMINUM STAIRS AND LADDERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for the fabrication and installation of aluminum stair and ladder systems.

B. Related Sections

1. Section 05500 – Metal Fabrications
2. Section 05520 - Aluminum Handrails and Railings
3. Section 05530 – Metal Grating

1.02 SYSTEM DESCRIPTION

A. Design Requirements

1. Comply with the provisions of the following codes, standards, and specifications, except as otherwise shown or specified.

- a. The Aluminum Association Designations:

Structural rolled or extruded shapes	6061-T6
Extruded shapes	6063-T5
Plates	6061-T6
Gratings (bearing bars)	6061-T6
(crimp bars)	6063-T6
Sheets	Alcad 3003-H14 and 3003
Bolts and nuts	2024-T4

B. Performance Requirements

1. Stairs are to be fabricated to support a live load of 100 lbs. /sq. ft. and a moving concentrated load of not less than 300 lbs.

1.03 SUBMITTALS

A. In accordance with Section 01300 submit the following:

1. Complete shop drawings and design computations, stamped by a Professional Engineer registered in the State of Rhode Island who is experienced in this type of work. All computations shall be in conformance with the Specifications for Aluminum Structures, (SAS) 30, by the American Aluminum Association. This submission will be reviewed by the Engineer but design responsibility remains with the Contractor and the Contractor's Engineer and under no circumstances, does the Engineer assume responsibility for the means, methods, sequences, procedures or techniques in connection with the performance of any of the work of the Contractor.

2. Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor, details and installation instructions for products to be used in the fabrication of aluminum stair work, include coating products. Transmit copy of instructions to the installer.
3. Shop drawings for the fabrication and erection of aluminum stair assemblies and ladders. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.
4. Mill certificates and a signed statement from the fabricator that all aluminum work furnished is of the proper alloys as specified herein.

1.04 SEQUENCING

A. Inserts and Anchorages:

1. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of the handrails and railings work.
2. Provide setting drawings, templates, instructions and directions for installation of anchorage devices.
3. Coordinate delivery with other work to avoid delay.

PART 2 PRODUCTS

2.01 STAIR SYSTEMS

A. Aluminum stairs

1. Provide structural aluminum channel stringers and supports, aluminum tread plate treads and platforms, sheet aluminum risers, grating treads and platforms as indicated on the Drawings and in the details.

B. Plate treads

1. Formed from 1/4 inch thick aluminum tread plate and the risers shall be formed from 0.080-inch thick sheet aluminum.
2. Treads shall be supported by and attached to 1-1/4 inch by 1-1/4 inch by 3/16 inch aluminum carrier angles bolted to the stringers.
3. Treads shall be the widths indicated.
4. Risers shall be bolted to the treads.

C. Plate platforms

1. Fabricated of 1/4 inch thick aluminum tread plate and shall be supported on the edges by structural aluminum angles and at the mid spans by structural aluminum tees.

D. Aluminum tread plate for treads and platforms shall have an acceptable nonskid pattern surface.

E. Provide all structural aluminum angle hangers, struts, rod hangers, closure plates, and brackets indicated or necessary to complete the stairs as indicated.

F. Grating stair treads

1. In accordance with SECTION 05530 and the following:
2. Welded aluminum safety treads with 1-1/4 inch abrasive or extruded aluminum corrugated nosings.
3. Punched and slotted integral carrier plates for attaching to the channel stringers.

G. Grating platforms

1. In accordance with SECTION 05530 and the following:
2. Constructed of the specified aluminum grating and shall have the same nosings as the treads.
3. Supported at the ends on structural aluminum angles and at the mid spans by structural aluminum tees.

2.02 LADDERS

- A. Constructed of pipe uprights with solid round rod rungs mortised and welded to the uprights. Securely anchor to the wall with angles or bent plates, as indicated, welded to the uprights and expansion bolted to the wall. All welds shall be ground smooth.
- B. Interior ladders shall be secured to the floor slabs with floor flanges as indicated.
- C. The uprights of ladders to roofs or platforms shall widen at the top, extend above the roof or platform level, and shall be turned back to form guard rails.
- D. Construct from 1-1/2 inch IPS, Schedule 40 aluminum pipe uprights and 1 inch solid round aluminum rod rungs unless otherwise indicated on the drawings. After fabrication, the aluminum ladders shall be given an Aluminum Association Standard Finish, Designation M12C22A31 followed by a shop coat of methacrylate lacquer.

2.03 HANDRAILS

- A. In accordance with Specification SECTION 05520.

2.04 SHIP LADDER

- A. Constructed of aluminum channel stringers, aluminum pipe handrails and aluminum riveted grating treads. The treads to be Type K manufactured by Borden Metal products Co., Elizabeth, NJ; Reticuline Type M manufactured by IKG Industries, Long Island City, NY; Type KM manufactured by Kerrigan Iron Works, Inc., Nashville, TN; or acceptable equivalent product.
- B. Bearing bars of treads to be 3/16 inch thick by 1-1/4 inch deep and be fabricated of 6061-T6 aluminum alloy.
- C. Crimp bars to be fabricated of 6063-T5 aluminum alloy, riveted on 7 inch centers, and raised slightly above the bearing bars and serrated.

- D. Treads to be provided with integral slotted and punched end plates for attaching to stringers. Treads to be provided with 1-1/4 inch abrasive or extruded aluminum corrugated nosings.
- E. Provide structural aluminum clip angles, brackets and fasteners to complete the ship ladders as detailed on the Drawings.

2.05 FASTENERS

- A. Stainless steel in accordance with SECTION 05500.

2.06 FABRICATION

A. Shop Assembly

1. Use materials of the size and thickness shown, or if not shown, of the required size and thickness to produce adequate strength and durability in the finished product for the intended use. Work to conform to the dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use the type of materials shown or specified for the various components of work.
2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 of an inch unless otherwise shown. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.
3. Weld corners and seams continuously in accordance with the recommendations of the American Welding Society. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.
4. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flathead (countersunk) screws or bolts.
5. Provide for anchorage of the type shown, coordinated with the supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support for the intended use of the work.
6. Pre-assemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Anchorages

1. Furnish setting drawings, diagrams, templates instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors.
2. Install inserts and anchorage devices in accordance with Section 05500.

3. The use of impact imbedded fasteners will not be allowed.

3.02 FASTENING TO IN-PLACE CONSTRUCTION

A. Provide anchorage devices and fasteners where necessary for securing stair items to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required.

3.03 CUTTING, FITTING AND PLACEMENT

A. Perform all cutting, drilling and fitting required for the installation of the miscellaneous metal items. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in framework for items which are to be built into concrete, masonry or similar construction.

B. Fit exposed connections accurately together for form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop-welded because of shipping size limitations.

3.04 FIELD WELDING

A. Comply with AWS Code for the procedures of manual shielded metalarc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.05 ALUMINUM WORK PROTECTION

A. Aluminum surfaces be in contact with concrete or masonry to be protected by a coat of Coal Tar 46-465 H. B. Themecol manufactured by Tnemec Company, North Kansas City, MO; Bitumastic Super Service Black manufactured by KOP-COAT, Inc., Pittsburgh, PA; or an acceptable equivalent product.

B. Areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as directed so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected. Before application of coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances, and shall be immersed in or swabbed with an acceptable solvent. Next, the surfaces shall be rinsed with clear water and thoroughly dried.

C. Protect against electrolysis where aluminum is to be used in conjunction with dissimilar metals.

D. Where a shop coating of methacrylate lacquer has been specified on aluminum work to protect the surface from stain, the protective coating of lacquer worn off due to handling or erection shall be replaced in the field by a new coating of lacquer of the same type.

- E. During construction, care shall be taken to prevent damage to the aluminum work from splashing or by the accumulation of paint, concrete, mortar, or other similar materials.

3.06 CLEANING ALUMINUM WORK

- A. After aluminum has been erected, it shall be cleaned with mild soap and water, followed by a clear water rinse.

END OF SECTION

SECTION 05520

ALUMINUM HANDRAILS AND RAILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for fabrication and installation of aluminum handrails and railing.

B. Related Sections

1. Section 05500 – Metal Fabrications
2. Section 05510 – Aluminum Stairs and Ladders
3. Section 05530 – Metal Grating

1.02 PERFORMANCE REQUIREMENTS

- ###### A. Railing assembly including anchoring of posts and framing members shall be capable of withstanding the minimum loadings required by the Massachusetts State Building Code.

1.03 SUBMITTALS

A. In accordance with Section 01300 submit the following:

1. Manufacturer's specifications, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of handrails and railings, include coating products. Transmit copy of instructions to the installer.
2. Shop drawings for the fabrication and erection of handrail and railing assemblies. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

1.04 QUALITY ASSURANCE

A. Qualification for Welding Work.

1. Confirm welding processes and welding operators in accordance with the American Welding Society, AWS D1.2, Structural Welding Code – Aluminum.

1.05 PROJECT CONDITIONS

A. Field Measurements.

1. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of the work to existing features and work completed under this Contract.
2. Coordinate fabrication with Construction Schedule.
3. Where field measurements cannot be made without delaying the Work, proceed with fabricating metal fabrications upon receipt of Engineer reviewed and approved shop drawings, without field measurements. Allowance shall be made for trimming and fitting.

1.06 SEQUENCING

A. Inserts and Anchorages:

1. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of the handrails and railings work.
2. Provide setting drawings, templates, instructions and directions for installation of anchorage devices.
3. Coordinate delivery with other work to avoid delay.

PART 2 PRODUCTS

2.01 HANDRAILS AND RAILINGS

A. General

1. All-welded construction.
2. Fabricated as indicated on the Drawings.
3. Stanchions to be 1-1/2 inch IPS, Schedule 80 aluminum pipe, alloy 6063-T6
4. Top and intermediate rails and returns to be 1-1/2 inch Schedule 40 aluminum pipe, alloy 6063-T6.
5. Fabricate in panels with joints made in a neat and inconspicuous manner.
6. All exposed welds shall be ground smooth.
7. Provide stainless steel anchor bolts and fasteners in accordance with SECTION 05500.

B. Removable pipe railings

1. Fabricated in the same manner as fixed railings.
2. Installed as indicated.

C. Brackets for wall-mounted handrails

1. Cast aluminum pipe rail brackets with curved tops.
2. 3 inch projection from wall to the center of the handrail.

D. Brackets for floor mounted stanchions

1. Cast aluminum of the round, flat base flange configuration.
2. Designed to withstand the required loading and to support and reinforce the post.

E. Brackets for side-mounted stanchions

1. Aluminum brackets as detailed on the Drawings.
2. Provide a 1-3/8 inch projection from wall to the center of the stanchion.

2.02 HANDICAPPED PROVISIONS

- A. Provide knurled, abrasive or other textured finish on portions of handrails, a distance of 4 feet from stairs and other openings, to indicate a danger signal in accordance with applicable ADA requirements.

2.03 FABRICATION

A. Shop Assembly:

1. Form exposed work true to line and elevation with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 of an inch, unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.
2. Weld corners and seams continuously in accordance with the recommendations of AWS. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.
3. Form exposed connections with flush, smooth, hairline joints, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flathead (countersunk) screws or bolts.
4. Provide for anchorage of the type shown, coordinated with the supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support.
5. After fabrication, all aluminum pipe railings shall receive an Aluminum Association Standard Anodic Finish, Designation M12C22A31, followed by a shop coat of methacrylate lacquer.
6. Preassemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Anchorages

1. Furnish setting drawings, diagrams, templates instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors.
2. Install inserts and anchorage devices in accordance with Section 05500.

3. The use of impact imbedded fasteners will not be allowed.

3.02 FASTENING TO IN-PLACE CONSTRUCTION

- A. Provide anchorage devices and fasteners where necessary to secure handrails and railings to in place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wedge anchors and other connectors as required.

3.03 CUTTING, FITTING AND PLACEMENT

- A. Perform all cutting, drilling and fitting required for the installation. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in framework for items which are to be built into concrete, masonry or similar construction.
- B. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop-welded because of shipping size limitations.
- C. Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Space posts not more than 8 feet on centers, unless otherwise shown. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 1. Handrail stanchions shall be mounted on the top of stair stringers as indicated on the drawings.
 2. The stanchions set into concrete curbs shall be set into preformed holes and secured in place with nonshrink grout. The holes shall be at least $\frac{3}{4}$ inches greater in diameter than the outside diameter of the stanchions and shall be a minimum of 6 inches deep.
 3. Products offered by manufacturers to comply with the requirements for hydraulic cement include the following:
 - a. Embeco; Master Builder's
 - b. Ferrolith G; Sonneborn Bldg. Products, Inc.
 - c. Por-Rok; Halemite Mfg. Co.
 4. The stanchions to be side-mounted to structure walls shall be attached to brackets anchored to the structure wall with wedge anchors or suitable fasteners providing a system capable of withstanding the minimum load as specified.
- D. Anchor rail ends into concrete and masonry with aluminum round flanges (unless shown otherwise) welded to rail ends and anchored into the wall construction with lead expansion shields and bolts.
- E. Secure handrails to walls as shown, or by means of wall brackets, and wall return fitting at handrail ends.

- F. Provide brackets with not less than 3 inch projection from the finish wall surface to the center of the pipe handrail, and with the wall plate portion of the bracket drilled to receive on 3/8 inch bolt. Locate brackets not more than 60 inches on center. Provide flush-type wall return fittings with the same projection as that specified for wall brackets. Secure wall brackets and wall return fittings to building construction as follows:
1. For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.
 2. For hollow masonry anchorage use toggle bolts having square heads.

3.04 FIELD WELDING

- A. Comply with AWS Code for the procedures of manual shielded metalarc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.05 ALUMINUM WORK PROTECTION

- A. Aluminum surfaces be in contact with concrete or masonry to be protected by a coat of Coal Tar 46-465 H.B. Themecol manufactured by Tnemec Company, North Kansas City, MO; Bitumastic Super Service Black manufactured by the KOP-COAT, Inc., Pittsburgh, PA; or an acceptable equivalent product.
- B. Areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as directed so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected. Before application of coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances, and shall be immersed in or swabbed with an acceptable solvent. Next, the surfaces shall be rinsed with clear water and thoroughly dried.
- C. Protect against electrolysis where aluminum is to be used in conjunction with dissimilar metals.
- D. Where a shop coating of methacrylate lacquer has been specified on aluminum work to protect the surface from stain, the protective coating of lacquer worn off due to handling or erection shall be replaced in the field by a new coating of lacquer of the same type.
- E. During construction, care shall be taken to prevent damage to the aluminum work from splashing or by the accumulation of paint, concrete, mortar, or other similar materials.

3.06 CLEANING ALUMINUM WORK

- A. After aluminum has been erected it shall be cleaned with mild soap and water followed by a clear water rinse.

END OF SECTION

SECTION 05530

METAL GRATING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for the fabrication and installation of metal gratings and appurtenances.

B. Related Sections

1. Section 05500 - Metal Fabrications
2. Section 05510 – Aluminum Stairs and Ladders
3. Section 05520 – Aluminum Handrails and Railings

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A36, Specification for Carbon Structural Steel.
2. A123, Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
3. A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
5. A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
6. A568, Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold Rolled.
7. B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
8. F593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
9. F594, Specification for Stainless Steel Nuts.
10. F844, Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

B. American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)

1. MBG 531, Metal Bar Grating Manual.
2. MBG 532, Heavy Duty Metal Bar Grating Manual.

1.03 SUBMITTALS

A. In accordance with Section 01300 submit the following:

1. Shop Drawings

- a. Grating: Show dimensions, weight, and size, and location of connections to adjacent grating, supports, and other work.
- b. Grating Anchorage: Show structural calculations and details of anchorage to supports to prevent displacement from traffic impact.
- c. Grating Supports: Show dimensions, weight, size, location, and anchorage to supporting structure.
- d. Catalog information and catalog cuts.
- e. Manufacturer's specifications, to include coatings.

B. Samples:

1. Two samples of aluminum grating approximately 4 inches by 8 inches, showing at least four crossbars each and four bearing bars each.
2. One sample will be retained at the site to be used as a basis for acceptance or rejection of grating installed.

C. Quality Control Submittals:

1. Special handling and storage requirements.
2. Installation instructions.
3. Factory test reports.
4. Manufacturer's Certification of Compliance for specified products.
5. Written Test Report that swaged crossbars, if used on grating, meet the requirements of the specified test and additional requirements of these Specifications.

1.04 PREPARATION FOR SHIPMENT

- A. Insofar as is practical, factory assemble items provided.
- B. Package and clearly tag parts and assemblies that are of necessity shipped unassembled and protect the materials from damage, and facilitate identification and final assembly in the field.

PART 2 PRODUCTS

2.01 FOOT TRAFFIC GRATING

A. Design:

1. Uniform Service Load: 200 psf minimum uniform load and 300 pound minimum concentrated load, unless otherwise shown.
2. Maximum Deflection: 1/4 inch, unless otherwise shown.
3. Space bearing bars at 1-3/16-inch center-to-center.
4. Banding: 3/16-inch minimum.

B. Material:

1. Aluminum Bar Type Grating:
 - a. Press-locked rectangular design, as manufactured by IKG/Borden, Clark, NJ; IKG/Borden Type B or Type F.

- b. Swage locked aluminum grating, rectangular bar type, as manufactured by:
 - 1) IKG/Borden, Clark, NJ; IKG/Borden Type BS or Type FS.
 - 2) Seidelhuber Metal Products, Inc., San Carlos, CA; Type A-2.
 - 3) Ohio Gratings, Inc., Canton, OH; Aluminum Flush Top, Type 19SGF2.
 - 4) Klemp Corp., Chicago, IL; Type KRP.

or

2. Aluminum Bar Type Grating:

- a. Swage locked, rectangular bar grating in accordance with ASTM B221, 6061-T6
- b. Provide with clear, Class II, anodized finish in accordance with Aluminum Association Designation AA-A31, 0.4 mils thick minimum.
- c. Layout as indicated on the Drawings.
- d. Bearing Bars shall be of the depth noted on the drawings and shall be spaced at 1-3/16" on center.
- e. Cross bars shall be spaced at 4" on center. Individual grating panels shall be banded around their edges and clipped to framing members with the grating manufacturer's standard fastening devices.
- f. A serrated surface shall be provided where indicated on the Drawings.
- g. Grating shall be 19-SG-4 as manufactured by Ohio Gratings, Inc. of Canton, OH, Type BS as manufactured by IKG Borden or Paramus, NJ, or Engineer approved equal.

3. Galvanized Steel Bar Type Grating: Press-locked, deep rectangular crossbar design, as manufactured by IKG/Borden, Clark, NJ; Type B or Type F.

4. Galvanized Steel Plank Style Safety Grating

- a. Hot rolled, pickled and oiled black steel, ASTM A568, hot-dip galvanized after fabrication with serrated openings.
- b. Manufacturers and Products:
 - 1) USG Industries, Metal Products Div., Chicago, IL; Grip-Strut.
 - 2) IKG/Borden, Clark, NJ; IKG/Deck Span.
 - 3) Morton Manufacturing, Libertyville, IL; Open-Grip.

5. Aluminum Plank Style Safety Grating

- a. Regular, heavy-duty, with serrated openings.
- b. Manufacturers and Products:
 - 1) USG Industries, Metal Products Div., Chicago, IL; Grip-Strut.
 - 2) IKG/Borden, Clark, NJ; IKG/Deck Span.
 - 3) Morton Manufacturing Co., Libertyville, IL; Open-Grip.

6. Stainless Steel Plank Style Safety Grating

- a. ASTM A167, Type 316L stainless steel grating with serrated openings.
- b. Manufacturers and Products:
 - 1) UGS Industries, Metal Products Div., Chicago, IL; Grip-Strut
 - 2) IKG/Borden, Clark, NJ; IKG/Deck Span.

7. Stair Treads:

- a. In accordance with this SECTION and the applicable requirements of SECTION 05510.

2.02 LIGHT VEHICULAR TRAFFIC GRATING

A. Design:

1. Maximum Load: 2,000 pounds per wheel, minimum wheel base and axle width of 4 feet 0 inch.
2. Space main bars at 1-3/16-inch center-to-center.
3. Banding: 1/4 inch.

B. Material:

1. Aluminum Bar Type Grating: Press-locked deep rectangular crossbar designed as manufactured by IKG/Borden, Clark, NJ, IKG/Borden; Type B or Type F.
2. Galvanized Steel Bar Type Grating:
 - a. After Fabrication: ASTM A123, zinc coating.
 - b. Manufacturer and Product: IKG/Borden, Clark, NJ; IKG/Borden heavy-weld Type HWF or Type HWB or press-locked, rectangular crossbar, Type FJ or BJ.

2.03 HEAVY VEHICULAR TRAFFIC GRATING

A. Design:

1. Loading: AASHTO HS 20-44.
2. Banding: 1/4 inch.

B. Material:

1. Galvanized Steel Bar Type:
 - a. Heavy-duty, main bars spaced at 1-7/8-inch maximum center-to-center.
 - b. After Fabrication: ASTM A123, zinc coating.
 - c. Manufacturer and Product: IKG/Borden, Clark, NJ; KG/Borden heavy-weld Type HWF or HWB or press-locked, rectangular crossbar, Type BJ or FJ.

2.04 ACCESSORIES

A. Anchor Bolts and Nuts:

1. Carbon Steel: ASTM A307 or A36.
2. Stainless Steel: ASTM F593 and ASTM F594, Type 316.
3. Galvanized Steel Bolts and Nuts: ASTM A153, zinc coating for ASTM A307 or A36.

B. Flat Washers

1. Carbon Steel: (Unhardened): ASTM F844; use ASTM A153 for zinc coating.
2. Stainless Steel: see SECTION 05500.

C. Removable Fastener Clips and Bolts:

1. Removable from above grating walkway surface.
2. Hat Bracket: Type 304 stainless steel.
3. Bolt: type 316 stainless steel.

4. Cast iron, galvanized body.
5. Manufacturer and Product: Struct-Fast, Wellesley Hills, MA; Gratefast.

D. Partially Removable Anchor:

1. Bolt: Threaded stud, Type 316 stainless steel.
 - a. Manufacturer: Nelson Stud Welding Co., Loraine, OH.
2. Hat Bracket: Type 304 stainless steel.
 - a. Manufacturer:
 - 1) Struct-Fast, Wellesley Hills, MA.
 - 2) Or equal.

2.05 FABRICATION

A. General:

1. Exposed Surfaces: Smooth finish and sharp, well-defined lines.
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in a neat, substantial manner.
3. Conceal fastenings where practical.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Weld Connections: Not permitted on grating except at banding bars.

B. Design:

1. Field measure areas to receive grating, verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.
2. Section Length: Sufficient to prevent its falling down through clear opening when oriented in the span direction when one end is touching either the concrete or the vertical leg of grating support.
3. Minimum Bearing: ANSI/NAAMM MBG 531.
4. Metal Crossbar Spacing: 4-inch maximum, unless otherwise shown or specified.
5. Crossbars: Flush with top of main bar and extend downward a minimum of 50 percent of the main bar depth.
 - a. Swaged Crossbars:
 - 1) Within 1/4 inch of top of grating with 1/2-inch minimum vertical dimension after swaging, and minimum before swaging dimension of 5/16-inch square.
 - 2) Crossbar Dimension After Swaging: Minimum 1/8-inch wider than the opening at minimum of two corners at each side of each square opening in main bar.
 - 3) Crossbars may be a special extruded shape so that after swaging the top will be flat, 3/16 inches wide and will be flush with the top surface of the bearing bars for a minimum of 5/8 inches at center between bearing bars.
 - 4) Flush crossbar meeting all of the above except that after swaging shall overlap one corner by a minimum of 1/8 inch. A sample of one bearing bar and one crossbar shall be tested by holding the bearing bar and pulling on the crossbar. The crossbar to bearing bar shall sustain a minimum of 300 pounds without pullout of the bearing bar.

- 5) Tightly fit main bars and crossbars allowing no differential movement.
 6. Do not use weld type crossbars.
 7. Banding: Same material as grating: ANSI/NAAMM MBG 531 and ANSI/NAAMM MBG 532.
 8. Furnish stainless steel Type 316 threaded anchor studs, as fasteners for grating attachment to metal supports either not embedded or partially embedded in concrete, as manufactured by Nelson Studs Welding Co., Loraine, OH.
- C. Supports:
1. Seat angles and beams where shown:
 - a. Same material as rectangular bar grating.
 - b. Extruded aluminum frame with slot for recessed grating clips, as manufactured by Thompson Fabricating Co., for aluminum I-Bar type grating.
 2. Coordinate dimensions and fabrication with grating to be supported.
 3. Coordinate dimensions with increased depth due to serrations.
 4. Welded Frames With Anchors: Continuously welded.
- D. Slip-Resistant Surface:
1. Rectangular Steel and Aluminum Bar Grating (as noted): As manufactured by:
 - a. IKG/Borden, Clark NJ; EZ Weldslip-Resistant Coating.
 - b. Seidelhuber Metal Products, Inc., Hayward, CA; Safety Grit Non-Slip System.
 - c. Ohio Gratings, Inc., Canton, OH with "Slip-Not" Safety Surface manufactured by W.S. Molnar Co., Detroit, MI.
 2. I-Bar grating aluminum shall incorporate a striated anti-skid walking surface produced during the extrusion process, as manufactured by:
 - a. IKG/Borden, Clark, NJ.
 - b. Seidelhuber Metal Products, Inc., Hayward, CA.
 - c. Klemp Corp., Chicago, IL.
- E. Aluminum:
1. ASTM B221 extruded shapes.
 2. Fabricate as shown and in accordance with manufacturer's recommendations.
 3. Grind smooth sheared edges exposed in the finished work.
 4. Swage crossbars, if used, with equipment strong enough to deform crossbars.
 5. Eliminate any loose crossbar intersections on swaged grating.
- F. Foot Traffic Grating: Any single grating section, individual plank, or plank assembly shall be not less than 1 foot 6 inches or greater than 3 feet 0 inch in width or weigh more than 150 pounds.
- G. Light Vehicular Traffic Grating: Any single grating section, individual plank, or plank assembly shall not be less than 1 foot 6 inches or greater than 3 feet 0 inch in width (except 3/8-inch thick bearing bar grating), or weigh more than 150 pounds.
- H. Heavy Vehicular Traffic Grating: Minimum width of grating sections shall be 2 feet 0 inch regardless of length or weight.

PART 3 EXECUTION

3.01 PREPARATION

A. Electrolytic Protection:

1. Aluminum surfaces in contact with dissimilar metals, other than stainless steel, and embedded or in contact with masonry, grout, and concrete, to be protected by a coat of Bitumastic Super Service Black manufactured by KOP-COAT, Inc., Pittsburgh, PA; 46-465 Heavy Themecol manufactured by Tnemec Company, North Kansas City, MO; or an acceptable equivalent product.

3.02 INSTALLATION

- A. Install supports such that grating sections have a solid bearing on both ends, and that rock and wobble grating movement does not occur under designed traffic loading.
- B. Install plumb or level as applicable.
- C. Install welded frames with anchors to straight plan without offsets.
- D. Anchor grating securely to supports using minimum of four fasteners clips and bolts per grating section.
- E. Use stainless steel anchors and accessories with aluminum gratings.
- F. Completed installation shall be rigid and neat in appearance.
- G. Commercially Manufactured Products:
 1. Install in accordance with manufacturer's recommendations.
 2. Secure grating to support members with fasteners.
 3. Welding is not permitted.
 4. Fasteners: Field locate and install.
 5. Permit each grating section or plank style grating assembly to be easily removed and replaced.
- H. Protect painted surfaces during installation.
- I. Should coating become marred, prepare and touch up surface in accordance with paint manufacturer's instructions.

END OF SECTION

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DIVISION 06

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SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to provide rough carpentry necessary for the proper completion of all work shown on the Drawings or specified herein which generally shall consist of the following:
 - 1. Furnish, erect and maintain all exterior staging over eight feet in height required by all trades for the proper execution of their work.
 - 2. Install all wood blocking, wood grounds, and wood nailers in all areas requiring attachment of work of other sections of this Specification.
 - 3. All miscellaneous carpentry work not specifically shown on the Drawings or specified herein, but customarily done under this Section and necessary to proper completion of the work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All lumber shall be of sound stock delivered dry and shall be fully protected at all times from injury and dampness. Split, broken or otherwise damaged pieces will not be allowed in the work.
- B. Wood members that will be in contact with concrete shall be pressure treated. Treatment shall consist of a wood preservative applied under pressure using chromated copper arsenate (Fed. Spec. TT-W-550b), AWPAs Std. P5, or fluor chrome arsenate phenol (Fed. Spec. TT-W-535a), AWPAs Std. P5, in accordance with the requirements for treating wood. Net final retention of oil shall be not less than 0.35 lb per cu ft. Lumber and treatment shall conform to GENERAL REQUIREMENTS FOR TREATED LUMBER hereinafter.
 - 1. Lumber shall be of the form, structural grade and dressing as shown, specified or required.
 - 2. Lumber shall be fastened with approved nails, spikes, bolts, rods, plates and all other hardware of indicated or required sizes and lengths.
 - 3. Treatment shall consist of a wood preservative applied under pressure by the empty cell process of impregnation using pentachlorophenol solution in petroleum to 5 percent (Fed. Spec. TT-W-570a), AWPAs Std. P8. Net final retention of oil shall be not less than 10 lb per cu ft. Lumber and treatment shall conform to GENERAL REQUIREMENTS FOR TREATED LUMBER hereinafter. Lumber shall be dressed, tongue and grooved, bored and framed as required prior to treatment.

4. Wood for blocking, and nailers shall be Construction Grade, Douglas Fir or Ponderosa Pine.
5. Nails, spikes, etc., where sizes are not indicated or specified, shall be of suitable size and number to securely fasten and hold members in place. All fasteners for exterior workmanship of furring shall be hot-dip galvanized.

2.02 GENERAL REQUIREMENTS FOR TREATED LUMBER

- A. All pressure treatments shall conform to the latest appropriate standard specifications of the American Wood-Preservers' Association.
- B. Lumber shall be conditioned for treatment by air-seasoning, by kiln drying, by steaming, by heating in the preservative either at atmospheric pressure or under vacuum, or by a combination of them, in such a manner as will not cause damage to the timber for the use intended. Conditioning of lumber for pressure treatment shall conform to the requirements of AWWA Spec. C1 "Standard for Preservative Treatment by Pressure Processes -- All Timber Products".
- C. Pressure treatments shall comply with all applicable portions of AWWA Standards C2, C9, and C28.
- D. Tests of pressure treated material shall conform to Paragraph 3, "Results of Treatment" of AWWA Spec. C1.
- E. Treated timber shall be handled, bored, framed and field treated in complete conformance with AWWA Spec. M4 "Standard Instructions for the Care of Pressure Treated Wood After Treatment", where permitted by the Engineer. Treated lumber or timber injured so as to impair its structural capabilities or its preservative qualities will be rejected, and such material shall be removed from the job.
- F. When pressure treated materials have been cut into, or bored after treatment, where permitted, all cuts, chamfers, holes and damaged portions of lumber shall be carefully field treated with hot preservative solution and over-coated with a hot coal tar pitch coating. All holes bored after treatment shall be treated with equipment to apply preservative under pressure, using the Greenlee Bolt Treater or equal. Counterbored holes shall be coated with hot preservative followed by filling with an approved pitch or asphalt mastic.
- G. The Contractor shall furnish a certificate by the preservative treating plant warranting the grade of lumber, the quality of preservative used and the net final retention of preservative in pounds per cubic foot.

PART 3 EXECUTION

3.01 ROUGH CARPENTRY

- A. Framing shall be well nailed, spiked, or bolted together, erected plumb and true in accurate planes, and set accurately to support finished work.

- B. Wood anchored to concrete or masonry shall be rigidly fastened with 5/8-in. bolts countersunk flush, or as shown on the Drawings.
- C. Provide and set all grounds for finish.
- D. Do all necessary blocking of sizes and shapes as shown for all finish; use merchantable wood well secured in place.

3.02 INSTALLATION

- A. Fabricated products shall be installed in strict accordance with manufacturer's instruction, and/or as shown on the drawings.
- B. Work shall be done in neat, workmanlike manner by carpenters experienced in work of the type required herein.

END OF SECTION

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DIVISION 07

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SECTION 07600

FLASHING AND SHEET METAL WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and all sections within DIVISION 1-GENERAL REQUIREMENTS are hereby made a part of this Section.

1.02 SCOPE OF WORK

- A. Furnish and install all wall flashings, sheet metalwork, and appurtenant work as indicated on the drawings and as herein specified.

1.03 RELATED SECTIONS

Section 06100 - Rough Carpentry

1.04 SUBMITTALS

- A. The Contractor's attention is directed to the requirement of Section 01300.
- B. Provide samples of all metal and membrane flashing materials. Labels for materials shall be provided, showing weights, gages, or thickness.

PART 2 - PRODUCTS

2.01 METAL FLASHING MATERIALS

- A. Lead coated copper flashings shall be 20-oz. hard (cornice) temper copper sheets, lead-coated on both sides and shall comply with ASTM Standard Specifications for Lead-Coated Copper Sheets, Designation B101-78, for Type I or II, Class A Sheets (12 to 15 lb. total of lead per 100 sq. ft.).
- B.

PART 3 - EXECUTION

3.01 INSTALLATION OF METAL ROOF FLASHINGS

- A. Flashings shall be installed at all roof penetrations as indicated on the drawings. All joints in metal flashings shall be flat locked and soldered.
- B. All vent pipes shall be flashed with lead-coated copper as indicated on the drawings. The base flashing shall extend out on the roofing at least 6 in. and up to the top of the vent pipe. A lead-coated soft (roofing temper) copper cap flashing shall be installed at the top of the vent pipe, lapping the base flashing at least 4 in. and turning down into the pipe at least 2 in.

END OF SECTION

SECTION 07920

SEALANTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and all sections within DIVISION 1-GENERAL REQUIREMENTS are hereby made a part of this Section.

1.02 SCOPE OF WORK

- A. The work of this section includes all labor, materials, tools, equipment, and accessories necessary for the complete application of joint sealants and to the extent indicated on the Drawings and specified herein.
 - 1. Sealant and Backer - Perimeter of all openings.
 - 2. Foam Sealant - Expansion Joints, Cushion Joints and Control Joints.
 - 3. Joint Sealer at concrete pours separated by preformed filler.
 - 4. Backer Seal at expansion joints.
 - 5. Firestopping.
 - 6. Ceramic fiber batt fire barriers.

1.03 RELATED SECTIONS

Section 03300 - Cast-in-Place Concrete
Section 07600 - Flashing and Sheet Metal Work
Section 08101 - Fiberglass Doors and Frames

1.04 SUBMITTALS

- A. All sealants.

- 1. Certifications

Prior to application of any materials, notarized certificates shall be furnished by the Contractor to the Engineer for approval stating that the materials proposed for use meet all the requirements of this Section of the Specifications. The certification shall be accompanied by notarized test reports from an approved independent testing laboratory.

- 2. Samples

The Contractor shall submit, for approval of the Engineer, cured samples of the available colors of each type of sealant.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete joint sealants.

1. Joints in horizontal and vertical concrete surfaces shall be primed and sealed with a two component, non-sag, polysulfide sealant; "Sikaflex 412" as manufactured by Sika Chemical, "Synthacalk GC-2" as manufactured by Pecora Corporation or equal.

B. Sealants

1. All masonry and concrete openings passing through exterior and interior walls (Windows, Doors and around other openings that may not be shown on Drawings) shall be provided with a sealant Type "707 Architectural Sealant" by Protective Treatments Inc., Dayton, OH 45414 or equal.
2. Back-up material shall be open cell polyethylene or rod stock material recommended by Sealant manufacturer.
3. Vinyl rope shall be used as a wedge and backup for sealant at reglets.
4. Foam Sealant shall be "Will-Seal" Type 150 as manufactured by Illbruck/U.S.A., Minneapolis, MN 55412 or equal.
5. Foam Sealant shall be to design arrangements shown on Drawings, (Building Expansion Joints, Cushion Joints at Relieving Angles and Control Joints).

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

Materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and identification. Materials shall be kept dry until use. Emulsion products shall be kept from freezing.

3.02 INSTALLATION

A. Concrete Joint Sealant.

1. Install at ambient temperature of 40°F or above to dry, clean joint slots. Remove oil, grease, curing compound residue, rust and any other

foreign materials by sandblasting. Remove loose particles by oil-free compressed air or vacuum.

2. Mixing, priming and application shall be in strict accordance with manufacturer's instructions. Maximum depth of sealant shall be 1/2-inch.
3. Polyurethane shall not be used where chlorine may be present. A polyester sealant shall be used for this service.

B. Sealants

1. Metallic surfaces to be caulked shall be cleaned of oil, grease, wax, dirt and any other foreign matter likely to impair the bond.
2. Porous surfaces shall be cleaned and when recommended by the caulking manufacturer, primed as recommended.
3. Joints shall be designed to provide a caulking depth of one half joint width, but not less than 1/4 inch. Deeper joints shall be filled to the proper depth with polyethylene foam rod stock as specified.
4. Sealants shall be used from manufacturer's original cartridge in a standard open type, hand-operated caulking gun. Nozzle shall be cut to proper size to obtain neat, smooth, and uniform bead. When handling bulk material, manufacturer's printed instructions shall be followed.
5. A full bead of caulking shall be applied into the joint under pressure leaving a slightly concave surface. Tool with caulking tools within 10 minutes after application. All caulked joints shall be watertight.
6. Joints shall be caulked before painting adjacent work.
7. Clean up. On non-porous surfaces, excess uncured caulking shall be removed immediately with a solvent moistened cloth. On porous surfaces, excess caulking shall be allowed to cure overnight, then removed by lightly wire brushing or sanding. All adjacent surfaces shall be clean and free from stains.

END OF SECTION

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DIVISION 09

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SECTION 09900

PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for preparation and finishing of surfaces to be painted.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. D16, Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products
- B. Steel Structures Painting Council (SSPC).
 - 1. SP-1, Solvent Cleaning.
 - 2. SP-2, Hand Tool Cleaning.
 - 3. SP-3, Power Tool Cleaning.
 - 4. SP-5, White Metal Blast Cleaning.
 - 5. SP-6, Commercial Blast Cleaning.
 - 6. SP-7, Brush-Off Blast Cleaning.
 - 7. SP-10, Near-White Blast Cleaning.

1.03 DEFINITIONS

- A. In accordance with ASTM-D16.
- B. Wherever the words “solvent cleaning”, “hand tool cleaning”, “wire brushing”, or “blast cleaning”, or words of similar intent are used in these specifications, it shall be understood to refer to the applicable SSPC Specification.
- C. The term “paint” or “coating” as used in this specification includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, used as prime, intermediate or finish coats.

1.04 SUBMITTALS

- A. Shop Drawings
 - 1. Submit product data and manufacturers application instructions in accordance with SECTION 01300.

B. Samples

1. Colors as required.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer specializing in the production of paint and coatings for 10 years, minimum.
2. Applicator specializing in commercial, industrial and municipal painting for 5 years, minimum.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading

1. In accordance with manufacturers recommendations.

B. Acceptance at Site

1. Products to be delivered to site in sealed, labeled and unopened containers.
2. Labels to include Name, type, code, coverage, surface preparation, drying time, color, clean up procedure, and mixing and reducing instructions.
3. Remove unacceptable products immediately.

C. Storage and Protection

1. Store materials between minimum ambient temperature of 45 degrees F. and a maximum of 90 degrees F.
2. Storage area to be well ventilated, or as required by manufacturer.

1.07 PROJECT/SITE CONDITIONS

A. Environmental Requirements

1. Provide continuous ventilation and maintain ambient temperature above 45 degrees F., for 24 hours before, during, and 48 hours after application of finishes, unless otherwise required by coating manufacturer.
2. Do not apply coatings when exposed to rain or snow, or when relative humidity is above 50 percent.
3. Minimum application temperature for Latex paints:
 - a. 45 degrees F. for interiors.
 - b. 50 degrees F., for exteriors
4. Minimum application temperatures for other coatings:
 - a. 65 degrees for interior and exterior.
5. Lighting levels to be 80 ft. candles, measured mid height at substrate surface.

1.08 MAINTENANCE

A. Extra Materials

1. Provide 1 gallon each color to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Paints by the Tnemec Company, Kansas City, Missouri have been used as the basis for the paint schedule, other manufactures considered equal:
 1. Valspar Coatings,
 2. Carboline.
 3. or product deemed equivalent by the Engineer.

2.02 MATERIALS

A. Coatings

1. Ready Mixed, except field catalyzed coatings.
2. Process pigments to a soft paste like consistency, capable of being dispersed to a uniform coating.
3. Readily applied by spray or brush.
4. Dry free of streaks or sags.

B. Accessories

1. Linseed Oil, Shellac, Turpentine, Thinners to be of commercial quality, compatible to coatings used.

2.03 COLORS AND FINISHES

- A. Colors selected by the Owner from color chips submitted by the Contractor for review. The selection shall be in the form of a color schedule indicating the colors to be used on the various surfaces. The colors used in the final Work shall match the selected color chips.
- B. In general the finish coat shall be gloss or semi-gloss on metal work and flat finish on masonry, wood and drywall surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions

1. Verify surfaces are ready to receive work in accordance with manufacturers recommendations.

2. Report conditions which may affect proper application to Engineer.
3. Measure moisture content of substrates.
4. Do not apply coatings when moisture exceeds levels below:
 - a. Plaster and Gypsum wallboards 12 percent.
 - b. Masonry and Concrete 12 percent
 - c. Wood 14 percent

3.02 PREPARATION

A. Protection

1. Protect elements surrounding the Work required by this section from damage or marking.
2. Repair damage to other surfaces caused by Work of this section.
3. Furnish drop cloths, shields, and protective methods to prevent spray or paint spatter from disfiguring other surfaces.

B. Preparation of surfaces to be coated

1. General
 - a. Remove electrical plates, light fixtures, hardware, and fittings.
 - b. Correct minor defects and clean surfaces.
 - c. Seal marks which may bleed through surface finish.
2. Impervious Surfaces
 - a. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.
 - b. Rinse with clean water.
 - c. Allow to dry.
3. Aluminum
 - a. Remove surface contamination by steam or high pressure water.
 - b. Remove oxidation by sanding and solvent washing.
4. Insulated coverings
 - a. Remove dirt, grease, and oil from canvas and cotton.
5. Concrete
 - a. Blast-trak or brush blast.
6. Wood
 - a. Remove dirt, oil, and other soil with scrapers, mineral spirits, and sand paper.
 - b. Sand surfaces exposed to view, and remove all sanding dust.
7. Gypsum board
 - a. Fill minor defects with latex fill.
 - b. Prime repaired areas.
8. Galvanized surfaces
 - a. Remove contamination and oils with solvent wash.
 - b. Sand and remove sanding dust.
9. Masonry and Concrete
 - a. Allow 28 days curing prior to coating application.
 - b. Remove dirt, loose mortar, scale, salt, alkali powder or other foreign matter.
 - c. Remove oil and grease with solution of tri-sodium phosphate.
 - d. Rinse with water.

- e. Allow to dry.
 - f. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water.
 - g. Allow to dry.
10. Uncoated steel and iron
- a. Remove grease, scale, dirt and rust.
 - b. Remove heavy scale and rust with wire brushing or sandblasting.
 - c. Clean by washing with solvent.
 - d. Apply treatment of phosphoric acid solution.
 - e. Clean welds, bolts and nuts in a similar fashion.
 - f. Spot prime repaired areas.
11. Shop primed steel
- a. Remove loose primer and rust by sanding or scraping.
 - b. Feather edges to make touch-up patches inconspicuous.
 - c. Clean surfaces with solvent.
 - d. Prime bare steel.
12. Stainless steel surfaces shall not be painted.

3.03 COATING APPLICATION

A. General

- 1. Apply in accordance with manufacturers recommendations.
- 2. Apply each coat to uniform finish.
- 3. Apply each coat slightly darker than preceding coat, unless instructed otherwise by the Engineer.
- 4. Sand lightly between coats.
- 5. Allow preceding coat to dry prior to application of next coat.
- 6. Prime back surfaces of all woodwork.

3.04 MECHANICAL AND ELECTRICAL EQUIPMENT

A. General

- 1. Paint shop primed equipment with compatible finish coat.
- 2. Remove or mask items not to be painted.
- 3. Prime and finish all associated pipes, and ducts, both insulated and exposed, all hangers, brackets, collars and supports, unless items are pre finished.
- 4. Do not paint identification markings or tags on equipment.
- 5. Paint exposed conduit and piping in finished areas.
- 6. Paint both sides and edges of plywood mounting boards.
- 7. Reinstall all trim, fittings, plates ect. After painting is complete.

B. Color Code

- 1. Piping and equipment in accordance with Article 3.06 of this specification.

C. Identification

- 1. Label piping by contents and arrows indicating direction of flow.

2. Labels to be twenty feet (20) apart maximum, and within each space through which pipe line passes.
3. Adjacent to each side of walls which pipeline penetrate.
4. Adjacent to valves, equipment, and pumps.
5. Locate labels where they are unobstructed from view and visible from valves.
6. Colors to be white or black as appropriate for the substrate.
7. Letters, numbers and flow arrows to be stenciled to pipeline and equipment or die cut from vinyl film as approved by the Engineer.

8. Lettering size as follows:	Pipe Diameter in Inches	Size of Letters in Inches
	3/4 to 1-1/4	1/2
	1-1/2 to 2	3/4
	2-1/2 to 6	1-1/2
	8 to 10	2-1/2
	Over 10	3

D. Metal tags

1. Pipelines smaller than 3/4 inches in diameter and for valves, securely fasten brass tags, 2-1/2 inches x 1/2 inches, with etched lettering filled with enamel paint.

3.05 CLEANING

- A. Promptly remove spilled, splashed and/or spattered paint.
- B. Maintain premises free of clutter, tools, equipment and material.
- C. Collect waste cloths and material which may constitute a fire hazard and and remove daily from site.

3.06 COLOR SCHEDULES

A. Interior

1. Chosen by Owner.

B. Piping

- | | |
|-------------------|---------------------------------------|
| 1. Water lines | Raw.....Olive Green |
| | Settled or Clarified.....Aqua |
| | Finished or Potable.....Dark Blue |
| 2. Chemical Lines | Alum.....Orange |
| | Caustic.....Yellow with Green Band |
| | Chlorine.....Yellow |
| | Fluoride.....Light Blue with Red Band |
| | Polymers.....Orange with Green Band |
| | Potassium Permanganate..Violet |
| 3. Waste Lines | Raw.....Gray |
| | Sludge.....Brown |
| 4. Miscellaneous | Compressed Air.....Dark Green |
| | Fuel Oil.....Red |

3.07 EXTERIOR COATING SYSTEM SCHEDULE

A. Miscellaneous Ferrous Metal Items

1. Shop surface preparation: SSPC-SP-10, Blast profile 1.5 - 2.5 mils.
2. 1st coat; (Shop applied)-Tnemec Hydro-Zinc 2000, DFT 2.5-3.0 mils.
3. 2nd coat (Field applied)-Tnemec Series 66 Epoxoline, DFT 4.0-6.0 mils.
4. 3rd coat (Field applied)-Tnemec Series 66 Epoxoline 66, DFT 4.0 to 6.0 mils.

B. Ferrous Metals Scheduled for Immersion Service

1. Shop surface preparation: SSPC-SP-10, Blast profile 1.5 - 2.0 mils.
2. 1st coat; (Shop applied)-Tnemec 66-1211 Red Primer, DFT 3.0 mils.
3. 2nd coat (Field applied)-Tnemec 104 H.S. Epoxy, DFT 6.0 to 10.0 mils.
Scarify 1st coat prior to 2nd coat application.
4. 3rd coat (Field applied)- Tnemec 104 H.S. Epoxy, DFT 6.0 to 10.0 mils.

C. Ferrous Metals Scheduled for Immersion Service in Potable Water, NSF approved

1. Surface preparation: SSPC-SP-10, Blast profile 1.5 - 2.0 mils.
2. 1st coat; (Shop applied)-Tnemec Hydro-Zinc 2000, DFT 2.5 to 3.5 mils.
3. 2nd coat (Field applied)-Tnemec Series 20-1255 Beige, DFT 3.0 to 5.0 mils.
4. 3rd coat (Field applied)- Tnemec Series 20-AA90 White, DFT 3.0 to 5.0 mils.

D. Galvanized Metal

1. Surface preparation: lightly scarify surface, solvent clean using Tnemec 41-4 solvent.
2. 1st coat: 66 Hi-Build Epoxyline, DFT 2.0 to 4.0 mils.
3. 2nd coat: 73 Endurashield, DFT 1.5 to 3.0 mils.

E. Concrete, and Concrete Block Masonry (New)

1. 1st coat: Tnemec Series 52 Tnemecrete, DFT 8.0 mils.
2. 2nd coat: Tnemec Series 52 Tnemecrete, DFT 8.0 mils.

F. Concrete, and Concrete Block Masonry (New), (Clear finish)

1. 1st coat: Tnemec Acrylic Sealer.
2. 2nd coat: Tnemec Acrylic Sealer.

G. Asphalt

1. 1 coat Traffic Marking Paint.

3.08 INTERIOR COATING SYSTEM SCHEDULE

A. Concrete Block

1. 1st coat: Tnemec 130-6602 Spray then back roll.
2. 2nd coat: Tnemec 83 Ceramlon II Epoxy, DFT 6.0 mils.
3. 3rd coat: Tnemec 83 Ceramlon II Epoxy, DFT 6.0 mils.

B. Concrete Walls and Ceilings

1. 1st coat: Tnemec 83 Ceramlon II Epoxy, DFT 6.0 mils.
 2. 2nd coat: Tnemec 83 Ceramlon II Epoxy, DFT 6.0 mils.
- C. Drywall
1. 1st coat: Tnemec 51-792 Sealer
 2. 2nd coat: Tnemec Series 23 Enduratone.
 3. 3rd coat: Tnemec Series 23 Enduratone.
- D. Wood (to be painted)
1. 1st coat: Tnemec 36-603 Undercoat.
 2. 2nd coat: Tnemec Series 23 Enduratone.
 3. 3rd coat: Tnemec Series 23 Enduratone.
- E. Metals, Structural Steel, Piping, Railways, Equipment, ect.
1. Shop surface preparation: SSPC-SP-6, Blast profile 1.5 - 2.0 mils.
 2. 1st coat; (Shop applied)-Tnemec 66-1211 Red Primer, DFT 3.0 mils.
 3. 2nd coat (Field applied)-Tnemec Series 66 Epoxoline, DFT 3.0 to 4.0 mils.
 4. 3rd coat (Field applied)-Tnemec Series 73 Endura Shield, DFT 1.5 to 2.5 mils.
- F. PVC Piping
1. Surface preparation: Scarify prior to coating.
 2. 1st coat: Tnemec Series 66 Epoxoline, DFT 1.5 to 2.0 mils.
 3. 2nd coat: Tnemec Series 66 Epoxoline, DFT 1.5 to 2.0 mils.
- G. Non-ferrous Metals (Galvanized, Copper, ect.)
1. Surface preparation: Lightly scarify surface, solvent clean using Tnemec 41-4 solvent.
 2. 1st coat: Tnemec 66 Epoxoline, DFT 1.5 to 3.0 mils.
 3. 2nd coat: Tnemec 73 Endurashield, DFT 2.0 to 3.0 mils.
- H. Canvas and Cotton Insulation Coverings.
1. 1st coat: Tnemec 51-792 Sealer.
 2. 2nd coat: Tnemec Series 6 Tneme Cryl.
 3. 3rd coat: Tnemec Series 6 or Series 7 Tneme Cryl.
- I. Interior concrete tanks in contact with potable water.
1. Surface preparation: SSPC-SP-7 (Acid etching not allowed).
 2. 1st coat: Fill large voids with Tnemec 63-1500 Filler/Surfacer.
 3. 2nd coat: Tnemec Series 20-1255 Beige, DFT 3.0 to 5.0 mils.
 4. 3rd coat: Tnemec Series 20-AA90 White, DFT 3.0 to 5.0 mils.

3.09 PIPING COATING SYSTEM SCHEDULE

A. Ductile Iron

1. Surface preparation: Immersion Service-SSPC-SP-10
2. 1st coat: (Shop Applied) Tnemec Series 66-1211, DFT. 3.0 mils.
3. 2nd coat: (Field Applied) Tnemec 66, Color, DFT 4.0 mils.

4. 3rd coat (Field Applied) Tnemec Series 66 Color DFT 4.0 mils.

B. PVC

1. Surface preparation: Clean and dry.

2. 1st coat: Tnemec series 66, Hi-Build Epoxoline, DFT 4.0 to 6.0 mils.

C. Carbon Steel

1. Surface preparation: Immersion Service- SSPC-SP-10.

2. 1st coat: (Shop Applied) Tnemec Series 66-1211, DFT. 3.0 mils.

3. 2nd coat: (Field Applied) Tnemec 66, Color, DFT 4.0 mils.

4. 3rd coat (Field Applied) Tnemec Series 66 Color DFT 4.0 mils.

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DIVISION 11

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SECTION 11282

STAINLESS STEEL SLUICE GATES AND APPURTENANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Furnish, install and test stainless steel sluice gates and appurtenances as indicated and specified.
 - 1. Sizes are indicated in the gate schedules on the Drawings.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 1 - General Requirements
 - 2. Section 02050 - Demolition
 - 3. Division 16 – Electrical

1.3 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Comply with the requirements of Section 01300 - Submittals.
 - 2. Submit Shop Drawings showing the following:
 - a. Complete description in sufficient detail to permit item-by-item comparison with the Specifications.
 - b. Dimensions.
 - c. Weights.
 - d. Capacity.

- e. Maximum support reactions.
- f. Performance characteristics.
- g. Layout drawing for all equipment showing installation details.
- h. Wiring diagrams for all electrical items (both internal and external)
- i. Deviations from Drawings and Specifications.
- j. Manufacturer's installation and testing instructions.
- m. Affidavits of compliance with referenced standards and codes.
 - 1. Manufacturer's standard guarantee.
- m. Submit Manufacturer's installation report as specified in Part 3.

B. Operation and Maintenance Manuals:

- 1. Comply with the Requirements of Division 1 and the Supplemental Requirements Below.
- 2. Required Operation Data:
 - a. Complete, detailed operating instructions for each piece of equipment.
 - b. Explanations of all safety considerations relating to operation.
- 3. Required Maintenance Data:
 - a. Include all information and instructions required to keep equipment properly lubricated and adjusted so that it functions economically throughout its full design life.
 - b. Explanation with illustrations as necessary for each maintenance task.
 - c. Recommended spare parts lists.
 - d. Recommended schedule of maintenance tasks.
 - e. Lubrication charts and table of alternate lubricants.
 - f. Troubleshooting instructions.

- g. List of special maintenance tools and equipment.
- h. Name, address and phone number of manufacturer and manufacturer's local service.
- i. Include copies of all approved Shop Drawings.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

- 1. Manufacturer shall have a minimum of ten years experience in producing similar type equipment, and shall show evidence of ten installations in satisfactory operation upon request.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

- 1. ASTM A276, stainless and heat-resisting steel bars and shapes.
- 2. ASTM A480, stainless steel plate, sheet, and strip.
- 3. ASTM B584, copper alloy and sand castings for general application.
- 4. ASTM D4020, U.H.M.W. polyethylene molding and extrusion material.
- 5. ASTM D2000, standard classification system for rubber products in automotive applications.
- 6. ASTM B26, aluminum alloy sand castings.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with Section 01600 and as specified.

B. Shipping:

- 1. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
- 2. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.

3. Deliver spare parts at same time as pertaining equipment. Deliver to Owner after completion of work.
- C. Receiving:
1. Inspect and inventory items upon delivery to site.
 2. Store and safeguard equipment, material and spare parts in accordance with manufacturer's recommendations. Store materials to permit easy access for inspection and identification. Keep all items off ground, using pallets, platforms or other supports. Do not store items in a manner that might cause distortion or damage to that item.
 3. Unload, haul, and store items.
 4. Pay demurrage charges if failed to promptly unload items.
 5. Assume responsibility for equipment, material and spare parts just before unloading from carrier at site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Whipps, Inc., Athol, MA.
- B. Rodney-Hunt Co., Orange, MA.
- C. Waterman Industries, Exeter, CA.
- D. Or acceptable equivalent product.

2.2 SERVICE CONDITIONS

- A. Stainless steel sluice gate sizes and other pertinent data are included in the gate schedules on the drawings.

2.3 GENERAL

- A. All gates produced by a single manufacturer and designed for installation in the structures as indicated on the drawings.

2.4 GATE ASSEMBLIES

- A. Type: self-contained, rising stem unless otherwise specified.
- B. Leakage not to exceed 0.025 gpm per foot of seal perimeter.
- C. Unless otherwise specified, all stainless steel parts, including fasteners shall be type 316 stainless steel.

2.5 MANUAL CRANK ACTUATORS

- A. Indicate the direction of operation.
- B. See Paragraph 2.15.

2.6 FRAMES

- A. Formed or extruded stainless steel construction consisting of guides, an invert member and a top member where top closure is required. Suitable reinforcements will be provided to resist all operating loads.
- B. Minimum material thickness shall be 1/4", except for gates having an opening of 16 square feet or less, where 3/16" will be allowable.
- C. Self-contained frames shall be provided with a support yoke for mounting the actuator.
 - 1. The support yoke shall consist of structural members welded or bolted to the extended guide members.
 - 2. The support yoke shall be located as required to provide full travel of the gate slide unless otherwise specified.
 - 3. The yoke shall be designed so that the maximum deflection is limited to 1/360th of the span when operating at maximum specified head.
 - 4. For gates with powered actuators, the yoke shall be designed to limit the maximum yoke stress to 18,000 PSI at operator stall.
- D. Frames that are attached with epoxy doweled anchor bolts shall be provided with bolts conforming to ICBO report 4285 regarding number of bolts, size, and placement.

2.7 SEALS

- A. The frames shall be equipped with seats/seals to prevent metal-to-metal contact and restrict leakage.
 - 1. The guides of all gates shall incorporate ultra high molecular

weight polyethylene (UHMW) seat/seals on both the upstream and downstream sides of the gate slide. Each seat/seal will be shaped to act as both a bearing surface and a seal. The top seal, where required on upward opening gates, shall be mounted on the frame and be of low friction polymer construction.

2. All upward opening gates shall contain a replaceable, flush bottom neoprene invert seal, mounted on the slide.
3. All downward opening gates (weir gates) shall have low friction polymer seals mounted on the frame member at the invert of the waterway.
4. All seals shall be attached to the frame with stainless steel retainers and/or stainless steel bolts.
5. To minimize leakage, seal-to-slide pressure shall be adjustable by means of frame mounted wedges, which do not impinge the waterway opening.

2.8 SLIDES

- A. Stainless steel construction, reinforced with angle, channel, or plate stiffeners as required to limit the deflection at maximum specified head to 1/8" and the maximum stress of 12,000 PSI.
- B. Minimum material thickness will be 1/4", except for gates with openings of 16 square feet or less, where 3/16" will be allowable.
- C. Stem connectors shall consist of two vertical members welded to the slide. Each stem shall be bolted to the stem connector with two stainless steel attachment bolts.
- D. Edge of slide shall be 1/2" thick minimum when 1/4" is the minimum material thickness and 3/8" thick when 3/16" is the minimum material thickness.

2.9 STEMS

- A. The entire stem shall be from solid stainless steel rod.
- B. The stem shall have a minimum diameter of 1-1/2".
- C. The threaded portion of the stem shall have rolled or machine cut acme threads polished to a 63 micro inch finish.
- D. The stem shall be of a size to safely withstand without buckling or permanent distortion the stresses induced by normal operating forces.

- E. The stem shall be designed to transmit in compression at least 2.5 times the output of the manual actuator with an 80 lb. effort or 1.43 times the stall thrust on electric motor actuators.
- F. A field adjusted threaded cast aluminum stop collar shall be provided on all stems with manual actuators to limit downward travel of the slide.
- G. A field-adjusted aluminum split collar upstop shall be provided on all submerged gates and weir gates to limit the upward travel of the slide.

2.10 STEM GUIDES

- A. Provide integral frame mounted stem guides to limit the L/r ratio of the operating stem to 200 or less.
- B. Stem guides shall be bronze bushed and adjustable in two directions.

2.11 STEM COVERS

- A. All rising stem stainless steel sluice gates shall be provided with clear lexan or butyrate stem covers.
- B. The stem covers shall be properly vented and closed at the top with a plastic cap.
- C. The stem covers shall be provided with field mounted mylar travel indicator strips.

2.12 ANCHOR BOLTS

- A. Provide Type 316 stainless steel, epoxy doweled anchor bolts.
- B. Provide anchor bolts of no less than 1/2" diameter.
- C. Provide all anchor bolts with ample cross section to withstand the force created by operation of the gate.
- D. Install anchor bolts per manufacturer's instructions.

2.13 WALL THIMBLES (not used)

- A. Wall thimbles shall be a heavy one-piece stainless steel 316L construction of the type indicated on the gate schedule and shown on the contract drawings. Depth of the thimble shall be the same thickness as the wall. Minimum material thickness shall not be less than 3/16". All parts of wall thimble including the gussets and stiffeners shall be stainless steel 316L. The vertical centerlines shall be clearly marked at top and bottom to permit alignment of the front face into vertical plane.
- B. Wall thimbles shall be internally braced during concrete placement to

prevent warping. Square thimbles shall be provided with holes in the invert to allow satisfactory concrete placement beneath the thimble, and shall be on centers of 24" or less. A suitable mastic or gasket shall be used to form a seal between the front face of the thimble and the back of the gate frame. "E" type thimbles shall have the back flange drilled for mounting to pipe flange.

2.14 PAINTING

- A. All cast iron and carbon steel parts shall be completely shop primed and painted. Field painting, other than touch up, shall not be required.

2.15 MANUAL ACTUATORS

- A. The actuator shall be as shown in the Contract Drawings, provided that the effort to operate does not exceed a 40 lb. pull when the gate is subjected to the maximum unbalanced head.
- B. All manual actuators will be enclosed in a high strength cast aluminum or cast iron housing with a bronze operating nut.
- C. Non-Geared Handwheel Actuators
 1. Roller-type bearings shall be provided above and below the operating nut.
 2. Mechanical seals shall be provided above and below the operating nut.
 3. The handwheel shall have a minimum diameter of 15" and a maximum diameter of 24".
- D. Geared Crank Actuators
 1. Gearboxes shall have a 1" minimum diameter stainless steel pinion shaft.
 2. Roller-type bearings shall be provided above and below the operating nut.
 3. Mechanical seals shall be provided on the top and bottom of the actuator housing and around the pinion shaft.
 4. All gears are to be steel or bronze.
 5. The crank shall have a minimum radius of 12" and a maximum radius of 15".
- E. Interconnected Actuators

1. All stainless steel sluice gates 72" wide or larger or those with widths greater than twice their height shall be provided with two stems and two gearboxes connected by an aluminum or stainless steel interconnecting shaft for simultaneous operation via crank.
2. Gates shall also be equipped with dual actuators if deemed necessary for proper operation by the gate manufacturer.

F. Remote Actuator Drives

1. Remote actuator drives shall be provided in cases where the centerline of the handwheel (mounted on non-gearred actuator) will be located 48" or greater from the operating floor, where the centerline of the handwheel (mounted on geared actuator) will be 54" or greater from the operating floor, or where the centerline of the crank will be located 48" or greater from the operating floor.
2. Remote drives shall be of the chain and sprocket type with an aluminum cover.
3. Remote drives shall be used in conjunction with geared crank actuators. The centerline of the crank shall be positioned 30" above the operating floor.

2.16 ELECTRIC MOTOR OPERATORS

A. Manufacturers:

1. Limitorque Corp. Lynchburg, VA.
2. Rotork Controls Inc., Rochester, NY.
3. Emerson Process Management, Missouri City, TX.
4. AUMA Actuators, Cannonsburg, PA.
5. Or acceptable equivalent product.

B. **The electric motor operator shall be suitable for Class 1, Division 1, Groups C & D location.**

C. Motor operators shall be furnished by gate manufacturer.

D. Each operator includes electric motor, reduction gearing, reversing starter, thermal overloads, drive bushing or stem nut, control transformer and limit

controls. Gears totally enclosed in XP Class 1 Dive 1 housing with integrally cast mounting for motor, and removable cover for limit controls.

1. Power will be 3-phase 480 volts..
 2. Equip each operator with a handwheel for manual operation and hammerblow device, which permits motor to come up to speed before picking up load and unseating gate.
 3. Actuators shall be so designated that they are suitable for operation by Instrumentation and Control SCADA system via hardware I/Os.
 4. Stem coupling shall be accomplished by means of a high tensile, manganese bronze stem nut. The nut shall be of the 2-piece design, permitting installation and removal without disassembly of the actuator, uncoupling of the actuator from the valve, or removal of the external power and control wiring conduit.
- E. Provide opening and closing speeds of approximately 12-in. per minute for motor operators.
- F. Mount operator for stainless steel sluice gates on a pedestal with flanged bases drilled for anchor bolts.
- G. Provide internal clutch that cannot engage handwheel operating mechanism and motor-operating mechanism at same time.
1. Provide handwheel with arrow and word OPEN cast on wheel to indicate turning direction to open. The handwheel shall operate in the clockwise direction to close.
 2. Design for handwheel to not rotate during power operation. Design for motor not to rotate during manual operation.
 3. Provide 18-in. maximum diameter handwheel and gear ratio to give maximum rate of movement possible with 40-lb. pull on hand wheel.
 4. Should power be returned to the motor while the handwheel is in use, the design of the unit shall prevent transmission of the motor torque to the handwheel. Use of the handwheel shall not negate the hammer-blow feature.
- H. Reduction Unit of worm-gear type, worm and planetary spur type, modified planetary type, or acceptable reduction unit of spur-gear type.

1. Provide spur gears with cut teeth.
 2. If worm gears are used, operate worm shaft in ball or roller bearings and provide machine cut, ground, and highly polished; bronze worm with large contact area.
 3. Accurately machine worm, spur gears, and all shafts of heat-treated steel.
 4. Operate output or driving shaft in bronze bearings or in ball or roller bearings.
 5. Make provisions to take thrust in both directions.
 6. Lubricate gearing at all times.
- I. Fully wire electric motor operators at factory and furnish complete with terminal strips for external power and control connections as specified under appropriate electrical sections.
- J. Provide manual or automatic control as indicated or specified.
- K. Manual Control: Provide OPEN, STOP, and CLOSE push-button at operator.
- L. Automatic Control: Include options for remote control.
- M. Manufacture contacts and operating parts of non-corrodible metal.
- N. Each actuator shall be supplied complete with open-stop-close push buttons. Push buttons shall be furnished integral or in a separate enclosure for remote mounting. As a minimum, the remote enclosure shall be suitable for Class 1, Division 1, Groups C & D and NEMA 4X weatherproof construction.
- P. Limit Controls:
1. Positive in action ensuring tight seating and full openings.
 2. Mechanism designed to minimize drift or over travel and to open or close gate to fixed, predetermined point at every operation.

3. Provide controls to disconnect driving mechanism from stem. Geared-limit or torque-limit type as required, but capable of ready adjustment for predetermined limits of opening and closing travel.
4. Provide torque switches for both directions of travel to break the control power circuit when the gate has reached the stops in the open or closed position or when an obstruction has been encountered in either direction of travel. Open and close torque switches shall be adjustable by means of individually calibrated dials (marked open and close). Provide high torque pilot light in the push-button station.
5. Provide dry 10A, 120 VAC contacts for remote high torque alarm for remotely controlled gates.
6. Friction devices or setscrew arrangements shall not be used to maintain the setting.
7. The switches shall be of the adjustable type, capable of being set either fully open, fully closed, or at any intermediate point. Limit switch gearing shall be totally enclosed to prevent entrance of foreign matter or loss of lubricant.

Q. Motor Provisions:

1. Specifically designed for service intended, Class 1, Division 1, Groups C & D and NEMA 4X minimum weatherproof construction.
2. 460-volt, 3-phase, 60-Hertz, squirrel-cage, reversible, high-torque motors of standard make with grease packed ball bearings.
3. Motors shall be capable of operating through one complete cycle, open-close-open or close-open-close, under the maximum specified operating conditions when voltage to the motor is ± 10 percent of the specified voltage.
4. Service factor: 1.15.
5. Enclosure: TENV.
6. Insulation: Class B minimum.
7. Maximum Speed: 1800 rpm.
8. Provide motor starters with overload protection on all three phases.

2.17 ACTUATOR MOUNTING

- A. The actuator shall be mounted to the gate yoke on self-contained gates. The yoke shall consist of two channel members that are welded or bolted to the top of the gate frame. The actuator shall be pedestal mounted on non self-contained gates. Pedestals shall be concentric, offset, or wall bracket mounted. Pedestal assemblies shall be fabricated stainless or carbon steel.

2.18 SHOP TESTS

- A. Shop testing shall be performed. Before final assembly, all seating and wedging surfaces shall be cleaned thoroughly of all foreign materials and final adjustments made. With the gate fully assembled and closed, the clearance between seating faces shall be checked with a 0.0040-inch thickness gauge. If the thickness gauge can be inserted between seating faces, the wedging devices shall be readjusted or the gate slide or gate frame or both shall be remachined until insertion is no longer possible. In the event of remachining, clearances shall be checked again as stated above.
- B. After completion, all seating and wedging surfaces shall be cleaned thoroughly of all foreign materials, and final adjustments shall be made. The stainless steel sluice gate shall then be shop operated from the fully closed to the fully open position to verify that the assembly is workable.
- C. Operate floorstands and benchstands to insure proper assembly and operation.

PART 3 - EXECUTION

3.1 GENERAL

- A. It shall be the Contractor's responsibility to handle, store, and install the gate, actuator mechanism, stem, stem guides, and accessories in accordance with the manufacturer's drawings, installation manual and recommendations. Care shall be taken to avoid warping the gate frame and to maintain tolerances between seating faces. All gates, stems, and actuators shall be plumbed, shimmed, bolted and aligned accurately. All gates shall be installed in a dry environment and in strict accordance with manufacturer's published instructions.

1. Chemical Adhesive anchors for attaching stainless steel sluice gate components to wall material are specified.
- B. Prior to installation, protect stored gates and appurtenances from damage due to exposure to sunlight, heat, dirt, debris, freezing and thawing, vandalism, etc.
 1. Store gates and appurtenances in accordance with manufacturer's written recommendations.
- C. Clean debris, dirt, and gravel, from inside of gates and channels before placing gates.
- D. Install stainless steel sluice gates in completely assembled condition with discs wedged lightly but firmly into seats with nuts pulled up tight.
- E. Erect and support gates in respective positions free from distortion and strain on appurtenances during handling and installation.
- F. Inspect material for defects in workmanship and material.
- G. Clean out debris and foreign material from gate opening and seats, test operating mechanisms to check proper functioning, and check nuts and bolts for tightness. Repair, gates and other equipment that does not operate easily or are otherwise defective.

3.2 FLOORSTAND OPERATORS AND STEM GUIDES

- A. Set floorstand operators and stem guides so stems run smoothly in true alignment. Anchor guides firmly to walls. Check distances from centerlines of gates to operating level or base of floorstand and adjust if necessary to suit actual conditions of installation.

3.3 ACCEPTANCE TESTS

- A. After installation of equipment, and after completion of the services of manufacturer's representative as stated in Section 01735, operate each gate to demonstrate its ability to operate smoothly and without jamming.
- B. Leakage Test:
 1. Seating Heads: Leakage not to exceed 0.025 gpm per foot of seating perimeter.

2. Unseating Heads: Leakage not to exceed 0.025 gpm per foot of seating perimeter.
 3. Conduct tests at heads shown in the gate schedule.
- C. Correct or replace defects and defective equipment at no additional compensation.

3.4 FIELD TOUCH-UP

- A. After installation and testing of stainless steel sluice gates and approval of Engineer, provide field touch-up to all damaged and abraded surfaces. Engineer to determine surfaces to receive field touch-up.
- B. Touch-up coating shall be similar to type, color and mil thickness applied in shop application.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION

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SECTION 11285

FLOOD BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Furnish, install and test aluminum stop log flood barriers and appurtenances as indicated and specified.
 - 1. Approximate sizes are indicated in the details on the Drawings. Contractor to confirm dimensions in field.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 1 - General Requirements

1.3 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Comply with the requirements of Section 01300 - Submittals.
 - 2. Submit Shop Drawings showing the following:
 - a. Complete description in sufficient detail to permit item-by-item comparison with the Specifications.
 - b. Dimensions.
 - c. Weights.
 - d. Capacity.
 - e. Maximum support reactions.
 - f. Performance characteristics.
 - g. Layout drawing for all equipment showing installation

details.

- h. Deviations from Drawings and Specifications.
- i. Calculations prepared by a Licensed Professional Engineer registered in the State of Rhode Island demonstrating the design conditions are met.
- j. Manufacturer's installation and testing instructions.
- k. Affidavits of compliance with referenced standards and codes.
- l. Manufacturer's standard guarantee.
- m. Submit Manufacturer's installation report as specified in Part 3.

B. Operation and Maintenance Manuals:

- 1. Comply with the Requirements of Division 1 and the Supplemental Requirements Below.
- 2. Required Operation Data:
 - a. Complete, detailed operating instructions.
 - b. Explanations of all safety considerations relating to operation.
- 3. Required Maintenance Data:
 - a. Include all information and instructions required to keep equipment properly lubricated and adjusted so that it functions economically throughout its full design life.
 - b. Explanation with illustrations as necessary for each maintenance task.
 - c. Recommended spare parts lists.
 - d. Recommended schedule of maintenance tasks.
 - e. Name, address and phone number of manufacturer and manufacturer's local service.
 - f. Include copies of all approved Shop Drawings.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of five years experience in producing similar type equipment, and shall show evidence of five installations in satisfactory operation upon request.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. ASCE/ SEI 24-05, 6.2 Dry Proofing
 2. ASCE 24-14 (Flood Resistant Design and Construction)
 3. FEMA Technical Bulletin 3-93 Non-Residential Flood proofing
 4. FEMA Flood Proofing Non-Residential Structures #102
 5. AISE Manual and Specifications.
 6. BS EN 1999-1-1:2009 (Design of Aluminium Structures)
 7. ASTM D4020, U.H.M.W. polyethylene molding and extrusion material.
 8. ASTM D2000, standard classification system for rubber products in automotive applications.
 9. ASTM B26, aluminum alloy sand castings.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 and as specified.
- B. Shipping:
1. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
 2. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
 3. Deliver spare parts at same time as pertaining equipment. Deliver to Owner after completion of work.
- C. Receiving:
1. Inspect and inventory items upon delivery to site.

2. Store and safeguard equipment, material and spare parts in accordance with manufacturer's recommendations. Store materials to permit easy access for inspection and identification. Keep all items off ground, using pallets, platforms or other supports. Do not store items in a manner that might cause distortion or damage to that item.
3. Unload, haul, and store items.
4. Pay demurrage charges if failed to promptly unload items.
5. Assume responsibility for equipment, material and spare parts just before unloading from carrier at site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Flood Control International, New York, NY.
- B. Or acceptable equivalent product.

2.2 EQUIPMENT

- A. Flood control barrier shall provide an effective seal against short term and long term high water event to an elevation of the 100-year flood plus three-feet.
- B. Stop log barrier shall consist of fully removable aluminum beams with integral gaskets.
- C. The stop log barrier shall be completely removeable to existing finished floor elevation. Installations requiring a step are not acceptable.
- D. The stop log barrier shall be capable of forming a water tight seal against the existing concrete slab. Modifications to the existing slab or threshold are not acceptable.
- E. Barrier gaskets shall be field replaceable.

2.3 Design

- A. All components of the stop log flood control barrier shall be provided by a single manufacturer and designed for installation in the structures as indicated on the drawings.
- B. Flood barriers shall conform to the criteria for resisting lateral forces due to hydrostatic pressure from flood water as detailed in FEMA Technical Bulletin 3-93.

- C. Flood barriers shall conform to the criteria for resisting lateral forces due to moving flood waters at a minimum velocity of 8-feet per second.
- D. Flood barriers shall resist 1000-pound object at a minimum velocity of 8-feet per second.

2.4 Materials

- A. Aluminum beams shall be constructed of bolt Grade 6063-T66 and temper.
- B. Beam wall thickness shall be a minimum 0.125-inch
- C. Beams to weigh a maximum of 5.5 pounds per linear foot.
- D. Gaskets
 - a. Base gaskets shall be medium compression mechanically retained on the bottom barrier beam
 - b. On beam to beam joints provide ¼-inch EPDM tube gaskets fixed to beam.
- E. All anchors shall be 316 stainless steel.

2.5 Performance

- A. The maximum amount of leakage permitted through the stop log flood barrier is to be in accordance with requirements of FM Global 2510 of 0.05 gallons per linear foot of barrier per minute.

2.6

PART 3 - EXECUTION

3.1 GENERAL

- A. It shall be the Contractor's responsibility to handle, store, and install the stop log flood barrier, and accessories in accordance with the manufacturer's drawings, installation manual and recommendations. Care shall be taken to avoid warping the gate frame and to maintain tolerances between seating faces. All beams and channels shall be plumbed, shimmed, bolted and aligned accurately. All flood barriers shall be installed in a dry environment and in strict accordance with manufacturer's published instructions.
- B. Prior to installation, protect stored stop logs and appurtenances from damage due to exposure to sunlight, heat, dirt, debris, freezing and thawing, vandalism, etc.
 - 1. Store stop logs and appurtenances in accordance with manufacturer's written recommendations.
- C. Clean debris, dirt, and gravel, from inside of openings before installation of flood barrier.
- D. Inspect material for defects in workmanship and material.

- E. Clean out debris and foreign material from flood barrier and seats, test operating mechanisms to check proper functioning, and check nuts and bolts for tightness.
- F. Repair, beams and other equipment that does not operate easily or are otherwise defective.

3.2 ACCEPTANCE TESTS

- A. After installation of equipment demonstrate the beams can be installed and removed without jamming.

3.3 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 11310

SUBMERSIBLE WET PIT SEWAGE PUMPS AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

- A. Furnish, install, test and place into satisfactory operating condition wet pit submersible sewage pumps, guide rails, guide rails slide, straight through base connections, grab link assemblies, and control relays, each designed for pumping raw wastewater with minimum spherical diameter solids passage of 3”.

1.02 RELATED WORK

- A. Division 1 – General Requirements
 1. Section 01665 – Services of Manufacturer’s Representatives
 2. Section 01710 – Startup
 3. Section 01730 – Operations and Maintenance Manual
 4. Section 01750 – Spare Parts
 5. Section 01751 – Lubricants
- B. Division 9 - Finishes
- C. Division 13 – Instrumentation and Controls
- D. Division 15 - Mechanical
- E. Division 16 - Electrical Work

1.03 DESIGN REQUIREMENTS

- A. The Work shall include all accessories, and appurtenances necessary to make a complete system. Work shall conform to requirements for installation, materials, and equipment approvals of state, local, Underwriters' Laboratories, Inc., or other applicable codes, whether or not called for in detail on the drawings or in these specifications.
- B. All pump openings, internal passages, and internal recirculation ports shall be large enough to permit the passage of a sphere 4" in diameter, and any trash or stringy material which may pass through the average house collection system. Screens or any internal devices that create a maintenance nuisance or interfere with priming and performance of the pump shall not be permitted.
- C. Pumps and motors shall be capable of operating in a continuous submerged condition in vertical position in a wet pit installation. Pumps shall be mounted on a single 2-inch guide rail with slide bracket for easy removal without having to enter the wet well. A straight through 4-inch discharge shall be permanently connected to the 6-inch discharge pipe via an eccentric reducer located inside the wet well.

D. Certified dimensional drawings indicating size and locations of the priming recirculation port or ports shall be submitted to the Engineer prior to shipment.

E. New pumps shall be capable of performing under the following operating conditions:

Oakland Pump Station*
2-Pumps

Pumps	Capacity (gpm)	TDH (ft)	Maximum Motor Horsepower	Maximum Speed (RPM)	Min Total Efficiency (wire to wire)	Shut-off Head (ft)	Pump Runout
Single Pump Operation	470	94	25 ¹	1800	56%	133	820 gpm @ 75 ft
Parallel Pump Operation	555 ²	104		Operating condition for each pump			

- 1: Motors rated 208 volts, 3 phase, Inverter duty rated.
- 2: Combined two pump parallel flow. Each pump shall provide 278 gpm while operating within the pumps allowable operating range.
- 3: Motor shall not overload over the entire length of the curve.

F. The pumping units shall be designed to pump raw domestic sewage and discharge into a forcemain.

1.04 QUALITY ASSURANCE

- A. Pumps shall be the product of a single manufacturer with a minimum of ten years experience with equipment of the size and type specified operating in a similar arrangement.
- B. Equipment and accessories shall be the standard cataloged products of the manufacturer except as otherwise specified or indicated.
- C. Pump manufacturer to provide the submersible pump, pump base, guide rail slide brackets, upper guide brackets, straight through base connection, rails and appurtenances regardless of the manufacturer, as a complete and integrated package to insure proper coordination and compatibility of equipment.

1.05 SHOP TESTS

A. Motor Tests

1. Motor factory shop tests shall be in accordance with IEEE Standard 112, Appendix A, plus the factory’s standard routine tests for the specified motor horsepower.

B. Pump Tests

1. Certified Performance Tests: Conduct performance tests per HI Grade 1U on each pump and motor unit to determine head, capacity, speed, and brake horsepower at not less than six points on the operating curve including rating point and best efficiency point. Test data shall be sufficiently comprehensive to produce guaranteed performance curves showing head versus capacity, efficiency, and brake horsepower for the rated speed. Engineer shall be supplied with the complete test procedure in advance of the testing. Test shall be witnessed and certified by a professional Engineer.
2. Hydrostatic Pressure Tests: Conduct hydrostatic pressure tests on each pump.
3. Demonstrate that all equipment is capable of continuous operation in satisfactory manner without mechanical or electrical defects or operational difficulties under suction and discharge conditions.
4. Repeat tests, if necessary, until results are obtained satisfactory to the Engineer.
5. Correct or replace all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.
6. Conduct all tests in accordance with the latest standards of the Hydraulic Institute.
7. If the specified tests indicate the pump or motor will not meet the specifications, the Engineer has the right to require complete tests for all pumps and motors at no additional cost to the Owner.

1.06 REFERENCES

- A. ASTM A48 - Standard Specification for Gray Iron Castings.
- B. ASTM A276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
- C. AFBMA
- D. Hydraulic Institute Standards.
- E. National Electrical Manufacturer's Association.

1.07 SUBMITTALS

- A. Submit to the Engineer for approval as provided in Section 01300, shop drawings showing details of construction and installation of all equipment furnished under this Section. The following shall be included:

1. Shop drawings and materials of construction and performance of electric motors, pumps, controls, pipes, valves and fittings, equipment, conduit, wiring, wiring devices, transformer and access manhole, rails and bracket.
 2. Manufacturer's rating curves showing pump characteristics of pressure, capacity, brake horsepower, and efficiency. This information shall be prepared specifically for the pump proposed. Catalog sheet showing a family of curves will not be acceptable.
 3. Literature and drawings describing the equipment in sufficient detail, including materials of construction and parts list, to indicate full conformance with the detail specifications.
 4. Complete parts list for equipment furnished.
 5. Motor data such as HP, Volts, RPM, FLC, Efficiency, and p.f. as described herein.
 6. Complete wiring diagrams and schematics of all controllers, control panels, control devices, and operators furnished under this Section.
 6. Complete wiring diagrams and schematics of all power and control systems.
 7. Drawings depicting the mechanical seal configuration.
 8. Floor plans, sections and elevations showing a complete layout to scale of all equipment, piping, electrical conduits and wall sleeve installation locations and methods to provide watertight seals.
 9. Motor wiring diagrams for power and high temperature switches.
 10. Services of manufacturer's representative and warranties.
 11. Drawings and calculations indicating pipe support material, locations, and engineering data of support scheme.
- B. In the event that it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all non-conforming aspects for review and approval by the Engineer.
- C. Submit under provisions of Section 01300.
- D. Pump and Motor Characteristics and Performance Data:

1. Provide guaranteed certified performance curves based on actual shop tests of mechanically duplicate pumping units, showing they meet specified requirements for capacity, head, horsepower, efficiency, and NPSH. For units of same size and type, provide curves for a single unit.
 2. Catalog performance curves at required speed showing maximum and minimum impeller diameters available.
- E. Manufacturer's written warranty.
- F. Shop Test Results: One (1) electronic copy of pump performance test data, pump performance curves, hydrostatic test results and motor test results.
- G. Field Inspection Reports: Submit under provisions of Section 01700.

1.08 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Provide operation and maintenance instructions as specified in Section 01730. Note, both "Paper" and "Electronic" manuals are required.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Ship equipment, material, and spare parts complete except where partial disassembly is required by transportation regulations or for protection of equipment.
- B. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
- C. Deliver spare parts at same time as pertaining equipment.
- D. Inspect and inventory items upon delivery to site and provide Engineer with inventory list.
- E. Store and safeguard equipment, material, and spare parts in accordance with manufacturer's instructions and deliver to Owner after completion of the work.

1.10 WARRANTY

- A. The manufacturer shall guarantee the pumps free from defects in workmanship and materials for a period of 5 years (3 years 100% parts and labor, 2 years prorated at 75% year 4, 50% year 5) from date of startup, not to exceed 5 years 6 months from date of shipment.

PART 2 PRODUCTS

2.01 ACCEPTABLE PUMP MANUFACTURERS

- A. Sulzer
- B. Additional pump manufacturers may be considered acceptable alternatives. Documentation shall be submitted with Bids for review and approval by the Engineer that demonstrates compliance with project specifications, including dimensions, process mechanical, electrical, instrumentation and control.
- C. Should equipment which differs from the first named in this Section 2.01.A be offered and determined to be the equal of that specified, such equipment shall be acceptable only on the basis that any revision in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no additional cost to the Owner and be as approved by the Engineer.

2.02 PUMP CONSTRUCTION

- A. Major pump components shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of zinc phosphate primer followed by a high solids two part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment of standard chain fittings, or for hooking from the wet well surface. The hoop shall be stainless steel 1.4401 (AISI 316), and shall be rated to lift a minimum of four times the pump weight. Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two planes of the sealing interface. Housing interfaces shall meet with metal-to-metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners. Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered equal. No secondary sealing compounds shall be required or used.
- B. Impeller: The ABS ContraBlock Plus impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The impeller shall be of the semi-open, non-clogging, single vane design, with a minimum spherical solids passage size of 4 inches. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore to prevent disruption of the flow stream and loss of hydraulic efficiency. Impellers that use wear rings and impellers that are enclosed channel design will not be accepted due to the nature of clogging.

- C. Self-Cleaning Wear Plates: The ABS ContraBlock Plus wear plate shall be constructed from gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The wear plate shall be designed with an inlet incorporating strategically placed cutting grooves and an outward spiral V-shaped groove on the side facing the impeller, to shred and force stringy solids outward from the impeller and through the pump discharge. The wear plate shall be mounted to the volute with three stainless steel securing screws and three stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller for maximum pump efficiency. Adjustment to allow for wear and restore peak pumping performance shall be accomplished using standard tools, and without requiring disassembly of the pump. The use of fixed or non-adjustable wear plates or rings, or systems that require disassembly of the pump or shimming of the impeller to facilitate adjustment shall not be considered equal. The suction flange shall be integrated into the wear plate and its bolt holes shall be drilled and threaded to accept standard 4 inch ANSI class 125 flanged fittings.
- D. Premium Efficiency Motor: The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request. Motors that are rated IE2 or IE1 will be rejected.

The Premium Efficiency motor shall be housed in a watertight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) enclosure capable of continuous submerged operation underwater to a depth of 20 meters (65 feet), and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation materials, rated for 180°C (356°F). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.

The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40°C (104°F), and intermittently up to 50°C (122°F). The motor shall be capable of handling up to 15 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.3. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase-to-phase voltage imbalance tolerance of 1%. The motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives.

- E. Closed Loop Cooling System: The factory installed closed loop cooling system shall be adequately designed to allow the motor to run continuously under full load while in an unsubmerged or minimally submerged condition. A cooling jacket shall surround the stator housing, and an environmentally safe non-toxic propylene glycol

solution shall be circulated through the jacket by a circulating impeller attached to the main motor shaft. The coolant shall be pumped through an integrated heat exchanger in the base of the motor whenever the motor is running, allowing excess heat to be transferred to the process liquid. Cooling systems that circulate the pumped medium through the cooling jacket, or those that use a toxic cooling liquid shall not be acceptable. The use of external heat exchangers, fans, or the supply of supplemental cooling liquid shall not be required.

- F. Thermal Protection: Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140°C +/- 5°C (284°F). They shall be connected to the control panel to provide a high stator temperature shutdown signal, and are used in conjunction with external motor overload protection.
- G. Mechanical Seal: Each pump shall be equipped with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The mechanical seals shall be of non-proprietary design, and shall be manufactured by a major independent manufacturer specializing in the design and manufacture of mechanical seals. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty silicon-carbide seal ring and one rotating industrial duty silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and motor housing, shall contain one stationary industrial duty silicon-carbide seal ring, and one rotating one rotating industrial duty silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe non-toxic material. Tungsten Carbide seals will not be accepted.
- H. Mechanical Seal Protection System: The primary mechanical seal shall be protected from interference by particles in the wastewater, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which

attempt to lodge behind the impeller, or wrap around the mechanical seal shall be effectively sheared by the active cutting system into particles small enough to prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function. Submersible pump designs that do not incorporate an active cutting system to protect the primary mechanical seal shall not be considered acceptable for wastewater service.

- I. Seal Failure Warning System: The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned above the mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be air filled, and shall have a drain / inspection plug with a positive anti-leak seal which is easily accessible from the outside of the pump. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber through the mechanical seal system, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. Systems utilizing float switches or any other monitoring devices located in the stator housing rather than in a sensing chamber between the mechanical seals are not considered to be early warning systems, and shall not be considered equal or acceptable.
- J. Pump Shaft: The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller. Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.
- K. Bearings: Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a deep grooved ball bearing and the lower bearings shall be a heavy-duty double row angular contact ball bearing. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 100,000 hours at flows ranging from ½ of BEP flow to 1½ times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race. Generic or unbranded bearings from other than major bearing manufacturers shall not be considered acceptable.

- L. Power Cable: The power cables shall be sized according to NEC and CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be oil and water resistant, and shall be capable of continuous submerged operation underwater to a depth of 65 feet.
- M. Cable Entry/Junction Chamber: The cable entry design shall not require a specific torque to insure a watertight seal. The cable entry shall consist of cylindrical elastomer grommets, flanked by stainless steel washers. A cable cap incorporating a strain relief and bend radius limiter shall mount to the cable entry boss, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry. Cable entry designs which utilize potting compounds to provide a watertight seal, or those which do not allow the cable to be easily changed in the field shall not be considered equal. The junction chamber shall be isolated and sealed from the motor by means of sealing glands. Electrical connections between the power cables and motor leads shall be made via a compression or post type terminal board, allowing for easy disconnection and maintenance.

2.03 Wet Well Guide Rail Base Assembly

- A. The discharge base & straight through 4-inch discharge shall be permanently installed in the wet well and connected to the discharge piping. In order to prevent binding or separation of the pump from the guide rail system, the pumps shall connect to the guide rail base automatically and firmly, guided by one 2-inch schedule 40 316 stainless steel guide rails extending from the straight through discharge to the top of the station. Systems using guide cable in lieu of rigid guide bars or pipes shall not be considered acceptable. The sliding guide bracket shall be a separate part of the pumping unit, capable of being attached to standard 4 inch ANSI class 125 or metric DN100 pump flanges, so that the pump mounting is non proprietary, and any pump with a standard discharge flange can be mounted on the base assembly. Base or bracket assemblies with proprietary or non-standard flange dimensions shall not be considered acceptable.
- B. A field replaceable Nitrile (Buna-N) rubber profile gasket or O-ring shall accomplish positive sealing of the pump flange/guide rail bracket to the straight through discharge pipe. Base assemblies that rely solely on metal-to-metal contact between the pump flange and straight through discharge pipe as a means of sealing are inherently leak prone, and shall not be considered equal. No portion of the pump shall bear directly on the floor of the sump..

2.06 CONTROLS

- A. Pumping System Control Panel shall be provided under Division 13 – Instrumentation and Controls.

- B. Pump manufacturer shall provide and deliver stator winding thermal sensor and moisture detection relays for each pump to the Contractor for incorporation into the motor controllers.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install items in accordance with manufacturer's instructions.
- B. Install pumping units and pump base in the bottom wet well structure and provide supports as required.
- C. After alignment is correct, grout as specified in Section 03300.
 - 1. Fill entire base and leave no gaps or voids.
 - 2. Do not embed leveling nuts in grout.

3.02 MANUFACTURER'S FIELD SERVICES

- A. Provide services of factory trained service engineer with a minimum of five (5) years' experience to assist in location of anchor bolts; setting, leveling, field erection, etc.; and coordination of piping, electrical and miscellaneous utility connections. Provide in accordance with Section 01665.
- B. Provide services of manufacturer's representative as specified in Section 01665.
- C. Provide operation and maintenance training as specified in Section 01665.

3.03 FIELD TESTING

- A. Refer to Drawing C-2.4 to coordinate bypass pumping system with installed new pumps during field testing and startup.
- B. Certified Performance Tests: With the suction and discharge piping configured for the final operating conditions, conduct performance tests on each pump to determine pump shutoff head and full speed operating head and flow.
- C. The Contractor shall conduct a running pump test for a minimum of 4 hours, in the presence of the Engineer. The test shall indicate that the pumps conform to the head and capacities specified.
- D. Field vibration testing shall be performed by the manufacturer's factory representative in accordance with HI 11.6.

- E. The Contractor shall provide both factory and field acceptance testing of the RVNR Starters, I&C pumps control and alarm panels as specified in Division 13 and Division 16.
- F. A 14-day operating period of the pumps will be required before acceptance. If pump performance does not meet the Specifications and shop drawing submittals, the Contractor shall take corrective measures or the pumps shall be removed and replaced with pumps that satisfy the conditions specified at no additional cost to the Owner. The decision of the Engineer shall be final.
- G. The manufacturer shall furnish the services in the presence of the Engineer, of a qualified factory representative for a minimum of 8 hours to confirm the completed pump installation to be satisfactory. Compensation for such services shall be paid for by the Contractor.
- H. The pump supplier, after successfully completing the pumps and I&C panels field testing, shall issue a letter of certification on the equipment's installation and operation with regards to its acceptability for its warranty.
- I. Pump tests include all I & C testing. Test will include the testing of all associated controls.

3.04 SPECIAL TOOLS AND SPARE PARTS

- A. Furnish one set of all special tools required for the proper servicing of all equipment supplied under these Specifications, packed in a suitable steel tool chest with a lock. Special tools shall include any tools not available in ordinary hardware stores.
- B. Furnish the manufacturer's standard set of spare parts including at least the following:
 - Two (2) Repair Kits,
 - Upper and lower mechanical seals,
 - bearings,
 - O-ring kit, and
 - Cable seals.
 - One (1) Impeller Kit
 - One (1) wear plate

END OF SECTION

SECTION 11330

SCREENINGS EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and installing one (1) Fine Stair Screens, one (1) Screenings Wash Press Conveyor/Compactors and accessories, as indicated on the Contract Drawings and as specified herein including all supports, complete, tested and ready for use.
2. All materials, labor, and costs associated with this Section are to be included in the Base Bid Item 1.1.

B. Related Sections

1. Section 01300 – Submittals
2. Section 01665 – Services of Manufacture's Representative
3. Section 01710 – Startup
4. Section 01730 – Operation and Maintenance Manuals
5. Section 01750 – Spare Parts
6. Section 01751 – Lubricants
7. Section 01810 – Maintenance of Operations and Sequence of Construction
8. Section 03300 – Structural
9. Section 11555 – Vertical Conveyor (Add Alternate No. A-2)
10. Division 13 – Instrumentation & Control
11. Division 16 – Electrical

1.02 REFERENCES

- A. American Institute of Steel Construction (AISC)
- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS)
- D. American Gear Manufacturer's Association (AGMA)

- E. American Iron and Steel Institute (AISI)
- F. American Petroleum Institute (API)
- G. American National Standards Institute (ANSI)
- H. National Electrical Manufacturers Association (NEMA)
- I. Steel Structures Painting Council, American National Standards Institute (SSPC)

1.03 SUBMITTALS

- A. Submit in accordance with SECTION 01300.
- B. Product Data
 - 1. Manufacturer's literature on all equipment including descriptions, diagrams, dimensions, materials, specifications, and drawings indicating compliance with the Contract Documents.
 - 2. Catalog cuts sheets reflecting characteristics for major items of equipment, motor data,
 - 3. Motor data such as HP, Volts, RPM, FLC, Efficiency, and power factor.
 - 4. Complete parts list for equipment furnished.
- C. Operation and Maintenance Manuals in accordance with SECTION 01730.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. General
 - a. Conform to Hydraulic Institute Standards.
 - b. Any reference to a specific manufacturer or model number is for the purpose of establishing a quality or parameter for specification writing and not to be considered proprietary.
 - c. Conform to requirements for materials, installation and equipment approvals of state, local, Underwriter's Laboratories, Inc., or other applicable codes, whether or not called for in detail on the drawings or in the specifications.
- B. Contract Requirements
 - 1. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that a single manufacturer shall supply all equipment called for under this Section. The equipment manufacturer shall, in

addition to the Contractor, assume the responsibility for proper installation and functioning of the equipment.

2. The Contract Documents represent the minimum acceptable standards for the screening equipment for this project. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. Equipment which is a "standard product" with the manufacturer shall be modified, redesigned from the standard mode, and shall be furnished with special features, accessories, materials of construction or finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.
3. Should equipment which differs from this Section be offered and determined to be the equal of that specified, such equipment shall be acceptable only on the basis that any revision in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc, required to accommodate such a substitution shall be made at no additional cost to the Owner and be as approved by the Engineer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading

1. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.
2. All equipment and parts must be properly protected against any damage during a prolonged period at the site.
3. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
4. The finished surfaces of all exposed flanges shall be protected by wooden blind flanges, strongly built and securely bolted thereto.
5. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
6. No shipment shall be made until approved by the Engineer in writing.

B. Storage and Protection

1. Spare equipment should be stored in climate-controlled environment.

PART 2 PRODUCTS

2.01 GENERAL

- A. The screenings systems furnished and installed for this project shall consist of one (1) Fine Stair Screens, one (1) Screenings Wash Press Conveyor/Compactors and accessories as detailed on the drawings and as specified herein. Design Summary:

1.	Number of Screens	1
2	Number of Screenings Wash Press Conveyor/Compactor	1
3	Minimum Flow through Screen, mgd	0.2
4.	Average Flow through screen, mgd	1.5
5	Maximum Hydraulic Capacity per screen, mgd With 35% blockage.	4.5
6.	Bar Spacing, inches	1/8
7.	Screen Drive Motor Size, hp	1.0
8	Washer/compactor Drive Motor Size, hp	2.0
9	Minimum Spray Wash System Supply, (GPM)	7

2.02 ACCEPTABLE MANUFACTURERS

- A. The project was designed based on the Claro fine stair screen and wash press.
- B. Should equipment which differs from the first named in this Section 2.01.A be offered and determined to be the equal of that specified, such equipment shall be acceptable only on the basis that any revision in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no additional cost to the Owner and be as approved by the Engineer.

2.03 FINE STAIR SCREEN

- A. The frame assembly shall be AISI 316 stainless steel of unified construction, forming a rigid structural assembly in order to provide a secure unit consisting of two side frames, two drive plates, fixed and mobile lamella support members, two frame support plates, and a base plate. The drive plates shall be mounted within the side frame and shall be connected to the mobile lamella support members. The frame assembly shall be designed to fit into the channel without the need for recessed channel walls or floor. The neoprene rubber side skirts shall be attached to the front side frames with AISI 316 stainless steel retainers and hardware to provide sealing between the screen and the channel walls. The side frames shall extend fully from the channel invert to the top of the unit and shall be arranged to pivot out of the channel for maintenance when required. The support legs shall be AISI 316 stainless steel.

- B. The fine stair screen screening surface shall consist of alternating fixed and mobile lamellas steps. All required lamellas shall be attached to either the fixed or mobile lamella support members. The lamellas shall be divided into two segments if required, one lower and one upper. The lamellas shall have a ¼” opening slot width. Fixed lamellas shall be provided with plastic UHMW spacers on each side to maintain the proper spacing and prevent metal-to-metal contact between the lamellas. The upper end of the fixed lamellas shall be outfitted with an end bar spacer to maintain proper slot opening. The lower portion of the mobile lamellas shall be provided with saw teeth to penetrate through fine grit and sand during operation. All lamellas shall be manufactured from AISI 316 stainless steel. Plastic lamellas are not acceptable.
- C. The fine stair screen shall be equipped with an AISI 316 automated screen flap located at the base of the machine to maintain proper spacing between the fixed screen steps throughout its entire operating cycle and in all operating conditions. This hinged screen flap shall be positioned perpendicular to the flow and levelled with the lowest step of the lamellas eliminating end bar spacers on the lower stationary lamellas. This automated screen deflector plate will move up and down with the movement of the lowest step. The screen will not use end-shoes or end-bar spacers at the base of its bar screen in lieu of a deflector plate. Fixed plates, brushes, rubber strips or other types of approaches are not acceptable. Special flushing equipment at the screen’s lowest step or frame and/or a recessed channel as a means of coping with grit build-up in lieu of the deflector plate are unacceptable. All steps on the lamellas shall be of the same height and depth which shall assure proper upward transport of the screenings from the very bottom to the top of the screen.
- D. A shrouded and easily removable discharge chute shall be provided at the point of discharge in order to direct the screenings into the transfer conveyor inlet hopper. The discharge chute shall be manufactured from AISI 316 stainless steel. The upper section of the stair screen located above the top of the channel floor slab shall be equipped with removable cover panels manufactured from AISI 316 stainless steel. A 4-inch diameter odor control connection shall be provided on the cover panel.
- E. Each fine stair screen shall be complete with an integrated drive assembly consisting of an electric gear motor (Class 1, Div. 1 Baldor 460V, 3 phase, 60 Hz; equipped with integral electrical brake also Class I, Div. 1 or equal), drive shaft, automatically/lifetime greased shaft, eccentric bearings, and home-position braking mechanism. The drive assembly shall be capable of elevating the weight of the mobile lamellas and the maximum debris load. No drive components shall be located below the maximum water level of the channel. The stair screen shall be driven by an eccentric drive shaft without the use of chains, sprockets, or belts. An appropriate safety guard shall be provided with each screen to stop the motor & perform a precautionary self-clearing sequence.

- F. A suture type weir shall be provided by the screen manufacturer and installed by the Contractor down-stream of the fine stair screen in order to maintain the required depth of flow in the channel as specified by the manufacturer.

2.04 SCREENINGS WASH PRESS CONVEYOR/COMPACTOR

- A. The wash presses shall receive municipal screenings captured by the respective fine stair screens, wash-off biological solids, and transfer screenings via a compaction tube into a hygienic bagging system installed at the end of the tube. All necessary supports shall be 316 stainless steel and supplied with the wash press and the discharge tube. All wash press, discharge tube, and bagging system components shall be accessible for servicing.
- B. The capacity of wet screenings at inlet for each wash press is 35 cfh. Quality of washed screenings shall be acceptable for landfill disposal & shall be able to pass the EPA Paint Filter Test (EPA 9095b)..
- C. The wash press shall be provided with a helical bevel/clincher gear drive with thrust bearings and a special flexible flange coupling connecting the gear drive shaft with the press shaft for optimal process performance and protection of the spiral and shaft. Systems with fixed shafts are not acceptable due to the risk of shaft deflection. The wash press spiral shall be made of special micro alloy steel rolled flat bar, nominal BN 220 minimum, and shall be driven by a drive shaft of shafting steel.. Shaftless spirals are not acceptable. Spiral made of welded flight sections are not acceptable. The last flight will be equipped with Hardox steel plate BN 400 minimum. The wash press shall have a stainless steel 316 wash zone tube with perforations for the drainage of wash water and exit of removed organics. The last 2 flights shall also be of double thickness for further spiral strength. The spiral shall also include a bolt-on nylon brush. Units with wedge wire are not acceptable due to grease plugging and susceptibility to damage issues. The wash press unit shall not be equipped with a drain pan. The wash press shall have a double trough construction with spray jet under the inlet drain. The wash press drain discharge shall be piped with PVC pipe to the effluent channel.
- D. The wash press shall be provided with a Class I, Div. 1, Baldor, UL 460V, 3 phase, 60Hz; helical bevel arrangement for reduced footprint or equal.
- E. Two (2) x 1/2" water connections equipped with isolating and solenoid automated valves (Class 1, Division 1) shall be provided at each press—one connection to wash the screenings internally and one to wash the debris outside the wash-compression zone of the unit. A 1.5 inch dia. AISI 316 pressure gauge will be supplied in order to measure water pressure to the press. A 50 mesh filter must be used to protect the solenoid valves and the wash press spray nozzles for each wash press. A suitable AISI 316 Y-strainer shall be provided by the screen manufacturer with manual ball valve/solenoid valve for manual/automated voiding of the strainer filter basket. The

voiding line shall be piped back to the channel immediately downstream of the screen by the Contractor.

- F. The wash press shall include a complete discharge piping system as shown on design drawings and specified here in. The piping system shall be AISI 316 stainless steel. Each discharge shall include a continuous hygienic bagger with a bag cartridge for each discharge tube.

2.05 CONTROL SYSTEM

A. Local control panels:

1. One (1) Class 1, Div. 1 combination Man/Off/Auto, Forward/Reverse, & push-pull E-Stop push button in a aluminum enclosure for each screen, the wash press, and vertical conveyor (total of three (3) control stations); 1 inch dia. Forward/Reverse selector switch shall have a spring return; all factory assembled, wired and tested.
2. One (1) Class 1, Div. 1 power lock-out station for each motor in its own aluminum enclosure for operator safety and installed adjacent to each piece of equipment (total of two (2) power-lock-out stations);

B. Main Control Panel

1. The screening system manufacturer shall furnish one (1) new remote main control panel for the fully automatic and manual operation of one (1) fine step screen, one (1) wash press compactor and one (1) vertical screenings conveyor. **The components specified and required for the vertical conveyor operation via the supplied control panel shall be provided as part of the Base Bid Item No. 1.1.**
2. UL-approved NEMA 4-12 epoxy painted steel enclosure for installation in the non-classified former pump motor room.
3. One (1) Allen-Bradley Micrologix 1400 PLC.
4. One (1) 7 inch color Siemens TP700 HMI touch screen or approved equal to represent the specific project equipment components & arrangement including current stage in the operational sequence, set points, motor amperage, and real-time timer, liquid levels, and other pertinent control values. A standard control panel that does not graphically represent the specific Burrillville, RI WWTF screening layout drawings in plan & elevation views, equipment models, and system is not acceptable;
5. Surge protector for the protection of the PLC & other 24 VDC components.
6. Emotron M20 torque guard or approved equal for the fine step screen and a current transformer for the wash press and the vertical conveyor. The one (1) Emotron units and two (2) current transformers are to be installed inside the main control panel;

7. Full voltage reversing 5 Hp minimum 460V/60/3 motor starters for the one (1) fine screen, one (1) wash press, & one (1) vertical conveyor including thermal overloads installed inside the control panel;
8. On the panel door: main disconnect switch, push button E-Stop, alarm reset push button, HAND/OFF/AUTO selector, white power on LED, red LED pilot lights for all motors "Fault" conditions, green LED pilot lights for all motors "Forward" and "Reverse" conditions, and yellow LED pilot lights indicating the operation of wash press solenoid #1 & solenoid #2;
9. The panel shall be UL508A listed assemblies that are factory assembled, wired and tested.
10. The panel shall contain the following items (minimum):
 - a. Motor controllers (FVR)
 - b. Main power disconnect
 - c. 480 volt, 3-phase operation with 120 volt control
 - d. Programmable logic controller (PLC) and OIT
 - e. Control relays
 - f. Terminal strips
 - g. Protective fuses
11. The PLC shall have I/Os for both controls and alarms including the following remote I/Os to the plant I&C SCADA system (minimum):
 - a. Screen system "ON/OFF" status
 - b. Screen system "FAIL" alarm
 - c. Screen system "Start/Stop" control
12. The panel electronics and instrumentation & control equipment wiring, software, startup, field testing, etc. shall be compliant with the applicable Electrical and I&C Contract Documents.
13. Enable a precautionary screening system reverse self-clearing sequence based on the Emotron M20 signal;
14. Provide instantaneous flow measurement based on the downstream level sensor and the design of the downstream Sutro weir. This instantaneous flow measurement shall be represented on the HMI. An additional flow log HMI page shall provide a rolling record of the following data: the daily flow total for the last 32 days, monthly totals for the last 12 months, and yearly totals for the last 6 years..

C. Level Control

1. Two (2) Endress & Hauser Prosonic ultrasonic level sensor and one (1) spare (total of three sensors), or approved equal installed upstream and downstream of the fine stair screen including corresponding transmitter installed inside main control panel (total of 1 transmitter);

2. A 316 stainless steel level control weir shall be provided to meet the manufacturer's water level requirements in the channel.

2.06 PAINTING, SURFACE PREPARATION, AND CORROSION PROTECTION

- A. All welded stainless steel components shall be acid washed after welding by either full dipping, applying spray-on acid solution, or by using acid passivation paste, following which all components are thoroughly rinsed with clean water and allowed to air dry.
- B. Motors and gear reducers shall be supplied with a finished paint system from the manufacturer. All other components shall receive surface preparation of SSPC-SP6, followed by one (1) shop coat of Tnemec 66-1211 Epoxoline primer, 3.0 to 5.0 mils dry film thickness and one (1) coat Tnemec Series 73 Endura-Shield, INOI No. 70, light gray enamel, 2.0 to 3.0 mils dry film thickness.
- C. Coat all stainless steel bolts and nut threads with non-seizing compound before assembly.

2.07 SPARE PARTS AND TOOLS

A. Fine Stair Screen Spare Parts List:

1. One (1) set of intermediate spacers
2. Four (4) bearings and bearing housings.
3. One (1) deflector plate
4. Ten (10) screen deflector plate mounting kits
5. Sixteen (16) high load sleeve bushings including two (2) circa clips each
6. One (1) set of hinge pins and springs

B. Screenings Wash Press Spare Parts List

1. One (1) wiper kit including mounting parts
2. One (1) set of Hardox slide wear bars (400 Brinell Hardness) including mounting bolts
3. One (1) set of bearings and gaskets/seals
4. Five (5) automatic lubricators
5. One (1) spiral and mounting parts

- C. All spare parts and tools shall be supplied in a robust tool box with each part clearly labeled.

- D. In accordance with SECTION 00800, furnish one set of all special tools required for the proper servicing of all equipment supplied under these Specifications, packed in a suitable steel tool chest with a lock. Special tools shall include any tools not available in local hardware stores.

E. Furnish One (1) year supply of required lubricants in accordance with SECTION 00800.

F. One year supply of continuous bag shall be included with the bagger.

PART 3 EXECUTION

3.01 INSTALLATION

A. The equipment shall be installed in strict accordance with the manufacturer's recommendations.

B. Bolts, nuts, and washers shall be AISI 316 stainless steel.

3.02 SERVICE.

A. Provide the services of a manufacturer's representative in accordance with Section 01665. The representative shall inspect and approve the installation, certify that the torque settings of the drive overload protection device are correct, perform the torque test and instruct the owner's personnel on maintenance and operation. If additional service is required due to the mechanisms not being fully operational, at the time of service requested by the contractor, the additional service days will be at the contractor's expense.

3.03 OPERATOR TRAINING

A. Provide operator training for OWNER'S personnel after system is operational. Training will take place while manufacturer's representative is at the job site for inspection. See Section 01665 for training requirements.

3.04 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 11555

VERTICAL CONVEYOR (ADD ALTERNATE NO. A-2)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and installing one (1) vertical conveyor and accessories, as indicated on the Contract Drawings and as specified herein including all supports, complete, tested and ready for use.

B. Related Sections

1. Section 01300 – Submittals
2. Section 01665 – Services of Manufacture’s Representative
3. Section 01710 – Startup
4. Section 01730 – Operation and Maintenance Manuals
5. Section 01750 – Spare Parts
6. Section 01751 – Lubricants
7. Section 01810 – Maintenance of Operations and Sequence of Construction
8. Section 03300 – Structural
9. Section 11330 – Screenings Equipment (Base Bid Item No. 1.1)
10. Division 13 – Instrumentation & Controls
11. Division 16 – Electrical Motors

1.02 REFERENCES

- A. American Institute of Steel Construction (AISC)
- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS)
- D. American Gear Manufacturer's Association (AGMA)
- E. American Iron and Steel Institute (AISI)

- F. American Petroleum Institute (API)
- G. American National Standards Institute (ANSI)
- H. National Electrical Manufacturers Association (NEMA)
- I. Steel Structures Painting Council, American National Standards Institute (SSPC)

1.03 SUBMITTALS

- A. Submit in accordance with SECTION 01300.
- B. Product Data
 - 1. Manufacturer's literature on all equipment including descriptions, diagrams, dimensions, materials, specifications, and drawings indicating compliance with the Contract Documents.
 - 2. Catalog cuts sheets reflecting characteristics for major items of equipment, motor data,
 - 3. Motor data such as HP, Volts, RPM, FLC, Efficiency, and power factor.
 - 4. Complete parts list for equipment furnished.
- C. Operation and Maintenance Manuals in accordance with SECTION 01730.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. General
 - a. Conform to Hydraulic Institute Standards.
 - b. Any reference to a specific manufacturer or model number is for the purpose of establishing a quality or parameter for specification writing and not to be considered proprietary.
 - c. Conform to requirements for materials, installation and equipment approvals of state, local, Underwriter's Laboratories, Inc., or other applicable codes, whether or not called for in detail on the drawings or in the specifications.
- B. Contract Requirements
 - 1. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that a single manufacturer shall supply all equipment called for under this Section. The equipment manufacturer shall, in addition to the Contractor, assume the responsibility for proper installation and functioning of the equipment.

2. The Contract Documents represent the minimum acceptable standards for the screening equipment for this project. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. Equipment which is a "standard product" with the manufacturer shall be modified, redesigned from the standard mode, and shall be furnished with special features, accessories, materials of construction or finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.
3. Should equipment which differs from this Section be offered and determined to be the equal of that specified, such equipment shall be acceptable only on the basis that any revision in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc, required to accommodate such a substitution shall be made at no additional cost to the Owner and be as approved by the Engineer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading

1. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.
2. All equipment and parts must be properly protected against any damage during a prolonged period at the site.
3. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
4. The finished surfaces of all exposed flanges shall be protected by wooden blind flanges, strongly built and securely bolted thereto.
5. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
6. No shipment shall be made until approved by the Engineer in writing.

B. Storage and Protection

1. Spare equipment should be stored in climate-controlled environment.

PART 2 PRODUCTS

2.01 GENERAL

- A. The vertical conveyor furnished and installed for this project shall consist of one (1) Vertical Conveyor, supports, and accessories as detailed on the drawings and as specified herein.

B. Design Summary:

1.	Number of Vertical Conveyors	1
2.	Screen Drive Motor Size, hp	2.0
3	Vertical Conveyor Capacity, CFH	35

2.02 ACCEPTABLE MANUFACTURERS

- A. The project was designed based on the Claro vertical conveyor
- B. Should equipment which differs from the first named in this Section 2.01.A be offered and determined to be the equal of that specified, such equipment shall be acceptable only on the basis that any revision in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no additional cost to the Owner and be as approved by the Engineer.

2.03 VERTICAL CONVEYOR

- A. All components of the vertical conveyor shall be AISI 316L stainless steel of unified construction with the exception of the spiral as noted below. **The vertical conveyor shall be capable of field assembly. The only access point is the double door on the upper level.**
- B. The discharge tube shall be 10-inch diameter 1/8" thick 316L stainless steel and include slide bars with a BN 400 minimum. The spiral shall be micro alloy BN 200 minimum with Hardox plate (HB 400) on first two flights for increased abrasion resistance. The shaft shall be provided with coupling discs, drive shaft, and drive plate.
- C. Provide 4-inch drain connection at the base of the vertical conveyor unit. Contractor to provide and install piping from unit to influent channel.
- D. An axial outlet including a flanged chute shall be provided. The chute shall be configured to allow for connection of a hygienic bagger.
- E. The support legs and fastening hardware shall be AISI 316 stainless steel.
- F. The vertical conveyor shall be complete with an electric motor (Baldor or equal) Class 1, Div. 1 460V, 3 phase, 60 Hz; SEW helical bevel arrangement drive unit, and gear drive adapter plate assembly including sealing system..
- G. Conveyor equipment shall be manufactured under ISO 9001 and ISO 14001 certification.

2.04 CONTROL SYSTEM

A. Local control panels:

1. One (1) Class 1, Div. 1 combination Man/Off/Auto, Forward/Reverse, & push-pull E-Stop push button in an aluminum enclosure for vertical conveyor (total of one (1) control stations); 1 inch dia. Forward/Reverse selector switch shall have a spring return; all factory assembled, wired and tested.
2. One (1) Class 1, Div. 1 power lock-out station for the motor in its own aluminum enclosure for operator safety and installed adjacent to the vertical conveyor (total of one (1) power-lock-out stations);

B. Main Control Panel

1. The vertical conveyor shall be integrated into the control panel provided under Section 11330.
2. Power to the vertical conveyor shall be interlocked to activate in conjunction with the wash press provided in Section 11330.

2.05 PAINTING, SURFACE PREPARATION, AND CORROSION PROTECTION

- A. All welded stainless steel components shall be acid washed after welding by either full dipping, applying spray-on acid solution, or by using acid passivation paste, following which all components are thoroughly rinsed with clean water and allowed to air dry.
- B. Motors and gear reducers shall be supplied with a finished paint system from the manufacturer. All other components shall receive surface preparation of SSPC-SP6, followed by one (1) shop coat of Tnemec 66-1211 Epoxoline primer, 3.0 to 5.0 mils dry film thickness and one (1) coat Tnemec Series 73 Endura-Shield, INOI No. 70, light gray enamel, 2.0 to 3.0 mils dry film thickness.
- C. Coat all stainless steel bolts and nut threads with non-seizing compound before assembly.

2.06 SPARE PARTS AND TOOLS

A. Vertical Conveyor Parts List:

1. One (1) spare set of shaft seal packing rings
- B. In accordance with SECTION 00800, furnish one set of all special tools required for the proper servicing of all equipment supplied under these Specifications, packed in a suitable steel tool chest with a lock. Special tools shall include any tools not available in local hardware stores.

- C. Furnish One (1) year supply of required lubricants in accordance with SECTION 00800.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The equipment shall be installed in strict accordance with the manufacturer's recommendations.
- B. Bolts, nuts, and washers shall be AISI 316 stainless steel.

3.02 SERVICE.

- A. Provide the services of a manufacturer's representative in accordance with Section 01665. The representative shall inspect and approve the installation, certify that the torque settings of the drive overload protection device are correct, perform the torque test and instruct the owner's personnel on maintenance and operation. If additional service is required due to the mechanisms not being fully operational, at the time of service requested by the contractor, the additional service days will be at the contractor's expense.

3.03 OPERATOR TRAINING

- A. Provide operator training for OWNER'S personnel after system is operational. Training will take place while manufacturer's representative is at the job site for inspection. See Section 01665 for training requirements.

3.04 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 11961

INTERIOR AND EXTERIOR PROCESS PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. The work covered under this Section of the Specifications includes the furnishing of all labor, equipment, and materials, and in performing all operations in connection with the furnishing, installation and testing of interior and exterior process piping systems, including piping, pipe fittings and specials, wall fittings, valves, jointing materials, and accessories, of the various materials, sizes, classes, joints and types, and appurtenant work, at the locations and to the general arrangements and details as indicated and/or as directed, complete in place, in accordance with the Drawings and Specifications.
- B. Multiple types of pipe and fittings specified in this section shall be produced in the United States in accordance with the American Iron and Steel requirements of P.L. 113-76, the Consolidated Appropriations Act of 2014. These items include (but are not limited to) the following:**
 - 1. Ductile Iron Pipe and Fittings**
 - 2. Stainless Steel Pipe and Fittings**
 - 3. Carbon Steel Pipe and Fittings**
 - 4. Iron and Steel Valves**

1.02 RELATED SECTIONS

- A. Section 02618 – Ductile Iron Pipe for Buried Service
- B. Section 02620 – HDPE Pipe for Buried Service
- C. Section 02622 – PVC Pipe for Buried Service
- D. Section 09900 – Painting

1.03 REFERENCES

- A. ASTM A716 – Standard Specification for Ductile Iron Culvert Pipe
- B. ASTM A746 – Standard Specification for Ductile Iron Gravity Sewer Pipe
- C. ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipe

1.04 SUBMITTALS

- A. Submit the following in accordance with Division 1 Specification Sections.
- B. Shop Drawings: Include materials lists, catalog cuts, and complete specifications for all piping materials including gaskets and connections. Shop drawings for all pumps, valves, valve operators, strainers, hangers and supports, wall pipes, wall sleeves, flexible connections, hydrants, nozzles, cleanouts, and other like manufactured items. Detailed piping layout drawings of all interior and exterior piping. Drawings of exterior piping shall also show the relationship between the work included in this section and that included in others where in close proximity.
- C. Operation and Maintenance Manuals: Submit materials for inclusion in Operation and Maintenance Manuals specified in Division 1.

1.05 MARKING, DELIVERY, STORAGE AND HANDLING

- A. All pipe shall be properly marked by the manufacturer in accordance with ASTM D2241. Markings shall be spaced at intervals of not more than five feet and shall include the following:
 - Nominal pipe size
 - Type of material with designation code
 - Pipe diameter to wall thickness ratio or class, as applicable
 - ASTM designation with which pipe complies
 - Manufacturer's name or trademark and code

PART 2 - PRODUCTS

2.01 PIPE SCHEDULE

- A. Pipes, fittings and specials, appurtenances and jointing shall be in accordance with the following schedule. This schedule is set forth as a guide as to types of materials and jointing required. The lack of mention of any specific pipe shall not relieve the Contractor from the responsibility of furnishing and installing all piping as required or directed for a complete job. The schedule indicates the types of pipe required for the principal piping systems included under this Section of the Specifications and is presented herein for convenience of references for the Contractor.

2.02 MATERIALS

- A. Ductile Iron Pipe and Fittings
 - 1. **Ductile Iron pipe and fittings shall be produced in the United States in accordance with the American Iron and Steel requirements of P.L. 113-76, the Consolidated Appropriations Act of 2014**

2. Ductile Iron Pipe and Fittings shall be manufactured by:
 - a. U.S. Pipe, Birmingham, AL
 - b. American Ductile Iron Pipe, Birmingham, AL
 - c. McWane Ductile, Phillipsburg, NJ
 - d. Approved equal
3. All ductile iron pipe shall be minimum of special thickness Class 52 unless otherwise noted. All ductile iron fittings shall be minimum of Pressure Class 250 unless otherwise noted. Ductile iron pipe and ductile iron pipe fittings and specials shall have cast upon them the class, thickness designation and initials of the manufacturer.
4. Ductile iron pipe with screwed-on flanges shall be centrifugally cast pipe conforming to ANSI Specification A-21.51 of latest editions. Flanges for flanged pipe shall conform to ANSI Specifications B16.1, latest edition, for American 125 Standard and shall have long hubs. After flanges have been screwed onto the pipe the face of the flange and end of the pipe shall be refaced together in the shop and the flange shall be sealed with epoxy compound to prevent corrosion of threads from the outside. Flanges shall be faced and drilled to American 125 Standard and to match the facing and drilling of the equipment, valves and to such other items to which they are attached. Ends of pipe connecting to flexible mechanical couplings shall be suitable for and properly prepared for making the joint with the flexible mechanical coupling. Pipe shall be lined as specified herein.
5. Ductile iron pipe with mechanical grooved couplings shall be centrifugally cast pipe conforming to ANSI Specification A-21.51 of latest revision. The pipe shall be radius grooved conforming to Victaulic Company of American's specifications for rigid joints. Flexible joints may be used to design considerations, as shown on drawings or detailed elsewhere in these specifications. Installation shall be in accordance with Victaulic Company of American's recommendations. Grooving dimensions are the same for any one pipe OD regardless of pipe class and pressure. The outside surface of pipe between the groove and pipe end must be smooth and free from deep pits or swells to provide a leaktight seat for the Victaulic gasket. All rust, loose scale, oil, grease and dirt shall be removed. Penned surfaces may require corrective action in order to provide a leaktight gasket seal.
6. Ductile iron flanged joint fittings shall be of the types indicated or as required and approved, and shall conform to the requirements of ANSI Specifications A21.10, latest edition, Pressure Class 250. Flanges shall be cast integral with the pipe fittings and specials and shall be faced and drilled in accordance with ANSI Specification B 16.1, latest edition, for American 125 Standard, and facing and drilling of all flanges shall match that of the equipment, valves, and such other items to which they are attached. Blank flanges shall be provided as required. Flanged fittings not available under ANSI Specification 21.10 shall be provided as required and shall conform to the application ANSI Specifications B 16.1 or B 16.2. Pipe fittings and specials shall be lined as specified herein. Pipe fittings, specials and adapters shall be of the sizes, dimensions and types as indicated, as specified, as required for the proper fitting of the completed work, and as approved by the Owner.

7. Fittings for mechanical joint pipe shall conform to requirements of ANSI specification A-21.10 with the exception of the end preparation. The end preparation shall be radius grooved conforming to Victaulic Company of America's recommendations for rigid joints. Coupling housings shall be malleable iron conforming to the requirements of ASTM specification A-47 or of ductile iron conforming to the requirements of ASTM Specification A-536. Sizes 3-inches through 12-inches shall be of two segments; sizes 14-inches and larger shall be four or more segments. Couplings shall be Style 31 as manufactured by Victaulic or approved equal. Lightly coat pipe ends and all gasket surfaces with Victaulic lubricant or other non-petroleum base lubricant. Bolts and nuts shall be carbon steel heat-treated and plated, conforming to ASTM Specification A-183, minimum tensile 110,000 psi. Bolts shall be of oval neck, track head design. Gaskets shall be of the mechanical grooved coupling design with short center leg to bridge pipe ends, and shall have properties as designated by ASTM Specification D-2000. Such gaskets shall be suitable for the required service. Victaulic-Style 341/342 transition flanges shall be used for direct connection of 125 pounds cast iron flanged valves, pumps or other equipment, directly to grooved pipe or fittings. Victaulic Style 341/342 transition flanges shall be malleable iron conforming to the requirements of ASTM Specification A-47 or ductile iron conforming to the requirements of ASTM Specification A-536. Gaskets shall have properties as designated by ASTM Specification D-2000 and shall be suitable for the required service.
8. All fittings associated with exterior ductile iron pipe shall be ductile iron with restrained joints conforming with ANSI A-21.10. Push on joints for such fittings shall be in accordance with ANSI A-21.11. All fittings shall be coated and lined as specified for its associated pipe and use. Restrained joint ductile iron pipe fittings shall be TR Flex® by US Pipe or equal.
9. Cement-mortar linings: Ductile iron pipe and ductile iron pipe fittings and specials, where indicated, shall be cement-mortar-lined in accordance with ANSI A-21.4. Thickness of the mortar lining shall be 1/8-inch for pipe 12-inches and smaller and 3/16-inch for pipe 14-inches and larger.
10. Glass lining: Glass lining where indicated shall be a specially formulated internal coating on ductile iron pipe or ductile iron pipe fittings and specials. All metal preparation, application and processing will follow the manufacturer's recommended procedures.
 - a. The coating shall consist of special glasses and inorganic materials applied in a minimum of two (2) coats, separately fired, to internal surfaces prepared by blasting. Following application of the ground (base) coat, the items shall be exposed to an appropriate maturing temperature (above 1400°F) to fuse the glass to the base metal forming an integral molecular bond with the metal. The resulting bond shall be sufficient to withstand a metal yield point of 0.001-inch/inch without damage to the glass.

- b. Subsequent coatings (finish coats) shall be processed in a similar manner, forming an integral molecular bond with the base coat.
 - c. The entire coating shall be from .008-inch to .012-inch thick. It shall have a hardness of from 5 to 6 on the Mohs Scale, and a density of from 2.5 to 3.0 grams per cubic centimeter. The green glass lining shall be capable of withstanding a thermal shock of 350°F to corrosion by solutions between pH-3 and pH-10 at 125°F. There shall be no visible loss of surface glass on the glass lining after immersion of a normal production run sample in an 8 percent sulfuric acid solution at 148 degrees F for a period of ten (10) minutes. In addition, when tested according to ASTM Designation C283-54, it shall show a weight loss of not more than 3 milligrams per square inch.
 - d. The glass lining shall be in accordance with the manufacturer's standard tolerances for coverage, continuity and gloss. Pin holes, crazing or fishscales, which substantially expose the metal substrate, shall be cause for rejection of the pieces.
 - e. Sizes, details, handling, stacking, etc. shall be in accordance with the manufacturer's recommendations.
 - f. No cutting or tapping of glass-lined pipe in the field shall be permitted.
11. Asphaltic exterior coating: All ductile iron pipe and fittings for buried service shall be given an asphaltic exterior coating. Coating shall be in accordance with ANSI A-21.51 for pipe and ANSI A-21.10/A-21.53 for fittings.
12. Painting: Pipe exterior preparation and coating for interior and above grade pipe shall be in accordance with Specification Section 09900 – Painting.
13. Pipe fittings with integrally cast bases shall be provided where indicated and as directed.
14. All flanged joints for ductile iron pipe shall be made with bolts or bolt studs with a nut on each end and 1/8-inch thick neoprene gaskets extending at least to the inside of the bolts. Bolts and nuts shall be heavy unfinished hexagon head bolts and nuts of Grade B low-carbon steel. Bolt studs and nuts shall be of the same quality as machine bolts. Gaskets shall be Flange-Tyte® by US Pipe or equal.

B. Polyvinylchloride (PVC) Pipe and Fittings

- 1. PVC Pipe shall be manufactured by:
 - a. J.M. Eagle, Los Angeles California
 - b. United States Plastic Corp., Lima, OH
 - c. Charlotte Pipe and Foundry, Charlotte, NC
 - d. Approved equal
- 2. Three types of PVC pipe are specified on this project – Schedule 80 pipe for pressure service, SDR 21 pipe for pressure service, and SDR 35 pipe for gravity service.
- 3. Schedule 80 Pressure Pipe: Unplasticized polyvinylchloride pipe and fittings shall be Type 1, high chemical resistance, normal impact, Schedule 80 pipe made of virgin polyvinylchloride and conforming to ASTM D 1785. Pipe fittings shall be of the

same material and shall be of the proper classification and wall thickness for use with Schedule 80 pipe. Joints in piping shall be solvent weld connections. A sufficient number of unions shall be provided to allow for convenient removal of piping. Connections to pipe of other materials, connections to equipment, and connections at such other locations, as indicated or directed, shall be made with flanges. All flanges shall be 150-pound PVC pipe flanges and flanged connections shall be made using 1/16-inch thick neoprene rubber gaskets and type 316 stainless steel bolts and nuts. Flanges shall be faced and drilled to American 125 Standard and as required to match the facing and drilling of the flanges to which they are to be connected.

4. SDR 21 Pressure Pipe: Pipe shall conform to the requirements of ASTM D2241 for Class 200, SDR 21 pipe. Pipe shall be manufactured from clean, virgin, approved Class 12454-B compounds, conforming to ASTM D1784, with an established hydrostatic design minimum of 2,000 psi for water at 73 degrees. F. Pipe shall be furnished in maximum 20-foot laying lengths with integral bell joints formed so as to contain a rubber sealing gasket. Joints shall be Push-on bell and spigot conforming to the requirement of ASTM D3139. Fittings shall be push on joint, conforming to ASTM D3139. Fittings shall be of a pressure classification at least equal to that of the piping with which they are to be used.
 - a. SDR 21 PVC Pressure pipe shall conform to Specification Section 02627.
5. SDR 35 Gravity Pipe: PVC pipe, couplings and fittings for gravity and sleeve service shall conform to ASTM D-3034 Type PSM with a SDR of 35.
 - a. SDR 35 PVC pipe shall conform to Specification Section 02622.
 - b. Joints for PVC pipe shall be push-on joints using permanently bonded elastomeric ring joints. Such joints shall be installed in accordance with the pipe manufacturer's written instructions. Any joint which is not properly made, shows signs of leakage or is, in the opinion of the Engineer, defective in any way shall be redone to the satisfaction of the Engineer.
 - c. Y-branches or tees utilized shall be of the same class and type as the pipe in which they are connected to.
- C. Copper Piping: Piping shall be of the thickness specified herein or as shown on the drawings, and shall be of the longest lengths commercially available.
 1. Copper Pipe shall be manufactured by:
 - a. Mueller Streamline Co., Collierville, TN
 - b. Cambridge-Lee Industries, LLC, Reading PA
 - c. Approved Equal
 2. Copper tubing for city water and plant water shall be ASTM B-88, Type K.
 3. Copper pipe shall conform to ASTM B-42.
 4. Fittings shall be cast bronze for copper pipe and cast bronze or copper stream-lined fittings for copper tubing conforming to ASTM B-30 UNS Alloy No. C83800.
 5. Unions shall be bronze with ground joints and shall be semi-finished.
 6. Joints for copper fittings shall be made with solder composed of 95 percent tin and

five percent antimony.

7. For copper tubing, Type K shall be used for underground services; Type L shall be used for above ground interior services.

D. Fiberglass Reinforced Plastic (FRP)

1. FRP Pipe shall be manufactured by:
 - a. Perry Fiberglass Products, Elyria, OH
 - b. Fibrex, Victoria, TX
 - c. Approved equal
2. Pipe shall conform to ASTM D2996 and ASTM D4024. Pipe shall be suitable for industrial air service.
3. The pipe shall be manufactured by the filament winding process using an amine cured epoxy thermosetting resin to impregnate strands of continuous glass filaments, which are wound around a mandrel at a 35.25° helix (54.75° winding) angle under controlled tension. Pipe shall be heat cured and the cure shall be confirmed using a Differential Scanning Calorimeter. Pipe shall have a resin-rich corrosion barrier reinforced with surfacing veil. The corrosion barrier shall have minimum resin content of 80%. The minimum acceptable cured thickness of the corrosion barrier shall be as follows:

1" to 1-1/2" pipe	15 mil nominal
2" to 4" pipe	30 mil nominal
6" to 16" pipe	35 mil nominal

4. Pipe shall be supplied with a matching tapered coupling and a matching tapered spigot. Pipe shall have a minimum continuous cyclic pressure rating of 150 psig at 225 degrees F in accordance with ASTM D2992 Procedure A.
5. All fittings shall be manufactured using the same type materials as the pipe. Fittings may be manufactured either by compression molding or spray-up/contact molding methods. Fittings shall be adhesive bonded matched tapered bell and spigot, or flanged. Flanges shall have ANSI B16.5 Class 150 bolt hole patterns. Bonding adhesive shall be manufacturer's standard for the pipe specified.
6. Gaskets shall be 1/8" thick, 60-70 durometer full-face type suitable for the service specified as recommended in the manufacturer's standard installation procedures. Bolts, nuts and washers shall be type 316 stainless steel.
7. Pipe shall be Green Thread, by Smith Fiberglass Company, or equal.

E. High Density Polyethylene (HDPE)

1. HDPE Pipe shall be manufactured by:
 - a. Chevron Phillips Chemical Co., The Woodlands, TX;
 - b. ISCO Industries, Louisville, KY, or
 - c. Approved equal.
2. HDPE pipe for biofilter air service shall be SDR 17, and for liquid service (lime slurry, etc.) shall be SDR 17, unless otherwise noted or approved.

3. Pipes shall conform to Specification Section 02620 – HDPE pipe for buried service.

F. Stainless Steel Pipe

1. **Stainless Steel pipe and fittings shall be produced in the United States in accordance with the American Iron and Steel requirements of P.L. 113-76, the Consolidated Appropriations Act of 2014**
2. Stainless Steel Pipe Shall be manufactured by:
 - a. Felker Brothers Corp, Marshfield, WI
 - b. Douglas Brothers, Portland, ME
 - c. Approved equal
3. Stainless Steel pipe shall be Schedule 10S unless otherwise noted.
4. Material: Stainless steel pipe shall be Type 304L sheet and plate per ASTM 240. Maximum carbon content of 304L material limited to 0.03 percent.
5. Fabrication: Fabricate in accordance with ASTM A778 in NPS sizes shown with dimensional tolerances per ASTM A530. Perform welding by qualified welders conforming to standard procedures. Weld piping with wall thickness up to 11 gauge (0.125-in.) with the TIG (GTAW) process. Properly bevel heavier walls and use a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Add filler wire of ELC grades to all welds to provide a cross section at the weld equal to or greater than the parent metal. Distribute smooth and evenly weld deposit and provide a crown of no more than 1/16 inch on the I.D. and 3/32 inch on the O.D. of the piping.
6. Concavity, undercut, cracks or crevices are not acceptable.
7. Butt Welds: Full penetration to the interior surface, with inert gas shielding provided to the interior and exterior of the joint.
8. Remove excessive weld deposits, slag, spatter, and projections by grinding.
9. Continuously weld angle face rings on both sides to the pipe or fitting.
10. Grind all welds on gasket surfaces smooth.
11. Contour pipe branches, taps and bosses to the radius of the main pipe run and bevel and weld with full penetration. No projections to the inside of the branch or main run are acceptable. Provide a smooth transition from ID of run to ID of branch.
12. Wire-brush outside weld area with brushes of stainless steel that are specifically designed for use only on stainless steel.
13. After manufacture, passivate stainless steel pipe, fittings, and appurtenances by immersion in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid. Temperature and detention time to be sufficient for removal of oxidation and ferrous contamination without more than superficial etch of surface. Perform a neutralizing operation by a clean water spray wash.
14. After fabrication, scrub welds with stainless steel wire brushes to remove weld discoloration and then wash clean.
15. Welding done in shop. Field welding not permitted.
16. Fittings: Butt weld type manufactured in accordance with ASTM-A-774 of the same raw material and in the same thicknesses as the pipe.

- a. Elbows: Provide smooth flow, die formed, long radius; with centerline to end of elbow equal to 1.5 times the nominal pipe size.
 - b. Tees and Wyes: Fabricate tees and wyes true and square with wall thickness same as pipe.
 - c. Reducers evenly tapered with tangent ends for butt weld connection. Reducers may be straight tapered cone construction.
17. Secure flanges to pipe ends and openings plugged before shipment.
18. Joints: Field joints for plain end pipe sections shall be made by sleeve type couplings. Sleeve type couplings shall be shouldered-type or 'Fixed x Expansion' (FxE) couplings (Depend-O-Lok by Victaulic or equal). Split couplings requiring cut or roll grooving of the pipe will not be allowed unless specifically called for. Connections at valves shall be flanged joints of the Van Stone back-up flange type using 150 lb. ANSI B16.1 forged steel, carbon steel or ductile iron back-up flanges with hot-dipped galvanized finish. Fabricate flanged joint face rings fabricated of rolled stainless steel angles. Use angle face rings with thickness equal to or greater than the wall of the pipe or fitting to which it is welded. Continuously weld on both sides to the pipe or fitting. Fabricate angle legs so as not to interfere with the flange bolt holes.
19. Shouldered Couplings: Couplings for joining pipe in a piping system where positive longitudinal locking action is required. Couplings shall consist of four basic components: a one-piece housing, gasket assembly, bolts and nuts, and end rings for pipe restraint.
20. Bellows Type Expansion Joints: Expansion joints for joining stainless steel pipe in a piping system where axial movement due to thermal expansion and contraction, angular deflection and lateral offset is required. Expansion joints shall consist of expansion bellows designed for the specified expansion/contraction and lateral offset; bellows end preparation; and end connection of the expansion joint to the stainless steel pipe.
- 3. Bellows type expansion joints shall be OmniFlex Expansion Joints shall be as manufactured by Brico Industries, Inc., Atlanta, Georgia to meet the system design requirements as shown on the drawings.
 - 4. OmniFlex expansion joints shall be furnished for installation at the locations shown on the drawings. All OmniFlex expansion joints shall be selected and installed in accordance with manufacturers' recommendations.
- B. Expansion Bellows
- 1. The expansion bellows shall be produced from fully annealed stainless steel sheet stock, rolled into a tube, seam welded and formed into corrugations.
- C. Bellows End Preparation
- 1. The expansion bellows shall have ends prepared for the end conditions called for on the drawings.

- D. End Condition
 - 1. Ends of expansion bellows shall be prepared for AirMaster Shouldered Couplings or flanges as required.
- E. Anchors
 - 1. Anchors or tie rods, where called for, are used to protect the expansion joint against excessive expansion and contraction forces, and shall be installed in accordance with the manufacturers' recommendation.
- F. Materials
 - 1. Bellows shall be manufactured from stainless steel meeting ASTM A240 type 321.
 - 2. Bellows end preparation shall be stainless steel pipe ends conforming to ASTM A240 type 304 and shall be welded to the integral end of the bellows. Ends to be prepared for the specified end condition.
 - 3. AirMaster end rings shall meet the requirements of ASTM A276 type 316L stainless steel.

2.5 PIPE SUPPORTS

- A. General:
 - 1. Provide a complete system of pipe supports, guides and anchors complete with necessary inserts, bolts, nuts, restraining and hanger rods, washers, miscellaneous steel and other accessories.
 - 2. Pipe supports shall support stainless steel pipe in a piping system where axial movement due to thermal expansion and contraction is required.
 - 3. Fixed supports shall be utilized where necessary to resist pipe movement and sliding supports shall be installed where necessary to allow for pipeline movement.
 - 4. Supports, guides and anchors located as required by MSS-SP69.
 - 5. Fabricate supports, guides and anchors in accordance with MSS-SP58.
- B. Anchors
 - 1. Pipe supports shall be bolted to structures in accordance with the pipe support engineer's design. There shall be no field welding of stainless steel pipe joints or of the stainless steel supports to the stainless steel pipe.
- C. Materials
 - 1. Supports shall be manufactured from stainless steel meeting the requirements of ASTM A240 type 304.
 - 2. Anchor bolts shall be type 316 stainless steel epoxy doweled type by Hilti or equal.

2.6 SHOP PAINTING

- A. Carbon steel, forged steel or ductile iron flanges and pipe support components shall be shop and finish coated.

2.02 WALL SLEEVES

- A. Wall sleeves shall be provided for all pipes passing through reinforced concrete structures, floors, walls, and brick or concrete masonry unit walls, except manholes. Wall sleeves shall be cast iron or HDPE. The Contractor shall be responsible for having wall sleeves readily available and tightly secured in the formwork at time of concrete placement.
- B. Cast iron wall sleeves shall be standard type, Class 250 with integrally cast wall flange. The wall sleeves shall be of the dimensions required and as directed with ends flush with both faces of the wall and for proper fitting of the carrying pipe through wall sleeve with suitable annular space. Cast iron wall sleeves shall be of approved type, dimension and wall thicknesses.
- C. HDPE wall sleeves shall have integral water stop collars and end caps that hold the sleeve's circular configuration during concrete pours. Sleeves shall be molded with textured exteriors for concrete bonding. HDPE wall sleeves shall be Century-Line® Engineered Sleeves by Thunderline and shall be engineered to mate with Link-Seal® modular mechanical seals.
- D. The annular space created by the wall sleeve and the pipe shall be positively sealed with Link-Seal manufactured by Thunderline Corporation or an approved equal. Seals shall be the modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assemblies positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely watertight seal between the pipe and wall opening. The seal shall be constructed so as to provide electrical insulation between the pipe and wall, thus reducing chances of cathodic reaction between these two members. All wall sleeves of which any portion is 25 feet or more below finished grade or where the wall sleeve penetrates a wall between a tank and an interior room shall have link seals on both the interior and exterior faces of the wall. All wall sleeves above this elevation shall have link seals on the interior wall only.

- E. The Contractor shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabricating or installing the seals. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a watertight joint.
- F. The Contractor shall familiarize himself with the installation of the seals through the manufacturers instruction bulletin that illustrates the proper procedure for installing and tightening the seal to provide a watertight pipe penetration.
- G. Wall and/or floor sleeves with closure for which the above sleeves are not suited as described shall be made by means of a sleeve capable of being bolted directly to the formwork to prevent misalignment. Seal of the annular space between the carrier pipe and the sleeve shall be by means of a confined rubber gasket and capable of withstanding 350 psi. Sleeve shall be manufactured from Ductile Iron with an integrally cast water-stop of 1/2" minimum thickness and 2-1/2" minimum height. Mechanical joint gaskets shall be EPDM. Wall sleeves shall be Omni Sleeve, Malden, MA or approved equal.

2.03 FLEXIBLE MECHANICAL PIPE COUPLINGS

- A. Flexible mechanical cast iron pipe couplings for joining of plain ends of ductile iron pipe shall be suitable for a 200 psi water working pressure and shall be of the proper size and suitable for use on the piping on which it is installed. Couplings shall be of cast iron construction and shall be provided with middle ring not less than 5-inches in length, galvanized bolts and nuts with rolled threads, "Grade 42" molded rubber gaskets, follower rings and accessories as required for the complete installation. Where indicated, the coupling shall be provided with not less than four tie rods extended from flange connections on each side of the couplings. Thickness of middle rings shall be as approved. Follower rings shall be amply proportioned to take, without deformation, the strains imposed on the coupling by the installation. The ends of the pipes shall be prepared and the couplings installed in accordance with the printed recommendations of the manufacturer of the couplings, and the Contractor shall be responsible for verifying dimensions of piping materials necessary to insure the proper fabrication, installation and fitting of the contract work.
- B. Flexible non-metallic couplings for joining flanged ductile iron pipe at equipment shall be suitable for a 200 psi water working pressure and shall be of the proper size and suitable for use on the piping on which it is installed. Couplings shall be of EPDM construction and shall be provided with type 316 stainless steel retaining rings. Where indicated, the coupling shall be provided with not less than four tie rods extended from flange connections on each side of the couplings. Couplings shall be Redflex Type J-1W, Wide Arch Expansion Joints or equal.

2.04 FILLER RINGS

- A. Filler rings of the same materials, facing and drilling as the flanges they are used with

shall be provided in flanged piping where necessary and approved for the proper fitting and layout of the piping.

2.05 TAPPED CONNECTIONS

- A. Tapped connections in pipe and fittings shall be made in such manner as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses shall not exceed that listed in the appropriate table of the Appendix to the ANSI A 21.51 based on three full threads for ductile iron.
- B. Where the size of the connection exceeds that given above for the pipe in question, a boss shall be provided on the pipe barrel, the tap shall be made in the flat part of the intersection of the run and branch of tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or approved.
- C. All drilling and tapping of ductile iron pipe shall be done normal to the longitudinal axis of the pipe; fittings shall be drilled and tapped similarly, as appropriate. Drilling and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean cut threads of the correct size, pitch, and taper.
- D. Tapping is not allowed for glass-lined pipe. All taps for glass-lined pipe shall be done at a tapped flange, filler flange or unlined spool piece that can be readily removed for maintenance.

2.06 VALVES. Valves fitted with extension stems or valve boxes shall be NRS type. All other valves shall be O.S. & Y type except where space limitations require a NRS type valve. NRS valves shall be used as directed by the Engineer where limited space is a controlling criteria. All valves shall open when turned left unless specified otherwise.

A. Gate Valves (Process Lines)

- 1. Valve Construction. Gate valves shall be made in accordance with AWWA Specification C-500. Gate valves shall be iron body, bronze trim, solid wedge with tapered seat or double revolving disc, parallel seat construction. If of the parallel seat type, the discs and wedges shall be free of pockets and ribs. Gate valves shall be iron body, bronze trim, solid wedge with tapered seat or double revolving disc, parallel seat construction. If of the parallel seat type, the discs and wedges shall be free of pockets and ribs. The valves shall be designed for 125 psi working pressure. Interior gate valves shall be O.S. & Y. except where N.R.S. is called for, and have a packing seal. Interior valves shall be flanged unless otherwise shown on the drawings. Flanges shall be drilled to the ANSI 125/150 pound standard. Exterior gate valves shall have O-ring seals and mechanical joints.

2. Manual Actuators. Interior gate valves shall be hand-wheel operated with extension stems or chain operators as required. Exterior gate valves shall be operated by a two-inch operating nut set 18-inches below finished grade when buried. Valve boxes and extension stems shall be as specified hereinafter. Means of actuation shall be by lever, gear actuator, tee wrench, extension stem, motorized actuator, and the like, as specified or as shown on the drawings.
3. All valves larger than twelve inches shall be equipped with gear actuators. The actuator gear box shall be of totally enclosed oil or grease bath lubricated type, suitable for operation at any angle and provided with the appropriate filling and drain plugs. All shaft bearings shall be furnished with permanently lubricated bronze bearing bushings. Actuator shall clearly indicate valve position and an adjustable stop shall be provided. Construction of actuator housing shall be semi-steel. All exposed nuts, bolts, and washers shall be zinc plated. All valve actuators shall be as recommended by the valve manufacturer. Chain operators shall be used on all valves located six feet or more above the finished floor. Chain wheels and chains shall be provided by the valve manufacturer to operate the particular valve. All exterior valves shall be equipped with the specified actuator and shall be suitable for buried service.

B. Gate Valves (Potable Water Lines) (NOT USED)

1. Gate valves shall be manufactured in full compliance with the content and intent of the specification. Gate valves shall be cast iron body, bronze mounted, double disc, parallel seat, O-ring type stuffing box with double Buna O-rings and non-rising stem. Valves shall have a two-inch operating nut or hand-wheel as required for the particular application and as shown on the drawings. Gate valves shall conform in every respect to AWWA.
2. All exterior and interior gate valves shall be designed for a minimum of 150 psi working pressure. Exterior valves shall have mechanical joints and shall be bituminous coated. Exterior gate valves shall be operated by a two inch operating nut set 18 inches below finished grade when buried and have an extension stem or chain operator as required when in structures. Chain operators shall be as specified. Valve boxes and extension stems shall be as specified hereinafter.

C. Gate Valves (2" and smaller)

1. Gate valves shall be 125 pound bronze with solid wedge, screwed-in bonnet, inside screw, non-rising stem, and screwed ends.

D. Check Valves

1. Check valves larger than two inches shall be of swing design and with iron bodies. Valves shall have bronze faced cast iron disc plate suspended at the top from a stainless steel shaft. Valve shaft shall be supported by bronze bushings and bearings and shall be packed through externally accessible stuffing box. Disc shall seat against resilient seat installed in the valve body. Valve closure shall be assured by means of outside lever and weight.
2. The valves shall be compatible with 125 pound ANSI drilled flange. Valves shall be cleaned and shop primed on the outside with a rust inhibitive priming system. All check valves shall be horizontally mounted.
3. Check Valves. (Two inches and smaller). Check valves shall be 300 pounds bronze curving design with screwed-in bonnet, regrinding bronze disc, and screwed ends. Disc shall be suspended at the top with a stainless steel shaft. All check valves shall be horizontally mounted.

E. Elastomeric “Duckbill” Check Valves (NOT USED)

1. Valve body shall be a two-piece split configuration, of cast iron. The two halves shall be sealed by rubber sheet gaskets that are cut to match the profile of the body halves. The flanges shall be drilled to mate with ANSI B16.1, Class 125/ ANSI B16.5 Class 150 flanges, and port areas shall be 100% of the mating pipe port area. Valve body shall be drilled and tapped for a supplied clean out plug on the top of the body and flushing connections on the bottom of the body supplied with plugs.
2. The check sleeve is to be of the fabricated elastomer “duckbill” type. The sleeve shall be one-piece rubber construction with fabric reinforcement. The inlet port shall have an integral flange, drilled to be retained by the flange bolts and acting as the gasket between pipe and valve. The flange will be drilled to ANSI B16.1, Class 125/ ANSI B16.5 Class 150 standards, and the inlet port area shall be 100% of the mating pipe port area. The port area shall contour down to a duckbill, which shall allow passage of flow in one direction while preventing reverse flow.
3. Manufacturer must have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data. Company name and location shall be cast onto the valve body. Valves are to be manufactured in the USA.
4. When line pressure inside the valve exceeds the backpressure outside the valve by a certain amount, the line pressure forces the bills of the valve open, allowing flow to pass. When back pressure exceeds the line pressure by at the same amount, the bills of the valve are forced closed.
5. All elastomeric “duckbill” check valves shall be Series 39 as manufactured by the Red Valve Co., Inc. of Carnegie, PA, or approved equal.

F. Plug Valves

1. Valves shall be of the non-lubricated, resilient seated, quarter-turn type furnished with flanged or mechanical joint end connections as required. Flanged valves shall have flanges in full compliance to ANSI B 16.1 Class 125 Standards, including facing, drilling and thickness. Face to face dimensions of flanged valves through 12" size shall be that of standard gate valves. Mechanical joint ends shall be in full conformance to ANSI Standard A21.11.
2. Port areas for all valves shall be at least 80% of full pipe area.
3. Valve bodies shall be of ASTM A-126 Class B, cast iron. Plugs shall be ductile iron (ASTM A-536, Grade 65-45-12) with upper and lower shafts internal. The valves must provide bidirectional sealing at 175 psi differential in sizes to 12" and 150 psi differential for sizes 14" and larger. Proof of design and cycle life testing shall be in full conformance to AWWA Standard C504-80. Valve seating shall provide a consistent opening/closing torque that is not dependent on adjustment of stop. Resilient seating shall be field replaceable on the existing plug.
4. All surfaces are to be protected, both internally and externally, with a factory coated heat fused thermoset epoxy or thermoplastic nylon complying fully with AWWA Standard C-550-81. These fusion-bonded coatings shall provide protection from corrosion in the shaft areas. Bearing areas to be isolated from solid particulates. All valves shall be of the bolted bonnet, top entry design, capable of repacking without removing the bonnet or valve from the pipe line.
5. Valves larger than eight inches and valves located seven feet or more above the finished floor shall be provided with manual gear operators having a maximum rim pull of 80 pounds as per AWWA C-504. Gear operators shall be enclosed and provided with seals on all shafts to prevent entry of water, allow submerging of the operator and suitable for running the gears in oil. All shaft bearings shall be furnished with permanently lubricated bronze bearing bushings. Adjustable stops shall be provided.
6. Actuators for gear operated valves shall be by handwheel if within six feet of the finished floor, and in accessible areas valves above six feet from the finish floor shall be operated by a chain operator and chain wheel provided by the valve manufacturer to operate that particular valve.
7. Actuators for valves eight inches and smaller located within six feet of the finished floor in accessible locations shall be by a portable lever. One portable level shall be provided for 50 percent of the valves or 15 portable levers whichever is less.
8. Actuators for valves in inaccessible locations shall be by extension stem, stem guides, 2-inch operating nut with mounting bracket or floorbox, or floor stand, and lever or handwheel as appropriate. The plug valve manufacturer shall provide all operator accessories as required to make each operator system completely operational. Design criteria for extension stems and stem guides shall be as specified under the section title -Miscellaneous Metal Work.

- . Valve 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. All exposed nuts, bolts, springs and washers used in buried service shall be stainless steel.
- 10. Three-way plug valves shall be tapered design with resilient (EPT) coated plug, cast in semi-steel. Port opening shall be a minimum of 95 percent of pipe area. Shut off shall be dead-tight. Interior of valve body shall have a minimum 0.005-inch epoxy coating. Flanges shall conform to ANSI 125 pound standard. Valves shall have upper and lower stainless steel bushings and an adjustable gland to control turning torque. Other features as specified herein for plug valves shall apply except that three-way valves six inches and larger shall be provided with gear operators. Unless otherwise shown on the drawings, three way plug valves shall be three port, three position, 180-degree turn design. Valves shall be as manufactured by Drum Owen Valve Company (Homestead), Bethlehem, PA, Style H, DeZurik, or equal.

G. Motor Operators (NOT USED)

1. Motor operators shall be provided for plug valves as shown on the drawings. Operators shall be as manufactured by Limitorque Corporation, Jamesbury Corporation, Rotork, Inc., or equal. It shall be the motor operator manufacturer's responsibility to mount and test the valve and actuator assembly to insure proper operation.
2. Motor operators shall be provided with a hand wheel for manual override and shall be provided with automatic electrical disengagement of the motor and automatic brake release when in the manual mode. Handwheel shall not turn when under electric operation and shall be of sufficient size as to require no greater than a 60-pound total rim effort. Handwheel shall be provided with an integral cutoff switch during manual operation.
3. Motor operator shall be designed to be removable from the valve without dismantling the valve and shall be provided with the following features:
 - a. Motor brake.
 - b. Heater with thermostat.
 - c. Limit switches. One switch shall be open and the second switch closed when the valve is fully open. When used with three-way valves, switches shall be used to indicate which outlet is open and which is closed.
 - d. NEMA 4X enclosure.
 - e. Operators shall operate on a 120 volt, single phase, 60 Hz, power supply up to 1/3 HP, and 480 volt, three phase, 60 Hz on greater than 1/3 HP.
 - f. Motor operator shall be capable of holding any valve position.
 - g. Motor operator controller shall be furnished with reversing motor starter, control power transformer, manual/automatic and

open/stop/close manual controls, open and close indicator lights and torque switches.

- h. Valve controllers shall be suitable for remote control and status via the facility I&C system.
- 4. Motor operator shall be provided with shaft seals and shall be totally enclosed and require no additional lubrication. Bearings shall be ball or roller type suitable for all loads encountered in the service conditions. Motor operator shall incorporate machine cut and hardened gears and shall have a bolting pattern to allow parallel or perpendicular mounting.
- 5. Motor operator shall produce the torques and speeds as listed below:

Size (Inches)	Minimum Torque (Inch-Pounds)	Fastest Operating Speeds (Seconds)
3	3,200	10
4	3,200	10
6	10,000	26
8	10,000	26
10	21,000	55
12	21,000	55
14	48,000	125
16	48,000	125

NOTE: It is the responsibility of the equipment supplier to verify minimum torques and fastest operating speeds for the motor operators supplied.

H. Knife Valves (NOT USED)

- 1. Valves shall be of the bonnetless knife type with wafer face-to-face flanged connections. Flanges shall be drilled to the ANSI 125/150 pound standard. WOG valve rating shall be 150 psi in sizes two inches through 24 inches and 125 psi in sizes 30 inches and 36 inches.
- 2. Valves shall be metal seated and lapped. Metal seated valves shall have a round port. Valves bodies shall have wetted parts of Type 304 stainless steel.
- 3. Valve packing shall be multiple layers of square, braided flax and shall be impregnated with marine or petroleum base lubricants. The packing gland shall be plastic coated. The gate shall have a knife edge. Both sides of the gate shall be finish ground. The stem shall be stainless steel. Valve superstructure shall be fabricated or hot rolled angular steel.
- 4. Valves two inches through 24 inches shall have a raised face seat with relieved area around the seat to prevent jamming.
- 5. Unless otherwise shown or specified, stem shall have double pitch threads and be equipped with two to one ratio gear operators with handwheels, which shall provide adequate clearance. Valves shall be by DeZurik or equal.

I. Butterfly Valves (NOT USED)

1. Butterfly valves shall have semi-steel bodies as specified under ASTM A-126, Class B, close nickel alloy iron with solid one-piece stainless steel shaft and constant contact with the disc to provide strength and rigidity. Shaft shall be ground and polished to minimize bearing and seal wear. Packing shall be multiple ring type packing. Valves shall have reinforced Teflon corrosion resistant bearings with phenolic back to assure smooth valve operation. Valve shall be of the lug body type for use between 125/150 ANSI flanges.
2. Butterfly valves shall have universal actuator mounting for field interchangeability. Valve disc shall be secured to shaft by means of wedge shaped 304 stainless steel tangible pins driven flat against the valve shaft and held in place by threaded pipe plugs. Disc material shall be semi-steel with welded nickel edge to provide corrosion resistance and to minimize undue seat wear. The resilient seat shall be bonded to a bronze retention ring and shall be held in place by stainless steel retaining screws. Retaining screws shall allow seat adjustment. A thrust bearing shall be provided at the bottom of the shaft to assure proper disc to seat alignment and absorb shaft thrust.
3. Valves shall be operated by a means of an enclosed handwheel. All actuator gearings shall be enclosed suitable for running in oil with seals provided on all shafts to prevent entry of dirt and water into the actuator. All shaft bearings shall be furnished with permanently lubricated bronze bearings and bushings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to closing torque. A maximum of 18 turns shall actuate the valve from fully closed to fully open. Valves shall be by DeZurik, Keystone or equal.

J. Solenoid Valves

1. Valves shall be direct acting packless two-way solenoid valves for water service. Valves shall be normally closed, unless otherwise shown suitable for operation with 120 volt, 60 Hertz power and have continuous duty Class A insulation and general purpose enclosure. Valve body shall be forged brass with safe body working pressure of at least 250 psi, NPT connections, with Buna-N seat, wetted parts shall be of stainless steel. Valves shall operate satisfactorily when mounted in any position. Valves shall be by ASCO or equal.

K. Globe Valves

1. Valves shall have bronze body and fittings and shall be hand-wheel operated. Discs shall be bronze and renewable type. Valves shall be designed for 150 psi working pressure and shall have threaded connections unless otherwise specified. Valves shall be by Powell, Stockham or equal.

L. Ball Valves

1. Ball Valves shall be of Type 316 stainless steel construction, except for those valves specified PVC construction or installed in PVC piping. Body shall be of rigid construction and symmetrically cast. The shaft and ball shall be integrally cast.
2. Seats and seals shall be Teflon and shall be recessed in a machined groove. Shaft packing shall be a braided band. Packing shall be tightened by means of a gland bearing strip. Replacement of the packing shall be accomplished without removing the actuator.
3. Ball shall have a straight-through passageway, and shall be of the full-port design. Valves shall be rated for 150-psi service. Valves shall be by Apollo or equal.

M. PVC Valves

1. Polyvinylchloride (PVC) valves shall be manufactured of the same PVC Type 1 Grade 1 molding compound used for the fittings to assure proper compatibility of system components.
2. Ball valves and ball check valves for PVC pipelines shall be true union PVC valves. Valve design shall allow for entire valve body removal by turning back the union nut at both ends of the valve. Valves shall have Teflon seats and packing. Valves shall carry a pressure rating of 150 psi at 75 degrees F water.
3. Diaphragm Valves. Valves shall be constructed of PVC, except diaphragm, including bonnet and handwheel. Diaphragm shall be replaceable and fully supported in any position. Valve shall have a non-rising stem with a diaphragm position indicator. Diaphragm shall be constructed of Teflon and shall be replaceable without removing valve from the line. Valve shall be socket ends. Valves shall be by Nibco or equal.

N. V-Port Ball Valves

1. Valves shall have a stainless steel, segmented, v-port ball with hard chrome facing. The body shall be cast carbon steel, ASTM A216, Grade WCB. Valves shall have integrally cast flanges for ANSI class 150 service. Shafts shall be type 316 stainless steel with splined ball-to-shaft connections and positive blow-out protection. Bearings shall be reinforced PTFE. Seats shall be reinforced PTFE meeting ANSI leakage classification VI. Adjustable packing shall be PTFE Chevron. Operation shall be manual by handwheel or chainwheel operators. Valves shall be DeZurik Type VPB or equal.

O. Pressure Reducing Valves. (Larger than two inch)

1. Valves shall be flanged globe body, bronze mounted, external pilot operated with a free floating piston and shall operate without springs, diaphragms or levers. The valve shall have a single seat with the seat bore equal to the size of the valve. Piston travel shall be a minimum of 25 percent of the seat diameter. The piston shall be guided above and below the seat no less than a length equal to 75 percent of the seat diameter. The piston shall be cushioned and designed to insure positive closure.
2. The valve shall be packed with leather and shall be furnished with an indicator rod to show the piston position. Gauge petcocks shall be furnished on the valve body. The pilot valve shall be easily accessible and shall be removable from the main valve under pressure. The pilot valve shall be adjustable without special tools or the removal of springs or weights. The main valve shall be designed to facilitate repairs internally without removing the valve from the line.
3. The valve shall be designed to maintain a preadjusted downstream pressure for varying rates of flow by piston positioning without water hammer.
4. The valve shall be suitable for 150 pound flanged service and shall conform to AWWA standards for flange thickness, drilling and the wall thickness of the body and caps. The valve body shall be constructed of grey iron, free from cold shuts and defects and having a minimum tensile strength of 35,000 psi.
5. The valve shall be hydrostatically tested at a minimum of two times the rated service pressure. All iron castings shall be coated on all surfaces with two coats of asphaltic base metal paint.

P. Pressure Reducing Valves (two inches and smaller) (NOT USED)

1. Pressure reducing valves two inches and smaller shall be of the single seated balanced design type globe body with threaded inlet and outlet ports. Valves shall be diaphragm operated, spring loaded, permitting convenient adjustment. The body shall be of bronze construction with stainless steel stem and furnished with a replaceable rubber seat. Valves shall be G-A Industries Figure 43-D, Watts No. 223, or equal.

Q. Pressure Relief Valve (NOT USED)

1. Pressure relief valve shall be cast iron frame and cover with a bronze body ring and rubber flap ring. Hinge pin shall be bronze and secured with cotter pins. Valve shall have two pivot points and shall have a flanged end. No leakage shall occur on a valve with at least 18 inches of water cover above the installed valve.

R. Air Release Valves (NOT USED)

1. Air release valves shall allow for the admission or release of large quantities of air during the fillup or drainage of pipelines and shall be specially designed for use with raw sewage. The valve shall open when the operating pressure falls below atmospheric pressure, and shall close and remain closed when the operating pressure is above atmospheric pressure.
2. Valves shall consist of a compact tubular all stainless steel fabricated body, HDPE hollow direct acting float, HDPE solid large orifice float, stainless steel nozzle and woven dirt inhibitor screen, nitrile rubber seals and natural rubber seat.
3. The valve shall have an integral anti-surge orifice mechanism which shall operate automatically to limit surge pressures rise or shock induced by closure to less than 2 times the valve rated working pressure. The intake orifice area shall be equal to the nominal size of the valve i.e., a 6" valve shall have a 6" intake orifice.
4. Large orifice sealing shall be by the flat face of the control float seating against a nitrile rubber O-ring housed in a dovetail groove circumferentially surrounding the orifice. The seating & unseating of a small orifice nozzle on a natural rubber seal affixed into the control float shall control discharge of pressurized air. The nozzle shall have a flat seating land surrounding the orifice so that damage to the rubber seal is prevented.
5. The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.
6. Connection to the valve inlet shall be by flanged ends conforming ANSI B16.1 Class 125. Flanged ends shall be supplied with type 316 stainless steel screwed studs inserted for alignment to the specified standard. Provide type 316 stainless steel nuts and washers.
7. Air and vacuum valves shall be Series RGX by Vent-O-Mat©. Valves shall be sized as indicated on the Drawings.

S. Pinch Valves (NOT USED)

1. Pinch valves shall be of the open body, full port design and shall be for service up to 75 psig. The valves shall be designed for a minimum of 50,000 cycles of operation. Valves shall incorporate a positive opening device to prevent collapsing under vacuum service. The manufacturer shall furnish certified test data of a bubble tight leakage test performance on each valve supplied.
2. Valves are to be of the full cast metal body, mechanical pinch type with flange joint ends on both the body and the sleeve trim. The valve shall have face-to-face dimensions of standard gate valves, in accordance with ANSI B16.10 up to 12" size. Sizes 14" and larger shall have a face to face dimension no longer than twice the nominal valve port diameter. The flanges shall be drilled to mate with ANSI B16.1, Class 125/ANSI B16.5, Class 150 flanges. The valve body halves are to be sealed with an elastomer

sheet gasket cut to fit the contour of the valve body. Body shall be epoxy coated for additional corrosion protection.

3. The sleeve trim shall be one piece construction with integral flanges drilled to be retained by the flange bolts. The sleeve trim shall be reinforced with calendared nylon or calendared polyester fabric to match service conditions. The sleeve trim shall be connected to the pinch bar by tabs imbedded in the sleeve trim reinforcing ply. All internal valve metal parts are to be completely isolated from the process fluid by the sleeve trim.
4. For full port and reduced port sleeves, the port areas shall be 100% of the full pipe area at the valve ends. For cone and variable orifice sleeves the inlet port area shall be 100% of the full pipe area, reducing to a smaller port at the outlet.
5. The steel mechanism shall be double acting with pinching of the sleeve trim occurring equally from two sides. ACME threads shall be used on all valve mechanisms. There shall be no cast parts in the operating mechanism.
6. For buried valve service, a torque tube shall be fitted to the body of the valve via a mounting plate. The tube shall extend from the valve to above grade level, providing protection for the operating stem and sealing the opening in the top body half. Valve shall be operated by turning a non-rising stem, contained within the torque tube, and connected to the pinch mechanism. Bevel gear operators shall be provided on all valves over 8" size, and on smaller sizes as specified on the purchase order. Torque tube shall be epoxy coated for additional corrosion protection. Valves shall be manufactured in the USA.
7. Rotating the handle clockwise, simultaneously lowers a pinch bar above the sleeve and raises a pinch bar below the sleeve, pinching the sleeve closed at the center of the valve. Turning the handle counter-clockwise separates the two pinch bars to open the valve.
8. Pinch valves shall be Series 75-B as manufactured by the Red Valve Co., Inc. of Carnegie, PA, or approved equal.

S. Vacuum Breakers (NOT USED)

1. Vacuum breakers shall be provided as shown on the drawings. Breakers shall be series "VB" as manufactured by Past-o-matic Valves, Inc., Totowa, NJ, or equal. Breakers shall be of Type 1, Grade 1 construction with stainless steel fasteners and shall have a one inch NPT connection.

T. Sampling Valves (NOT USED)

1. Sampling valves and fittings shall be provided on the discharge lines of pumps as shown on the Drawings. Valves shall be one inch stainless steel ball valves by Apollo or equal. The discharge side of each valve shall be provided with a 90 degree stainless steel elbow facing downward.

U. Floor Stands for Valves

1. Floor stands for valves shall be provided where shown on the drawings, and shall be the straight type design. The floor stands shall have a 15-inch long hand crank operator, and an operating reduction ratio of two to one. The floor stands shall be the rising stem type. The floor stands shall have a life nut, with Acme type threads, which shall engage an Acme threaded valve extension stem to raise or lower the valve. The threads and diameter of the lift nut shall be compatible with threads and diameter of the associated valve extension stem. The two to one reduction shall be accomplished with steel or cast iron gears which shall be designed for smooth operation and shall be able to support the operating loads without undue stress. The lift nut shall be of bronze and shall be mounted with roller bearings, which shall properly support the upward and downward thrusts encountered when operating the valves. The pinion shaft shall be mounted with roller and/or needle bearings. Lubrication fittings shall be provided for all bearings. All gearing, bearings, shafts, and the lift nut shall be housed in a weatherproof cast iron housing. Nuts and bolts shall be rustproofed steel. Seals shall be provided on all shafts and on the lift nut, where required, to exclude dirt and moisture, and to prevent leakage of lubricant. Floor stands shall be provided with stainless anchor bolts for installation.

2.07 TEMPORARY MANHOLES

- A. Temporary manholes shall provide convenient access to the temporary sewers and process lines during the construction of the proposed facility. The manholes shall be constructed of concrete block, brick, cast-in-place concrete, or precast concrete. Manholes shall be of the sizes and shapes required to provide convenient access and be of sufficient strength to withstand the traffic loads. Manholes shall have inverts and tables of concrete and/or brick. Manhole access shall be new or used reasonably watertight cast iron frame and cover with minimum 22 inch, and maximum 30 inch opening. Cover shall be maintained at temporary grade during construction.
- B. Following acceptance of the proposed facility and the abandonment of the temporary manholes, the temporary lines shall be plugged, the manholes demolished to at least two feet below proposed finish grade, and the manholes filled with clean backfill.

2.08 VALVE EXTENSION STEMS

- A. Valve extension stems shall be furnished as required and as shown on the drawings. Stems shall have a two-inch operating nut and a two-inch coupling for connection of the valves. Shaft lengths shall suit the particular installation. All exterior valves shall be provided with valve extension stems and valve boxes. All operating nuts shall be located 18 inches below finished grade.

2.09 VALVE BOXES

- A. Valve boxes shall be provided for buried valves. Valve boxes shall be cast iron, tar coated, sliding-type, adjustable together with a cast iron cover. For buried installations, bell end shall be sufficiently large to fit over the stuffing box of the gate valve.

2.10 VALVE TAGS

- A. NOT USED.

2.11 TAPPING SLEEVE AND VALVE (NOT USED)

- A. Tapping sleeves and valves shall conform to the latest specifications adopted by the AWWA and be of the specific size to suit the existing conditions.
- B. The tapping sleeves shall be mechanical joint, two part castings flanged on the vertical centerline, and come complete with all joint accessories. The surface area of each flange shall be thoroughly machined, and the sleeve flanges shall be fitted with lead gaskets. Each gasket shall cover the entire surface area of each joint for the full length of the sleeve. Bolts used to assemble the sleeves shall pass directly through each flange and through each gasket. This shall be properly spaced to insure uniform gasket pressure and compression.
- C. Sleeve outlets shall have counterbored flanges to insure proper centering of the tapping valve.
- D. All tapping valves shall be mechanical joint. Tapping valves shall conform to the specifications for gate valves (Municipal water lines).

2.12 DUPLEX STRAINERS (NOT USED)

- A. Strainers shall be manual duplex units with cast iron bodies and 125 lb flanged connections. Sizes shall be as indicated on the Drawings.
- B. Strainers shall have quick-opening, yoke type with Buna-N gaskets and elastomers. Bodies shall have NPT plugged drains. Strainer baskets shall be type 316 stainless steel with 1/8-inch perforations and bow-type handles. Flow diverters shall be tapered bronze valve plugs.
- C. Flow capacities shall be as indicated on the Drawings. Operating pressure drop shall not exceed 0.5 psig when measured with clean baskets and water.
- D. Strainers shall be standard Model #50 Series Manual Duplex Strainers by Hayward.

2.13 PRESSURE SENSORS AND GAUGES

- A. See Specification Section 15060 – Gauges.

2.14 CLEANOUTS

- A. Cleanouts shall be installed in the exterior piping at all bends in all sludge and scum lines and in other lines where shown on the drawings so as to allow clearing of the pipe(s) by rodding in either direction. Some bends therefore require two cleanouts. The four-inch riser pipe shown on the cleanout detail on the drawings shall be equipped with a bronze four-inch diameter cap. The dust cap shall connect to the flange adapter coupling without the use of threads. Two female quick disconnect coupling hose adapters shall be supplied for connection to hose. The hose adapter shall be four inches.

2.15 RESTRAINTS

- A. All valves and fittings shall be restrained, so that all thrusts shall be supported independent of the piping system. All restraints shall conform to pipe manufacturer's recommendation.
- B. For interior piping, restraints shall be located as follows:
 - 1. Anchors shall be placed so all forces will be balanced.
 - 2. Tiedowns shall be used to hold the pipe in position where velocity and surge forces will cause pipe movement. They shall control stress due to thermal expansion at wall pipes, sleeves and equipment.
 - 3. Guides shall be used to prevent transverse motion at flexible couplings used as expansion joints.
- C. Tie Rods: On piping, where flexible couplings are located near fittings or valves, stainless steel tie rods shall span the coupling from the two adjacent flanges. Such restraints can be deleted at the discretion of the Engineer, if both pipe ends are anchored in a concrete structure with no fitting or valve within the span. Where the Engineer intends to have flexible couplings used as expansion couplings, tie rods may be omitted. All tie rods shall be sized, spaced and installed according to the manufacturer's recommended procedure, or as directed by the Engineer.
- D. Thrust blocks shall be constructed at all exterior pipe fittings 22-1/2° and over, and valves, unless specifically ordered otherwise by the Engineer. The blocks shall be placed against undisturbed soil or against soil which has been compacted as specified in Division 2 for structures and pipes. Concrete used for thrust blocks shall be 3000 psi strength.

2.16 PIPE INSULATION

- A. The insulation for the pipe shall be a cellular glass type. It shall be a product which is made specifically for thermal insulation of underground piping and is compatible with the piping material.
 - 1. Insulation shall be composed of all glass sealed cells having no binders or fillers. The completed product shall be rigid and impermeable. Its ultimate compressive strength shall be at least 100 psi. The thermal conductivity of the cellular glass shall be no higher than 0.40 BTU/sq ft/F°/in.
 - 2. The cellular glass thickness shall be 2-inches thick. It shall comply with all requirements of federal specification HH-1-551 and ASTM C552.
 - 3. Bands for securing the insulation to the pipe shall be 0.5 inches wide by 0.020 inches thick and shall be made of stainless steel.
 - 4. Jacketing for buried insulation shall be flexible laminate consisting of asphalt and glass fabric. The material shall be prefabricated so that it can be wrapped around the insulation and easily secured in place. This flexible insulation covering shall be flexible and tough enough to be wrapped tightly around the insulation and secured without tearing or cracking.
 - 5. Jacketing for above ground insulation shall be standard gauge aluminum jacketing with stainless steel bands.

2.17 CHEMICAL INJECTION ASSEMBLIES (NOT USED)

- A. Provide chemical injection assemblies for points of chemical introduction into process pipelines as indicated on the Drawings. Assemblies shall be SAF-T-FLOW chemical injection assemblies by Ryan Herco Products Corporation or equal.
- B. Assemblies shall consist of ¾-inch brass corporations with wetted parts of PVC, Hastelloy C and Viton, and suitable for the chemical service intended. Check valve balls and seats shall be Teflon. Connections to chemical feed tubing shall be ½-inch NPT.
- C. Assemblies shall have stainless steel safety chains to allow the closing of the corporation stop without withdrawing the solution tube beyond the corporation packing.
- D. Assemblies shall be rated for 240 gallons per hour of chemical feed flow at 150 psig working pressure.

2.18 FOAM SPRAY NOZZLES (NOT USED)

- A. Nozzles shall be low pressure, standard spray, full-cone jet nozzles. Nozzles shall be high-grade, Type 316 stainless steel with removable caps and vanes. Nozzles shall have ½-inch NPT connections and 0.188-inch nominal orifice diameter and 0.125-inch maximum free passage diameter. Nozzle Capacity shall be 2.5 gpm per nozzle

at 10 psi and 2.1 gpm at 7 psi. Horizontal spray distance at 10 psi shall be 12.5 feet, 14 feet and 15.5 feet at nozzle heights of 3 feet, 5 feet and 7 feet above the water surface elevation respectively. Spray cone width at the tank water surface shall be 10.5 feet minimum at 10 psi. Twenty (20) spare spray nozzles shall be provided. Nozzles shall be Model ½ GG-316SS FullJet by Spraying Systems Company.

2.19 IN-LINE STATIC MIXERS (NOT USED)

- A. In-line static mixers shall be of a compact ring body design for mounting between two standard pipe flanges as sized on the Drawings. The ring body shall be a minimum thickness of 0.875 inches and shall be fabricated from Derakane FRP or Schedule 80 PVC.
- B. Ring-type neoprene gaskets shall be furnished and adhered to both sides of the mixer body. The mixer plate shall be designed to provide a geometric shape to create mixing vortices to effectively mix the injected chemicals with the process stream. The average variation in the process stream from the injection fluid shall be within 1 percent of the mean 10 pipe diameters downstream from the mixer.
- C. The mixing plate shall be no less than 0.125 inches thick and shall be Type 316 stainless steel. The mixer plate shall be mounted in a machined cavity on the upstream side of the ring body. The mixer body shall include two Type 316 stainless steel injection fittings as sized on the Drawings. Injection systems shall be designed for 100 psi working pressure. The in-line static mixers shall be Model 2800 by Westfall Manufacturing Company, Bristol, RI or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Handling of Pipe. The loading, hauling, unloading and handling of pipes and appurtenances shall be accomplished without damage to same. Dropping of pipe and appurtenances directly to the ground or floor will not be permitted. Suitable buffers or runners shall be provided. The Contractor shall be liable for any damage to the pipe or appurtenances until they are accepted in the completed work. Each pipe section shall be handled into its final position only in such a manner and by such means as the Engineer approves as satisfactory, and these operations will be restricted to those considered safe for the workmen and such as to cause no injury to the pipe or to any property. As far as practicable, the Contractor shall be required to furnish slings, straps, and/or approved devices to permit satisfactory support of the pipe when it is handled. Transportation from delivery areas to the trench shall be restricted to certain operations which can cause no injury to the pipe units.
- B. Tools for Pipe Installation. The Contractor shall furnish all tools, torque wrenches, materials and labor necessary to make the joints in pipe in strict accordance with the

manufacturer's specifications. Proper and suitable tools and appliances for the safe and convenient handling and installation of pipes shall be used. The Contractor shall exercise reasonable precaution during his operation in order to avoid damaging the material. All pipes, fittings or appurtenances which are so damaged shall be replaced by him at his sole expenses.

- C. Installation. All materials and equipment shall be installed in a neat workmanlike manner, and as recommended by the manufacturer. All piping shall be installed true to line and grade and rigidly supported. Pipe shall be installed with a constant slope and with a straight alignment between structures and fittings. When pipes are laid in a trench suitable coupling holes shall be dug to provide ample space for making joints and to allow the pipe to have bedding along its entire barrel length. Before setting wall sleeves and pipes to be cast-in-place, the Contractor shall check all plans and figures which may have a direct bearing on his pipe location and he shall be responsible for the proper location of his pipes during the construction of the buildings. A minimum of two, 1/4 lengths of pipe shall be used to connect to any manhole, pull box, foundation, building, structure and the like. All interior piping shall have sufficient number of unions or their equivalent to allow convenient disassembly and removal of piping. All valves and appurtenances shall be installed in accordance with manufacturer's directions at locations shown on the drawings. All in-line devices provided under instrumentation shall be installed as part of the work of this section.
- D. Cleaning and Plugging Pipe. The pipes and fittings shall be thoroughly cleaned before being laid and shall be kept clean until accepted in the finished work. The ends of all uncompleted lines shall be tightly closed with temporary plugs at all times when pipe laying is not in progress, and no trench water shall be permitted to enter the pipe.
- E. Trenching and Backfill. Trenching and backfill shall conform to the applicable provisions of the Earthwork Section of these Specifications. All pipes shall have a bedding of 3/4-inch stone from the face of the structure for a distance of ten feet or to undisturbed material.
- F. Screwed Connections. All threads shall be clean, machine cut, and all pipe shall be reamed before erection. Screwed joints shall be made up with good quality thread compound applied to the male thread only. After having been set up, a joint must not be backed off unless the joint is completely broken, the threads cleaned and new compound applied. Teflon tape or Teflon compound may be used for steel, polyvinyl chloride, chlorinated polyvinyl chloride and copper threaded connections.
- G. Arrangements. Except as otherwise required, changes in direction shall be made using proper fittings, and unless shown otherwise piping shall run parallel and at right angles to walls and floors. Systems shall be arranged with low points and drains to permit complete drainage of the system. Control piping may be arranged with unions

or union connections at low points to permit draining. Unions or flanges shall be provided close to main pieces of equipment and in branch lines to permit ready dismantling of piping without disturbing main pipe lines or adjacent branch lines.

H. Penetrations. All penetrations in walls, floors and ceilings shall be sealed watertight to the satisfaction of the Engineer.

3.02 PLASTIC PIPING (PVC and CPVC). The installation of plastic pipe for pressure service shall be strictly in accordance with the manufacturer's technical data and printed instructions and as follows:

A. General. The solvent welding procedure detailed herein applies to all Polyvinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC) pressure piping systems including molded fittings and socket type pump and valve connections.

B. Cement. Shall be a grade specifically recommended by the piping manufacturer for the size and schedule of pipe specified.

C. Pipe Preparation.

1. Cutting. Pipe shall be cut in accordance with the recommendations of the pipe manufacturer.

2. Deburring and Beveling. All burrs, chips, filings, and the like shall be removed from both the pipe inside diameter and outside diameter before joining. All pipe ends shall be beveled approximately 1/16-inch to 3/32-inch back from the edge at an angle of 10 to 15 degrees.

D. Fitting Preparation. Prior to solvent welding, all fittings and couplings shall be removed from their cartons and exposed for at least one hour to the same temperature conditions as the pipe in order to assure that they are thermally balanced before joining.

E. Cleaning. Pipe and fittings shall be clean of all loose dirt and moisture from the inside diameter and outside diameter of the pipe end and the inside diameter of the fitting. DO NOT ATTEMPT TO SOLVENT WELD WET SURFACES.

F. Priming. Apply primer to the pipe approximately 1/2 of the pipe diameter and in accordance with the manufactures recommendations. Apply primer freely in the socket keeping surface wet and applicator wet and in motion 5 to 15 seconds. Avoid puddling in socket. For checking penetration, you should be able to scratch or scrape a few thousandths of the primed surfaces away. Repeated applications to either or both surfaces may be necessary. Weather conditions do affect priming action. In cold weather more time is required for proper penetration.

G. Solvent Cement Application. Solvent cement application shall be in accordance with

the manufactures recommendation with a minimum of two coats. All excess cement shall be cleaned from the surfaces of the pipe and fittings.

H. Joining. Joining of PVC pipe and fitting shall be in accordance with the manufacturers recommendations and only at the below solvent welding joining temperatures and joint drying times:

1. THE ACTUAL JOINING SHOULD NOT BE DONE IN ATMOSPHERIC TEMPERATURES BELOW 40°F OR ABOVE 90°F, OR WHEN EXPOSED TO DIRECT SUNLIGHT.
2. NOT LESS THAN 48 HOURS OF JOINT DRYING TIME SHALL ELAPSE FOR ALL SIZES OF PIPE AND DRYING TEMPERATURES BEFORE THE JOINT IS MOVED OR SUBJECTED TO ANY APPRECIABLE INTERNAL OR EXTERNAL PRESSURE.

NOTE: Joints for plastic pipe shall be solvent welded except flanged or screwed where required. For plastic to steel, cast iron pipe or ductile iron pipe connections, complete metal pipe assembly first. Use flanged connections and tighten bolts evenly to prevent warping of rigid plastic pipe. A torque wrench may be used for a tight seal on gasket. Joints shall conform to manufacturer's recommendations installation of valves and fittings shall be strictly in accordance with manufacturer's instructions. In making solvent weld connections, the solvent should not be spilled on valves or allowed to run from joints. All completed pipe lines shall remain undisturbed for 48 hours to develop complete strength at all joints.

3.04 PVC PIPING. The installation of PVC pipe for sewers and conduits shall be strict accordance with the manufacturer's technical data and printed instructions.

- A. General. The pipe shall be laid with extreme care as to grade and alignment. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade. In order to insure a minimum amount of movement or disturbance, no more than two lengths of pipe may be laid before backfilling to a minimum of 12-inches over the pipe. Suitable coupling holes shall be dug to provide ample space for making joints and to allow the pipe to have bedding along its entire length. After laying each length to the line and grade shown, the trench shall be backfilled to the midpoint of the pipe and the trench compacted with special care taken to ensure that compacted material is placed under the haunches of the pipe. No walking upon or working over the pipes after it is laid will be permitted until it is covered with earth to a depth of at least 12-inches, except as may be necessary in tamping the earth and backfilling. All openings to the pipelines shall be satisfactorily protected to prevent the entrance of earth or water.
- B. Laying Pipe. Excavations shall be made to accommodate the bedding materials as previously specified. All excavations shall be kept dry while pipe is being laid and

until each joint and pipe has been inspected by the Engineer and approval given to commence backfilling operations. Any pipe which is not laid to grade and alignment shall be relaid to the satisfaction of the Engineer. No blocking shall be used.

1. The pipe is set with a laser beam. The laser beam projector shall be rigidly mounted with two point suspension, to its support platforms. This will assure that all ground equipment vibrations will be kept to a minimum and permit the laser beam to project itself coaxially through the center of the pipe. All units shall have equipment to control atmosphere conditions in the pipe that could affect the acceptable standard of construction. The laser aligning method selected shall be shown to have worked satisfactorily on at least three contracts, and is operated by competent, trained personnel. The Contractor shall establish center line and offset stakes at each manhole, plus one intermediate center line and offset stakes as a check point between manholes.

C. Allowable Pipe Deflection for PVC Pipe. Pipe installed under this specification shall have a maximum deflection of five percent at the time of testing. Such deflection is defined as the amount of vertical deformation (nominal inside diameter less the minimum vertical diameter when measured) multiplied by one hundred and divided by the nominal diameter of the pipe. Upon completion of a pipe section, including the placement and compaction of backfill, and the cleaning of the pipe, the Contractor shall measure the amount of deflection in all of the lines. This testing shall be done by the use of deflectometer, calibrated television or photography, or a properly sized "go, no go" mandrel or sewer ball. All lines with a deflection angle of greater than five percent shall be repaired by a re-bedding or replacement of the pipe.

3.05 LINES AND SLEEVES.

A. Lines, hoses, pipes, etc., installed in sleeves, including but not limited to chlorine solution, alum and lime discharges, shall have no joints, couplings, or fittings installed or located within the sleeve. All joints, couplings, and fittings shall be installed outside, in buildings, in pull boxes, or in manholes. The annular spaces between lines and sleeves at all structures shall be sealed watertight to the satisfaction of the Engineer.

3.06 FIRE HYDRANTS.

A. Fire hydrants and appurtenances shall be installed in accordance with the local municipal fire codes, and in accordance with specification Section 02641.

3.07 TESTING OF PROCESS PIPING

A. General. All piping and piping systems shall be leak tested by the Contractor in the presence of the Engineer. The Contractor shall provide typed and witnessed test reports for all such tests. One of two types of tests is required depending upon the

service of the pipe. Exfiltration/Infiltration tests shall be performed on all gravity sewers and on low pressure rated lines (five psi or less). Pressure tests shall be performed on all pressure lines including siphons and piping with pressure rated joints. All piping and piping systems not complying with the leak test shall be repaired or replaced by the Contractor to the satisfaction of the Engineer and be re-tested all at no additional cost to the Owner.

B. Exfiltration/Infiltration Test

1. After the completed line including service connections, if any, has been installed, the trench has been compacted to specification requirements, and manhole or joints showing noticeable streams or jets have been repaired and/or replaced the Contractor shall perform all exfiltration/infiltration tests. The Contractor shall be responsible for furnishing all labor, materials and equipment so that such tests can be accomplished at the times and locations necessary. The rate of infiltration/exfiltration shall not exceed 200 gallons per inch of pipe diameter per mile of pipe per day.

THE ATTENTION OF THE CONTRACTOR IS DIRECTED TO THE STRICT REQUIREMENTS RELATIVE TO MAXIMUM RATES OF INFILTRATION/EXFILTRATION AND TO THE IMPORTANCE OF THESE SPECIFICATIONS RELATIVE TO TIGHT JOINTS REQUIRED. LINES NOT MEETING THE ABOVE REQUIREMENTS SHALL BE REPAIRED AS NECESSARY AT THE CONTRACTOR'S EXPENSE.

2. Test Procedure

- a. When infiltration is observed the Contractor shall conduct V-notch weir infiltration tests. If such tests shown that the infiltration rate exceeds the limits specified above he shall make all necessary repairs to reduce the infiltration to the specified limit.
- b. When the V-notch weir tests as specified in Paragraph 1 above show that the rate is within the specified limits or when no infiltration has been observed an exfiltration test utilizing water or air shall be performed.

3. Exfiltration Tests

- a. Water tests shall be performed by filling the pipe with water to a point four feet above the top of the pipe at the upper end and measuring the water loss during a one hour period.
- b. For making low-pressure air tests, the Contractor shall use equipment specifically designed and manufactured for the purpose of testing sewer pipelines using low-pressure air. The equipment shall be provided with an air regulator valve of air safety valve so set that the internal air test using low-pressure air shall be made on each structure-to-structure section of pipeline.

Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressure without requiring external bracing or blocking. All air used shall pass through a single control panel. Low-pressure air shall be introduced into the sealed line until the internal air pressure reaches four psig greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe at the time of the test. However, the internal air pressure in the sealed line shall not be allowed to exceed eight psig. At least two minutes shall be allowed for the air pressure to stabilize in the section under test. After the stabilization period, the low-pressure air supply hose shall be quickly disconnected from the control panel. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig (greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe) shall not be less than that shown in the following table:

<u>Pipe diameter in inches</u>	<u>Minutes</u>
6	4.0
8	5.0
10	6.5
12	7.5
14	9.0
15	9.5
18	11.5

- c. For larger diameter pipe: Minimum time = 7.7 X Dia. (ft). When the pipe section to be tested contains more than one size of pipe, the minimum allowable time shall be based on the largest diameter pipe in the section.

C. Pressure Test

1. After the completed line including connections, if any, has been installed, the trench has been compacted to specification requirements and/or all supports and restraints have been installed, the Contractor shall perform all pressure tests. The Contractor shall be responsible for furnishing all labor, materials, and equipment so that such tests can be accomplished at the times and locations necessary.
2. All lines shall be pneumatically or hydrostatical tested for a period of two consecutive hours. The test pressure shall be that of the pipe design pressure or 1.5 times the apparent working pressure, whichever is the greater. The piping and piping system shall withstand the test pressure with a maximum loss of ten percent of the test pressure.

3.08 DISINFECTING AND FLUSHING

- A. The Contractor shall disinfect the lines carrying potable water.
- B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in the AWWA Standard for Disinfecting Water Mains, Designation C651-92, except as otherwise specified herein.
- C. The dosage shall be such as to produce not less than 10 parts per million after a contact period of not less than 24 hours.
- D. After treatment, the main shall be flushed with clean water until the residual chlorine content does not exceed 0.2 PPM.
- E. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.
- F. The Contractor shall dispose of the water used in disinfecting and flushing in an approved manner.
- G. If, in the opinion of the Engineer and/or owner, the above method of disinfection is deemed impractical; the lines carrying potable water shall be disinfected by the method outlined in AWWA Standard C651-92-Section 9.

3.09 PAINTING

- A. All piping shall be painted in accordance with specification Section 09900 – Painting.

3.10 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

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DIVISION 13

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SECTION 13300

INSTRUMENTATION AND CONTROLS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes furnishing all labor, materials, tools and equipment required to furnish and install complete modifications to the Town of Burrillville, RI Wastewater Treatment Facility (WWTF) Operations Building's existing MTU and RTU-1 control panels, modifications to the existing WWTF's SCADA system, a new pump control panel for the Oakland Pump Station, and instrumentation.
- B. The work required by this section shall include all primary instrumentation equipment and devices necessary to provide process data and monitoring as shown and as specified. The particular requirements of this section are specific in that this system supplier must furnish and install a system which will provide for a future input/output SCADA interface. All input/outputs (I/O) shall be collected as noted in the I/O lists of this project. The loop descriptions provide a functional description for the process portion of the system.
- C. The system supplier shall carefully review all requirements of this section in order to fully understand the limit of responsibility and the extent of what must be done to complete this portion of the system. It shall be understood that this system supplier will provide for a complete and operational I/O system that shall be completely documented and coordinated in order to provide for a complete system interface. Data collection shall be accomplished through hard-wired inputs to the PLC. All input/outputs (I/O) shall terminate at each of the respective panels.
- D. The capacity and quality of instruments and equipment shall be provided such that they perform the function described in the LOOP DESCRIPTION, as shown on the Contract Drawings and as listed in the Instrumentation List at the end of this section. It is the intent of this section of the specifications to specify a complete instrumentation and monitoring system. Anything that is not shown on the drawings but is mentioned anywhere in the specifications or vice versa, or anything not expressly set forth in either but which is reasonably implied, shall be furnished and performed as though specified, shown and mentioned in both. If an item appears in one area of the contract documents but not in another, it shall be provided in its entirety. This system supplier shall obtain and review complete set of the specifications and drawings prior to submitting final costs for the work of this section and/or any related sections.
- E. Equipment under this section shall be fabricated, assembled, installed, and placed in proper operating condition in full compliance with details, drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer as approved by the Engineer.
- F. The Instrumentation and Control System Supplier shall closely coordinate and cooperate with the supplier of the control panel and instrumentation furnished under the Section 11330 – Fine Screens.

- G. The Instrumentation and Controls System supplier under this Section shall insure total compatibility where interfacing between equipment is required and shall initiate and maintain close communication and cooperation with the supplier of the equipment throughout the shop drawing and equipment start-up and testing phases of the work and insure total compatibility of all required interfacing at no extra cost to the Owner.
- H. This Instrumentation and Controls System supplier shall be responsible for all input/output information transfer and communication between equipment PLC's. A Ethernet based fiber optic network shall be configured with this Instrumentation/Controls system and the existing SCADA system. A PLC to PLC network shall be established. All HMI screen configurations shall be the responsibility of this Instrumentation System Supplier. Provide all necessary man-hours as part of the final bid price for the work of this section to perform this work. Failure to do so and any associated additional costs shall be incurred by this system supplier and not the Owner.
- I. Due to the complexity of the work of this and other related sections and in order to establish a basis of bid for the equipment designed herein, a specific PLC manufacturer has been named within this section of the specifications. This has been done to match existing PLC equipment at the Treatment Plant Facility and other pump stations. In order to properly establish the requirements of this and other related sections, all system equipment and components for this PLC (Programmable Logic Controller) system as designed shall be as manufactured by Allen Bradley. Any deviation or substitutions at this time which requires any direct additional costs or additional work and results in additional costs for the requirements of this section shall be incurred by this Contractor and not the Owner. Also, any cabling data exchange changes, equipment changes, etc. shall be the responsibility of this system supplier to coordinate and provide as necessary to allow acceptability of the approved system. This shall be completely understood and there shall be no additional costs incurred due to failure to provide these requirements as noted. It shall be noted that all applicable DIVISION 11 sections and Section 13300 must provide the same manufacturer of PLC equipment for a compatible and complete system.
- J. Provide and configure a new pump control panel (PCP-1) for the Oakland Pump Station that shall include, but not be limited to, PLC, instrumentation, UPS system, power distribution equipment, motor starters, power supplies, Ethernet Switch, and CAT6 interface cable.
- K. At the WWTF configure the existing SCADA system PLC and SCADA system software to implement the WWTF's new Headworks Equipment and the Oakland Pump Station's new Pump Control Panel as specified herein and within contract documents.
- L. The Headworks Fine Screens PLC control panel is being provided under Section 11330. The CP-0105 PLC shall be networked with the SCADA system and MTU PLC via an existing Ethernet network through a Ethernet Switch connection in the existing SCADA RTU-1 control panel. All information collected through CP-0105 shall be available at the SCADA system. The CP-0105 control panel shall be located in the Operations Building Basement.

- M. At the WWTF modify the existing SCADA Control Panel RTU-1 to provide fused 120VAC power from the existing UPS backed 120VAC power system to power a new Intrinsically safe barrier panel.
- N. At the WWTF the following instrumentation shall be replaced with new, modify the existing SCADA Control Panel RTU-1 PLC and SCADA system software to accommodate the change is instrumentation.
1. Existing Headworks Oxygen Level Transmitter (AIT-0101) is being replaced with a new Oxygen Level Transmitter. Add a high level alarm to existing control loop.
 2. Existing Headworks Combustible Gas Level Transmitter (AIT-0102) is being replaced with a new Combustible Gas Level Transmitter. Add a high level alarm to existing control loop.
 3. Existing Headworks Hydrogen Sulfide Gas Level Transmitter (AIT-0103) is being replaced with a new Hydrogen Sulfide Gas Level Gas Level Transmitter. Add a high level alarm to existing control loop.
 4. Existing Influent Wet Well #1 Float Switch (LSH-0110) is being replaced with a new float switch. Control loop to remain the same.
 5. Existing Influent Wet Well #1 Bubbler Level Signal (LT-0110) is being replaced with a submersible level transmitter. Control loop to remain the same.
 6. Existing Influent Wet Well #2 Float Switch (LSH-0120) is being replaced with a new float switch. Control loop to remain the same.
 7. Existing Influent Wet Well #2 Bubbler Level Signal (LT-0120) is being replaced with a submersible level transmitter. Control loop to remain the same.
 8. Existing Influent Venturi Flow Meter Signal (FIT-1000) is being replaced with an Magnetic flow meter. Control loop to remain the same.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300 - Submittals:
1. Manufacturer's data, order sheet or equivalent for each individual instrument or device being supplied. The information shall include but not be limited to model number, exact chart, scale or calibration range, type of enclosure and mounting, input/output and power data and the instrument tag number (or loop number for auxiliary equipment). Sales literature will not be accepted.
 2. Manufacturer's outline and mounting dimensions for all field mounted devices, and scaled layout drawings for primary and supplemental control panels, including interfacing details for equipment to be supplied under DIVISION 11.
 3. Manufacturer's panel color selection with color samples.

4. Complete master wiring diagrams including field wiring requirement, elementary or control schematics including coordination with other electrical devices operating in conjunction with the instrument control panels. Suitable outline drawings shall be furnished for approval before proceeding with manufacture and shall include number of conduits and wires, size, tubing and mounting. It shall be required that this system supplier also refer to all other interrelated specifications and drawings. Therefore it is imperative that this system supplier obtains a complete set of contract specifications and drawings as part of the work and requirements of this portion of the system. Due to the complexity of the control functions, it is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard preprinted sheets or drawings simply marked to indicate applicability to this contract will not be acceptable.
 5. The system supplier shall clearly identify any exception to the specification or drawings. Failure to do this will be grounds for rejection of the submittal.
 6. The services of the instrumentation system vendor's factory engineer shall be included as part of the bid price to meet with the Engineer at his office for a minimum of two, 8-hour days to review shop drawings for this Section prior to approval by the Engineer.
- B. For approval before release for manufacturing:
1. Instrument and control panel layout to scale or dimensioned with overall size mounting and field entries dimensioned.
 2. Preliminary loop diagrams and logic diagrams in the I.S.A. & NEMA standard and shall include piping and wiring requirements for each loop.
 3. All equipment to be furnished under this Section must be approved prior to any of this equipment being released for manufacturing unless otherwise noted by the Engineer.
- C. Prior to final acceptance:
1. Final loop diagrams containing start-up data (to I.S.A. standard).
- D. Shop drawings shall be submitted in accordance with Section 01300 - Submittals and include the following special conditions:
1. All material submitted for review shall be contained in one submission. The material shall be furnished in bound volumes as required for a complete submittal. Loose material submitted will not be reviewed. Partial submittals unless agreed to by the Engineer will not be reviewed. Sales bulletins or other general publications are not acceptable as submittals.
 2. One set of reproducible drawings, size 2 feet x 3 feet. The Engineer reserves the right to accept or reject half size (11" x 17") reproducibles in lieu of 2 feet by 3 feet size. Half size copies shall be bound with each copy of the submittal.

3. If more than two submittals (initial submittal and one re-submittal) are required for approval, the system supplier shall be liable for back charges for the Engineer's services to review additional submittals.
 4. The instrumentation manufacturer shall furnish a complete set of the final approved wiring diagrams to the Electrical Contractor and supplier of filtration equipment.
- E. Shop drawing review period for this section shall extend beyond the specified period as defined in Section 01300 - Submittals. Due to the complexity of the system the review period allowed shall be a minimum of forty-five (45) days unless otherwise agreed to by the Engineer.
- F. Operation and Maintenance Manuals shall be submitted in accordance with the requirements of Section 01730 - Submittals.

1.03 RESPONSIBILITY FOR EQUIPMENT

- A. The Instrumentation and Controls Contractor shall be responsible for furnishing, installing, and placing in satisfactory operation all instruments, appurtenant process equipment, piping, and accessories, and shall coordinate all instrumentation, telephone modems, and Ethernet communication system equipment, analytical equipment, computer hardware, software, and peripherals, etc., to guarantee a complete and operational system. All panels, instruments, signal conditioners, switches and other devices, including computer equipment and software, shall be furnished by the same supplier.
- B. System responsibility, under Section 13300 (Instrumentation and Control System) shall be by a single Instrumentation and Controls Contractor. All instruments, equipment, panels, and computer hardware and software shall be provided by a single instrument system supplier. The system supplier shall be responsible to the Instrumentation and Controls Contractor for satisfactory startup, testing, calibration, operator training and successful operation of the entire integrated system.
- C. The Instrumentation and Controls Contractor shall coordinate the work of the system supplier's service personnel during construction, testing, start-up, calibration and acceptance of the system.
- D. The Instrumentation and Controls Contractor shall have in his employ the capable personnel for detail engineering, coordination, drafting, procurement and expediting, scheduling, construction inspection, installation, start-up service for calibration and commissioning, as specified and warranty compliance for the period specified.
- E. The Instrumentation and Controls Contractor shall provide for complete operation of all signals from "point to point" and shall assure complete compatibility of all equipment specified herein in DIVISION 11 - EQUIPMENT. It shall be the instrumentation and control system supplier's sole responsibility to resolve any and all interconnecting and interfacing problems in order to provide a completely integrated and operational system. The instrumentation and control system supplier shall provide all necessary coordination with DIVISION 16 - ELECTRICAL in providing the proper I/O (Input/Output) required

at all locations for a complete system.

- F. The supervisory service of a factory-trained service engineer, specifically trained on the type of equipment specified herein, shall be provided during construction to assist the General and Electrical Contractors in the location of sleeves, method of installing conduit and special cable, mounting, piping and wiring of each type of device and the method of protecting all of the equipment prior to placing it into service.
- G. It is the responsibility of the Instrumentation and Controls Contractor to assure that all instrumentation furnished under DIVISION 11 - EQUIPMENT is coordinated with equipment, hardware and software furnished under this Section. All primary sensing elements, transmitters, analyzers, and associated instruments being furnished under DIVISION 11 - EQUIPMENT shall be of the same manufacturer. It shall be this Contractor's responsibility, at the time of the bidding, to coordinate with the suppliers of each of these sections in order to assure that this requirement is upheld. Both suppliers shall agree, at the time of submitting their bids, that their bid prices reflect this requirement. Failure to meet this requirement, which results in any additional costs for this equipment, shall be the responsibility of this Contractor at no additional cost to the Owner. No exceptions shall be allowed.

1.04 DESIGN CRITERIA

- A. The Contractor shall provide a complete and operational system. This equipment shall be provided as described in this Section. It shall be the Contractor's responsibility to coordinate the installation of this equipment with all other associated equipment and to provide for a complete and operational system.
- B. The Work of this Section shall require field equipment interconnections. This Section shall describe the field equipment for interconnections but does not detail each specific point-to-point connection. It shall be the Contractor's responsibility to verify and coordinate final connections to all equipment.
- C. Control panel enclosures and components shall be Underwriters Laboratories (UL) recognized or listed, where such components are available. The complete control panel assembly shall be constructed by an accredited UL-508 fabrication and wiring assembly shop in accordance with UL-508 and related UL standards.
- D. The Work of this Section shall adhere to the requirements of the standards listed below as applicable. The latest edition in effect at the time of bid opening shall apply.
 - 1. American Petroleum Institute (API)
 - 2. The Instrumentation, Systems and Automation Society (ISA)
 - a. ISA S5.4, Instrument Loop Diagrams.
 - b. ISA S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
 - c. ISA RP60.3, Human Engineering for Control Centers
 - d. ISA RP60.6, Nameplates, Labels, and Tags for Control Centers
 - 3. National Electrical Manufacturers Association (NEMA)

4. National Fire Protection Agency (NFPA)
 - a. NFPA 70, National Electrical Code (NEC).
 - b. NFPA 79, Standard for Industrial Machinery.
5. Underwriters Laboratories, Inc. (UL)
 - a. UL 508, Standard for Industrial Control Equipment.
 - b. UL 698A, Industrial Control Panels Relating to Hazardous (Classified) Locations.
6. American Society for Testing and Materials (ASTM)
 - a. ASTM A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.05 SYSTEM DESCRIPTION

- A. Each loop description contains the basic functional description of the process. All components necessary to complete these functions shall be provided to satisfy the requirements of this section.
- B. Contacts referred to in the Loop Descriptions shall be "dry" type either normally open or normally closed as required for the function described. All contacts shall be rated 10 ampere at 120 volts.
- C. The scales of instruments and devices described in the instrument loop descriptions shall be as specified and noted in the Instrument List. All indicator scales shall read out in appropriate "Engineering" units. In cases where this information is not provided this shall be clarified and coordinated with the Engineer.
- D. Loop descriptions (and associated Loop Drawings) are intended to provide a conceptual overview of required system operation. Each of the loops may or may not show all specific components necessary for each system operation. The instrumentation system supplier shall provide all necessary equipment, devices, components, signal conditioners, software, and other requirements for complete and satisfactory system operation. The system supplier shall provide all necessary current-to-current converters (I/I's) required by loop description to provide proper signal loading.
- E. All signal interfacing compatibility is the responsibility of the supplier of equipment under Section 13300 (Instrumentation and Control System) and requires close coordination and cooperation with the supplier of equipment under DIVISION 11 - EQUIPMENT. In the loop description, any equipment or device which is not noted but shown elsewhere on loop drawings, specifications, etc. shall be provided by this system supplier in its entirety. Anything that is not shown on the drawings but is mentioned anywhere in the specifications or vice versa, or anything not expressly set forth in either but which is reasonably implied, shall be furnished and performed as though specified, shown and mentioned in both. If an item appears in one area of the contract documents but not in another, it shall be provided in its entirety. This system supplier shall obtain

and review complete copies of both the specifications and drawings prior to submitting final costs for the work of this section and/or any related sections. Any discrepancies shall be brought to the attention of the Engineer prior to submission of the final bid price in order to clarify any and all issues.

1.06 INSTRUMENTATION AND CONTROL SYSTEM SUPPLIER

A. The Instrumentation and Control System Supplier shall be the following with no substitutions allowed as the City has standardized on this supplier for their SCADA can controls systems.

1. R. E. Erickson Co., Inc.
Walpole, Massachusetts
508-668-9330

1.07 GENERAL MONITORING AND CONTROL REQUIREMENTS

- A. PLC programs shall be configured to allow operators, with the appropriate security clearance, to modify set points, pump sequencing, timer settings, etc. readily using the OITs or SCADA display screen. PLC programs shall be configured to allow logic modification by an operator, with the appropriate security clearance, using the programming devices and software provided under this Contract.
- B. Control logic, alarm logic and totalization calculations shall be executed via the PLC programs and not the OIT or SCADA graphic display software.
- C. Discrete alarms shall be configured with adjustable time delays (initially set at 3 seconds). Each discrete alarm time delay shall be independently adjustable.
- D. Analog inputs shall be provided with high and low alarm set points initially set at 80% and 20% of span, respectively, unless otherwise noted. High alarm set point dead bands shall default to a range from the set point to 3% of span below the set point unless plant personnel enter a different value. Low alarm set point dead bands shall default to a range from the set point to 3% of span above the set point unless plant personnel enter a different value. Each alarm dead band shall be independently adjustable.
- E. Alarms shall have the capability of being disabled from a security accessed only alarm enable screen located on the main SCADA computer only.
- F. Controlled equipment shall require only one positive selection of the control action by an operator before the command is executed.
- G. Sequential operations and sequential logic shall incorporate timers to alarm an incomplete sequence or malfunction. An alarm shall be generated if a required action or sequence of actions is not completed within an adjustable time period.
- H. Alarm set points, dead bands and time delays shall be accessible from the OITs or SCADA display screen by an operator with the appropriate security clearance.

- I. An operator must acknowledge an alarm displayed at the OITs or SCADA display screen before it clears. Alarm and acknowledgement logic shall follow the ISA S18.1 standard for manual reset (sequence M, Manual Reset).
- J. All motors, valves and mechanical equipment shall have an “available” status indicator when the device is available for remote automatic or manual control. Provide an alarm to notify plant personnel when a component becomes “unavailable.”
- K. Equipment shall be restarted either automatically or manually, as determined by the Engineer and Owner. Equipment shall fail in last position, or an Owner and Engineer determined safe position.
- L. Equipment shall be manually controlled either locally or remotely through the OIT and SCADA display screen unless otherwise indicated.
- M. Communication status between all PLCs shall be monitored and displayed. Communication failures shall be alarmed.

1.08 OAKLAND PUMP STATION LOOP DESCRIPTIONS

A. LOOP 0010: WET WELL LEVEL MONITORING

- 1. The Wet Well level shall be measured by a submersible level transducer (LT-0010) and hardwired through an intrinsically safe isolator into the PCP-1 PLC. Level shall be indicated the OIT.
- 2. The level transmitter (LT-0010) shall provide a 4-20 mA DC output signals proportional to the wet well level to the PLC. This signal shall be the primary means for automatic pump control, refer to Loop 0002. The Levels shall trigger high and low level alarms that are to be displayed at the OIT.
- 3. High and Low Level float switches (LSH-0010A, LSH-0010B, LSL-0010) shall be installed in the wet well. These switches shall provide backup alarms to the level transducers as well as providing a hardwired control of the pumps in case of a PLC, UPS, or transducer failure. The float switches shall be wired through intrinsically safe relays. A contact from each intrinsically safe relay shall be wired to the PCP-1 PLC, to PCP-1 Control Panel LED pilot lights for high and low level alarms and to back-up level control as described in Loop 0011.

B. LOOP 0011: SEWAGE PUMP #1

- 1. Sewage Pump #1 is controlled via an soft start motor starter. Operation of Sewage Pump #1 shall be monitored and controlled automatically through the PCP-1 PLC via hardwired I/O. A Hand/Off/Auto selector switch shall be mounted on the PCP-2 Control Panel door. When in the “Auto” position the remote automatic control and remote manual control through the PCP-2 OIT is enabled.
- 2. The following control, status and alarm signals shall be wired to the PLC I/O and displayed at the OIT and SCADA HMI:

- a. Sewage Pump #1 HOA switch in “Auto” position (YI-0011A)
 - b. Sewage Pump #1 run status (YI-0011B)
 - c. Sewage Pump #1 Start/Stop (YS-0011)
 - d. Sewage Pump #1 soft starter alarm (YA-0011A)
 - e. Sewage Pump #1 high motor temperature alarm (TSH-0011)
 - f. Sewage Pump #1 seal leak alarm (MSH-0011)
3. Non-resettable elapsed time meter shall be displayed at the OIT and SCADA HMI (KQI-0011B).
 4. A pump state disparity alarm shall be displayed at the PCP-1 OIT if the called state of the motor and the state of the run status contact do not agree after a preset adjustable time (YA-0011C). The disagreement alarm is enabled if the H/O/A switch is in the “Auto” position. The disagreement alarm must be manually reset through the PCP-1 OIT before Remote Automatic Control and Remote Manual Control is enabled.
 5. Remote Automatic: It shall be possible to select either Pump #1 and Pump #2 as Lead or Lag through the PCP-1 OIT. The Lead Pump shall come on when the level in the Wet Well exceeds an operator configurable high level set point, and the Lag Pump shall come on when the level in the Wet Well exceeds an operator configurable high-high level set point. The Lead and Lag Pumps shall shutdown when the level in the Wet Well drops below an operator configurable low level set point. The Lead and the lag pumps shall automatically alternate between Lead and the Lag designations every pump cycle.
 6. Remote Manual Control: The pump is manually start/stopped (YS-0011) via the PCP-1 OIT.
 7. If a pump is not available for service because of the following, the Lag Pump shall take over as the Lead Pump. The pump shall be locked out upon a disparity alarm or system protection alarm and must be manually reset before it can resume operation.
 - a. Disparity alarm (see below),
 - b. Motor over temperature alarm.
 - c. HOA switch is not in “Auto”.
 8. A pump disparity alarm (YA-0011B) occurs when a pump is called to start and the pump run status contact does not close within an operator selectable preset time (initially set at 30 seconds) or when a pump is called to stop and the pump run status contact does not open within the preset time. The disparity alarm logic shall be disabled if the H-O-A switch is not in the “Auto” position.

9. Back Up Level Control

- a. Back-up hardwired pump control logic utilizing the high level and low switches (LSH-0010A, LSH-0010B, and LSL-0010) in the Wet Well shall be provided.
- b. If the Wet Well level reaches the high float switch level (LSH-0010A) it is assumed that there has been a failure of the primary level instrumentation and/or the PLC and therefore the float switches and hardwired pump control logic shall be used for automatic pump control.
- c. When the Wet Well level exceeds the high level float switch level (LSH-0010A), Pump #1 shall be started. When the Wet Well level drops below the float switch low level (LSL-0010) the pump shall be stopped.
- d. When the Wet Well level exceeds the high-high level float switch level (LSH-1100B), Pump #2 shall be started. When the Wet Well level drops below the float switch low level (LSL-0010) the pump shall be stopped.
- e. Automatic control shall continue in this manner until manually reset by an operator at the PCP-2 OIT and then automatic pump control shall revert to the primary level instrument.
- f. A Primary Level Control Enable Switch shall be provided to enable and disable the PLC level control in order to test the hardwired float switch back up level control.

C. LOOP 0012: SEWAGE PUMP #2

1. Functionally identical to Loop 0011.

D. LOOP 0015: GENERATOR MONITORING

1. The following status and alarms shall be hardwired into the PCP-1 PLC and displayed/annunciated at the PCP-1 OIT:
 - a. Generator on (YI-0015A)
 - b. Generator not in auto (YI-0015B)
 - c. Generator failure (YA-0015A)
 - c. Generator alarm (YA-0015B)
 - d. Generator Low Fuel Tank Level (YA-0015C)
 - e. Generator Fuel Tank Leak (YA-0015D)

E. LOOP 0016: TRANSFER SWITCH MONITORING

1. The following status and alarms shall be hardwired into the PCP-1 PLC and displayed/annunciated at the PCP-1 OIT:
 - a. Transfer switch in normal position (YI-0016A)
 - b. Transfer switch in emergency position (YI-0016B)

F. LOOP 0017: RTU-1 PANEL POWER MONITORING

1. Loss of 120 VAC power to the new PCP-1 control panel (JAL-0017A) shall be annunciated at the PCP-1 OIT.
2. A 24 VDC power supply failure in the new PCP-1 control panel (JAL-0017B) shall be annunciated at the PCP-1 OIT.
3. The UPS failure in the new PCP-1 control panel (JAL-0017C) shall be annunciated at the PCP-1 OIT.

I. LOOP 0018: SECURITY SYSTEM ALARMS

1. The electrical building door has an existing door magnetic contact switch that shall be wired into the PCP-1 PLC for security monitoring. The PCP-1 OIT shall have a security screen that shall allow an operator a timed security enabled and disable pass code entry to activate and deactivate the security monitoring. When the security monitoring is enabled and the door switch is detected to be open a configurable timer shall start and when timed out the system shall send a dry contact signal to the existing alarm dialer.

J. LOOP 0019 STATION ALARM

1. An existing wall mounted alarm dialer is located in the pump station's electrical building. The following alarm dry contract signals shall be provided for interface to the existing alarm dialer.
 - a. Wet Level High. Combination of PLC Alarm and hardwired dry contact from LSH-0010 signal. (YA-0019A)
 - b. Building Intrusion (YA-0019B)
 - c. Generator Alarm. Combination of all generator alarms in LOOP 0013 (YA-0019C)
 - d. Transfer Switch in Emergency Position (YA-0019D)
 - e. Power Failure Alarm. Combination of 120VAC Power Failure, Power Supply Failure, and UPS Failure (YA-0019E)
 - f. Sewage Pump #1 Alarm. all Pump #1 alarms in LOOP 0011 (YA-0019F)

- g. Sewage Pump #2 Alarm. all Pump #1 alarms in LOOP 0012 (YA-0019G)
- 2. A 24VDC alarm buzzer shall be mounted on the pump control cabinet door and a 120VAC red alarm beacon light shall be mounted on the side of the pump station building. Both the horn and beacon shall be controlled via the PCP-1 PLC (SAL-0019) in which they will be activated on upon any new alarm condition listed above and stay activated until manually reset via at panel mounted alarm reset pushbutton (RAL-0019). The 120VAD red alarm beacon shall be powered from the pump control panel.

1.09 WWTF LOOP DESCRIPTIONS

A. LOOP 0101: HEADWORKS COMBUSTIBLE GAS MONITORING

- 1. A combustible gas detector transmitter (AIT-0101) shall be located on the station's lower and shall be connected to the MTU PLC via hardwired I/O in RTU-1. The gas level shall indicated at the OITs and SCADA HMI.
- 2. The gas level shall be trended and recorded (AIR-0101) at the SCADA HMI.
- 3. High gas level alarms (AAH-0101, AAHH-0101) shall be based on SCADA HMI entered gas alarm setpoints.
- 4. An Alarm dry relay contract shall be hardwired to a gas alarm station (YA-0100) that shall sound a horn and illuminate an alarm beacon, the alarm station shall have a horn silence pushbutton.

B. LOOP 0102: HEADWORKS TOXIC GAS MONITORING

- 1. Functionally identical to Loop 0101.

C. LOOP 0103: HEADWORKS OXYGEN GAS MONITORING

- 1. Functionally identical to Loop 0101 expect the following:
- 2. Low gas level alarms (AAL-0103, AALL-0103) shall be based on SCADA HMI entered gas alarm setpoints.

D. LOOP 0104: HEADWORKS EXHAUST FAN

- 1. The Headworks Exhaust Fan is controlled via a wall mounted VFD. Operation of the Exhaust Fan shall be monitored and controlled automatically through the MTU PLC via hardwired I/O in MTU. The Exhaust Fan has a Hand/Off/Auto selector switch on the VFD door, when in the "Auto" position the remote automatic control and remote manual control through the SCADA HMI and the OITs is enabled.
- 2. The following control, status and alarm signals shall be wired to the PLC I/O and displayed at the SCADA HMI and OITs:

- a. Headworks Exhaust Fan H/O/A selector switch in “Auto” (YI-0104A)
 - b. Headworks Exhaust Fan Run status (YI-0104B)
 - c. Headworks Exhaust Fan Start/stop pump (YS-0104)
 - d. Headworks Exhaust Fan speed feedback (SI-0104)
 - e. Headworks Exhaust Fan speed control (SC-0104)
 - f. Headworks Exhaust Fan VFD Alarm (YA-0104)
3. Non-resettable elapsed time meter shall be displayed at the OITs and SCADA HMI (KQI-0104).
 4. A motor state disagreement alarm shall be displayed at the OITs and SCADA HMI if the called state of the motor and the state of the run status contact do not agree after a preset adjustable time (YA-0104A). The disagreement alarm is enabled if the H/O/A switch is in the “Auto” position. The disagreement alarm must be manually reset through the SCADA HMI or the OITs before Remote Control is enabled.
 5. Remote Automatic Control: When placed in automatic mode the Exhaust Fan shall start (YS-0104) and continuously run until removed from automatic mode. The VFD speed command (SC-0104) is set based on pre-determined speeds for 6 air changes per hour or 12 air changes per hour per an operator selectable air change rate switch on the SCADA HMI and the OITs.
 6. Remote Manual Control: The Exhaust Fan is manually start/stopped (YS-0104) and VFD speed command (SC-0104) is manually entered via the SCADA HMI and the OITs.

E. LOOP 0105: INFLUENT SCREENINGS SYSTEM

1. The operation of the Influent Screenings System is through a manufacture supplied PLC based control panel, See Section 11330. All controls, alarms and indications data shall be transmitted via an Ethernet data exchange and displayed and trended at the SCADA HMI.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The INSTRUMENT LOOP DESCRIPTION, DIAGRAMS, AND INSTRUMENT LIST included at the end of this section indicate the intent of the process and interconnection between INSTRUMENTS. EQUIPMENT specified herein does not purport to cover all equipment that may be required to complete the process intent. Numbering identification is based on ISA standard. The instrument index sheets included within this section of the specifications have been furnished to summarize the system equipment and to list the

operating parameters for this equipment. This list may not completely include all the required equipment necessary for a completely operational system. The instrument supplier shall provide all necessary equipment required in order to perform the function for the system.

- B. All equipment shall be of the latest proven design. First generation equipment with less than three years general use shall have documentation on construction operation, field test and user list.
- C. All equipment shall be suitable for operation in the environment of the Project.
- D. Transmission to and from analog devices shall be 4-20 mA dc.
- E. All signal converters, isolation transformers, uninterruptible power supplies (UPS), power regulators, or power converters shall be the responsibility of the instrument supplier. The loop descriptions herein do not specify all hardware required for proper operation. It is the responsibility of the Instrumentation supplier to furnish and install all necessary equipment for complete systems.
- F. All equipment necessary to complete the functional requirements of this Section shall be supplied by the Instrumentation and Control System Supplier and be of the same manufacturer unless otherwise specified (e.g. signal converters, integrators, computing devices alarm trips etc.) shall be of the same manufacturer as the recorders, controllers and indicators.
- G. All necessary fuses or switches required by the Instrumentation and Control System Supplier for his equipment shall be provided with the equipment. All instruments requiring an external power supply shall have an internal ON-OFF switch.
- H. Indicator, recorders, controllers, integrators, relays, and other receiving devices, when operating in a loop shall be of a design such that a failure of an individual device shall not effect the operation and integrity of the remaining loop functions. All indicators, recorders either remote or panel mounted shall have an individual internal on/off switch.
- I. Electronic transmitting equipment shall provide loop power. True 2-wire transmitter may have its loop power supplied in the receiving instrument, if available, or by a plug in power supply mounted in the receiving instrument panel.
- J. All conductors running from the field to the control panel shall be of a single, continuous length, without splices except at approved junction boxes. The junction boxes shall have terminal blocks with 20 percent spares in addition to terminals for all wires including spare wires. Special care shall be exercised to carry grounding lines through such junction boxes with the least possible resistance.
- K. Multi-conductor cable may be used between junction boxes and control panels.
- L. All shielded cable shall be grounded at the control panel end only. Shields shall be carried through junction boxes with the least possible resistance and kept isolated from ground at these points. The field end of the shield shall be insulated to prevent grounding.

- M. All field electronics and outdoor control panel equipment shall be suitable for operation in ambient temperatures of -40 degrees F to 140 degrees F. All indoor control panel located electronics shall be suitable for operation in ambient temperatures of 40 degrees F to 120 degrees F.
- N. All external connection points shall be made at terminal blocks with No. 6-32 or larger screws.
- O. Nameplates shall be provided on all field mounted transmitters, level relays, control panels, indicators, etc. Nameplates shall be identical to those specified for Control Panels.

2.02 CONTROL PANELS

- A. Control panels as noted in the table at the end of this Section shall be furnished under SECTION 13300, INSTRUMENTATION AND CONTROL SYSTEM.
- B. The instrumentation system supplier shall provide all instrument devices necessary for proper input/output (I/O) operation. This shall include all signal conditioning, isolation and operation equipment.
- C. Provide custom Pump Control PLC based panel (PCP) capable of controlling two separate 25 HP, 3-phase, 208 volt submersible sewage pumps. The panel shall contain but not limited to a main power circuit breaker with through panel disconnect, distribution pump circuit breakers, soft start motor starters, control power transformer, relays, selector switches, indicating lights, power supplies, PLC equipment, OIT, and etc.
- D. A 208 volt, 3-phase, 200 amp power feed shall be provided to the control panel. Provide a lug for grounding connection of up to a No. 1/0 AWG conductor.
- E. Panel Enclosures
 - 1. Control panel shall be NEMA 12 constructed from 10 gauge steel. All seams shall be continuously welded and smooth. Doors shall have three point latching mechanism with vault type operating handle, continuous heavy duty hinges and provisions for pad locking. Door gaskets shall be neoprene attached with oil resistant adhesive. Body stiffeners shall be used where enclosures exceed 36 inches in width. Panel dimensions shall not exceed 36" wide x 60" in height.
 - 2. The panels shall be free of dents or other defects.
 - 3. The panels shall have an angle frame. The frame and shell shall be welded construction.
 - 4. Data storage pockets shall be provided on the inside of each panel and shall be of sufficient size to hold all of the prints required to service the equipment.
 - 6. Each panel shall be provided with a key lockable front handle. Provide gaskets as required to maintain the panel NEMA rating as specified herein.
 - 7. Provide a door stop kit for the panel to secure the door in the 90-degree open

position.

- F. All wiring within the panel shall be grouped together in harnesses and secured to the structure. Terminal blocks shall be provided for all external connections to the control panel and for all connections between the component mounting plate and enclosure mounted components to allow for easy removal of the component mounting plate if required for service. Terminal blocks shall consist of individual snap together contact sections mounted on a common mounting channel. Terminal block sections shall have tubular screw contacts mounted in a nylon housing to resist breakage; phenolic or other rigid, brittle materials shall not be considered equal. Plan screw contacts requiring lugs to be installed on wires shall not be considered equal.
- G. A complete master wiring diagram and elementary or control schematic shall be furnished and submitted for approval prior to manufacturing. Diagram shall indicate at a minimum the power distribution circuit, pump power/control circuits, terminal and wire numbers, control devices, and pilot lights.
- H. Circuit breakers shall be molded case, two pole with voltage and ampere ratings as required. A through door handle distribution circuit breakers for each pump shall be provided. The interrupting capacity shall be not less than 20KA, RMS symmetrical.
- I. Control power transformers shall supply 120VAC control power and be properly sized for all control loads plus an additional 25%. Transformer secondaries shall be equipped with time-delay fuses.
- J. A hand-off-automatic selector switch shall be provided for each pump. Selector switches shall be three position maintained type of heavy duty oil-tight construction. Toggle switch types shall not be considered equal. Selector switch contacts shall be heavy duty, double-break, silver. Switches shall be mounted through the control panel enclosure.
- K. Pump running indicating lights shall be provided and be heavy duty, oil tight, LED type.
- L. Provide Elapsed Time Meters shall be non-reset meter for each pump to indicate elapsed time of operation of the pump from 0 to 99,000.9 hours. The meters shall be mounted through the pump control panel enclosure.
- M. Provide a front panel mounted 24VDC alarm buzzer.
- N. The Instrumentation and Control System Supplier shall provide all instrument devices necessary for proper input/output (I/O) operation. This shall include all signal conditioning, signal isolation, surge/lightning protection and operational equipment for the system.
- O. Control panel(s) shall be completely assembled and wired at the Instrumentation and Control System Supplier's factory. All panels shall be UL listed and labeled. Refer to the Contract Documents for exact location and layout of each of the panels.
- P. All inputs/outputs (I/O) for electrically operated or motor-driven equipment shall be complete, including all necessary auxiliary relays, contactors, motor starters and isolation so as to require only wiring and connections to the equipment control circuit. All

contacts for control of motor-operated or electrically operated equipment shall be rated not less than 1200 VA (10 ampere at 120 volts) unless otherwise specified herein.

Q. Nameplates and Nametags

1. Nameplates shall be provided for all front mounted equipment. The nameplates shall be approximately 1 inch by 3 inch and shall be constructed of black and white laminated, phenolic material having engraved letters approximately 1/4 inch high extending through the black face into the white layer. Nameplates shall be attached to panels by self-tapping stainless steel screws or rivets. Nameplates shall be provided for each panel identifying the panel and shall be located at the top center of the panel. Size of the nameplate shall be as required for proper visual identification.
2. Nametags shall be provided for all equipment located within the control panel. Each and every device shall be tagged with permanently attached nametags with identification reference that shall correspond to all drawings and wiring diagrams for the system. The nametags shall be neatly installed and shall be clearly visible for service and maintenance of the equipment.

R. All panel equipment shall be pre-piped and/or pre-wired on or within the cabinet. All wiring shall comply with local and National Electrical Code requirements and shall be in open bundles wired to numbered terminals. Each cabinet shall have at least 25 percent spare additional terminals. A plug-in header with convenience outlets and flexible plug-in leads shall be supplied for each instrument power supply. An overhead, internal, gasketed fluorescent light shall be provided. Cabinet layouts shall be submitted to the Engineer for approval. Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.

S. All equipment shall be designed and constructed so that, in the event of a power interruption, the equipment provided under this Section shall resume normal operation without manual resetting of alarms or power source when power is restored. Therefore, no alarm points shall be activated upon restoration of power after a normal power outage unless it is a true alarm condition. Provide all devices or programming required to maintain this requirement.

T. Terminal strips shall be provided for the purpose of connecting all control, power, and signal wiring. Provide separate terminal strips for each in order to isolate the different wiring types (power, control, and signal). All terminal strips shall be completely labeled and numbered throughout for each and every unit. Direct inter-wiring between equipment will not be allowed.

U. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 3 inches of the side panel or 6 inches of adjacent terminal. Wiring troughs shall not be filled to more than 60 percent visible fill. Wiring trough covers shall be match marked to identify placement. If component identification is shown on covers for visibility, the identification mark shall also appear on the mounting sub-panel. All wiring shall be kept to the upper 3/4 quarters of the control panel.

V. Provide redundant 24VDC power supplies, power isolation and an uninterruptible power

supply (UPS) system within the control panel.

- W. All miscellaneous components shall be heavy-duty industrial type, or equal. Mounting hardware shall be stainless steel or cadmium plated. All cutouts shall be made true and square with no ragged cuts. The finished cutout shall be deburred, with no sharp edges. All welds shall be ground smooth and be deburred with no sharp edges. Welding on the panel face should be minimized. Adequate stiffness and supports shall be provided to insure a rigid stable structure.
- X. The finished enclosure shall be properly degreased, prime painted (2 coats) and finish painted (2 coats) in accordance with the paint manufacturer's instructions, prior to the installation of equipment. The final finish shall be smooth, free of runs, and uniform in tone and thickness. Two, one-pint containers of each color used shall be supplied with the panel for field touch up.
- Y. Provide Ethernet switch to create an Ethernet network between equipment as specified herein.
- Z. Provide one GFCI duplex receptacle marked for UPS use only inside panel for connection of UPS.
- AA. Provide with a front door mounted data interface port with a CAT6 Ethernet port and a GFCI receptacle.
 - 1. The data port shall be UL listed for outdoor use and have a lockable clear weather tight cover.
 - 2. The Ethernet port shall be connected to the control panel's Ethernet switch.
 - 3. The GFCI receptacles shall be powered from the control panel's incoming 120V AC power via fuses or a circuit breaker.
- AB. Provide air circulating equipment to dissipate heat from control panel components and maintain interior temperatures of out of doors control panels within an acceptable range for proper operation of control panel components.
- AC. Provide an Operator Interface Terminal (OIT) for the new control panels. The OIT shall be as specified in this Section and connected to the panel's Ethernet switch.
- AD. Provide a LED lighting fixture inside at top of panel with light switch and one duplex receptacle for convenience of 120 volt power during service and maintenance of equipment.
- AE. Provide ground lug.
- AF. Provide a high-intensity LED push-to-test pilot lights for indication of control panel power on. Control panel power on pilot light (white) shall be illuminated when there is AC utility or generator power provided to the control panel.

2.03 PROGRAMMABLE LOGIC CONTROLLERS (PLC's)

A. GENERAL

1. Furnish and install a complete modular PLC based control system at the pump station. This section of the specifications shall provide the hardware requirements for each of the PLC's to be provided for this project. In order to provide a complete and compatible system, this section of the specifications shall be referred to by other related sections. This has been done in order to provide equipment to be supplied by others, which is of the same manufacturer as this section for a completely compatible system architecture and structure.
2. The PLC system provided in the control panel shall come equipped with 20 percent spare I/O of each type utilized and the capability for an additional 20 percent future I/O of each type utilized.

B. PLC PLATFORM

1. Furnish and install the control system in accordance with the Performance Criteria Section of this specification and as detailed on the Contract Drawings. Each PLC shall include but not to be limited to: processor module (CPU), communications interface module, power supplies, software for PLC programming, operator interface system diagnostics, communications, data acquisition, and module racks. The PLC shall collect data, process control functions, communicate with other PLCs, distribute process information along the data highway, and may have their program down loaded from programmer's terminal, and be locally programmed from a portable laptop computer messages (report by exception) to an operator interface to reduce network traffic.
2. The PLC system shall be furnished by a single vendor who has actively been manufacturing programmable logic controllers of the required specified capabilities and whose products have operated successfully for a period of at least eight years. All PLC equipment shall have the following agency approval: UL, CSA, FM Class 1, Div. 2. All PLC equipment shall have a three (3) year factory warranty.
3. The PLC system manufacturer shall maintain, as part of a national network, engineering service facilities within 200 miles of the Project, to provide start-up service, emergency service calls, repair work, service contracts, maintenance, and training of Department personnel. Emergency service shall be available within twenty-four hours of notification.
4. PLC equipment and related hardware shall be CompactLogix by Allen Bradley.

C. CONSTRUCTION

1. The programmable logic controller and operator workstation shall be designed, manufactured and tested to the latest applicable NEMA, IEC, ANSI, and IEEE standards. The programmable logic controller shall meet or exceed the following industry standard specifications:

- a. RFI Immunity: ICS 2-230
2. The PLC and operator workstation shall be solid state, modular, and field expandable design allowing the system to be tailored to meet the application. The design shall have the capacity to allow for the expansion of the system by the addition of hardware and/or software.
3. The PLC and all of its components shall be capable of operating in an ambient temperature of 0 to 60 degrees Celsius (32 to 140 degrees Fahrenheit) and shall function continuously in the relative humidity range of 0-95 percent non-condensing.
4. Each PLC system shall include, but not be limited to, the following:
 - a. I/O chassis
 - b. Local I/O modules
 - c. Power Supply
 - d. Processor modules
 - e. Remote I/O scanner module
 - f. Remote I/O module
 - g. Cables
5. Each unit shall be capable of handling the required number of process inputs and outputs as specified herein and shown on the Contract Drawings, plus 15 percent active spares, plus capacity to accommodate 20 percent future inputs and outputs by the addition of the required circuit cards.
6. The PLC shall be capable of stand-alone operation in the event of a communication link failure.
7. All system modules, main and expansion chassis shall be designed to provide for free airflow convection cooling. No internal fans or other means of cooling, except heat sinks, shall be permitted.
8. Nameplates shall be provided for each module, device and equipment with appropriate data such as equipment number, rating, serial number, and manufacturer.

D. CENTRAL PROCESSING UNIT (CPU)

1. The CPU shall read the inputs, perform all system logic, conduct on-line diagnostics, and control the outputs. Diagnostics shall include memory checks, communications monitoring, I/O bus monitoring, watchdog timing, and user program validation. If an I/O module fault is detected, the processor shall turn

off the affected module.

2. The CPU shall be a self-contained unit, and shall provide ladder rung program execution and support remote or local programming. The CPU shall provide I/O scanning and inter-processor and peripheral communication functions.
3. The CPU shall give visual indication by illuminating an indicator when no fault is detected and an indicator when a fault is detected.
4. The main CPU front panel shall include three communication ports, two Ethernet/IP and one USB. One USB Ethernet port shall be dedicated to connection into the Ethernet switch to allow OIT, programming, data transfer, and SCADA connections. The Ethernet connector shall support communication to as many as 16 nodes.
5. The main chassis front panel shall include, but not be limited to the following:
 - a. Run mode of the CPU
 - b. Fault status of the CPU
 - c. Forced I/O
 - d. Battery Low Condition
 - e. If a remote device is communicating via the inter-processor communications link
6. A minimum of 1MB solid-state RAM user memory shall be provided for storage of the control program. The full memory of the CPU shall be useable for program or data storage.
7. Program back-up shall be battery backed RAM along with EEPROM for reliable program back-up.
8. Program functions shall include standard functions: contacts, coils, timers, counters, math functions, (add, subtract, multiply, divide) shift registers, bit, and word operations; and advanced functions: floating point math calculations including integer to floating point conversion, floating point to integer conversion, add, subtract, multiply, divide, square root, compare, and trigonometric functions.
9. Program functions shall include PID closed loop and cascaded PID loop control. The PID loop shall perform:
 - a. Output tracking for bumpless transfer between auto and manual mode.
 - b. Reset windup limiting.
 - c. Process variable alarming.

- d. Output preloading or bias.
 - e. Adjustable rate filtering.
 - f. Adjustable solution time base of 0.1 to 20.0 seconds.
- 10. The CPU shall include an integral real-time clock, backed up by an internal lithium or long term type battery, which can be accessed from the control program. The clock shall include functions for time of day (year, month, day, hour, minute, second, and day of the week), alarm, and operation hours counter.
 - 11. The CPU shall permit changing ladder program and data values while running.
 - 12. The CPU shall permit the addition of application specific instructions, created in a high level language, to augment the standard instruction set.

E. POWER SUPPLY

- 1. The programmable controller shall operate in compliance with a nominal electrical service of 85 to 132 VAC, single phase, and in the frequency range from 47 to 63 Hz.
- 2. The PLC power supply shall be of sufficient capacity to provide all required DC power to all PLC equipment, discrete and analog input/output circuitry under full load, and chassis-mounted communications equipment. The power supply shall be capable of providing 5 VDC, 12 VDC, 24 VDC or other required power to the CPU, I/O modules, chassis-mounted communication devices, and to other elements within the PLC.

F. PLC MODULES

- 1. All field wiring shall be to a removable terminal block, which will permit prewiring of the module, or removal and replacement of a module without disturbing the field wiring or any other I/O modules. All I/O modules shall be firmly attached to the I/O chassis.
- 2. All discrete I/O wiring shall be minimum No 14 AWG, RHW-2, 600 volt.
- 3. All modules shall be enclosed in rugged plastic, or metallic housings.
- 4. Input and output modules shall have faceplates which shall be marked or labeled in accordance with the Contract Drawings.
- 5. Inputs shall be optically isolated to protect bus circuits from transients and surges. Light emitting diodes, one adjacent to each pair of input terminals shall be provided to indicate a closed contact, conducting transistor switch; a low positive logic level, or AC line voltage on conditions.
- 6. All DC output circuits shall incorporate reverse voltage protection and AC output

circuits shall include fuses. Dry contact output contacts shall be rated for 10 amperes at 120 volts AC minimum. Isolation resistance shall be 1000 ohms minimum at 300 volts DC between any set of field terminals and any other set or earth ground. Isolation voltage shall be 1500 VAC rms. minimum between any set field terminals and any other set or earth ground. Light emitting diodes shall be provided adjacent to each pair of output terminals for on status indication. Dry output contacts shall be provided for all field device digital output control.

7. The analog input modules shall have a maximum of four isolated differential channels per module and shall accept 4-20 mADC from field-mounted transmitters. Over voltage protection shall be 7.5 Vac RMS. Input signal conversion shall be a minimum of 14-bit resolution.
8. Analog output modules shall have a maximum of four isolated differential channels per module and shall convert 14-bit data words into proportional, isolated 4-20 mA DC analog output signal. Output load drive capability shall be 500 ohms minimum for each output. Accuracy shall be +0.298 percent of full-scale output span. Analog output modules shall be selectable on a point per point basis to either hold the last state or to return to zero upon reset or stop of the programmable controller.

G. PLC PROGRAMMING

1. The programming format shall be traditional relay ladder diagram.
2. It shall be possible to program a maximum instruction matrix of eleven wide by seven deep containing as many as 70 examine instructions.
3. The capability shall exist to change a contact from normally open to normally closed, add instructions, change addresses, etc. It shall not be necessary to delete and re-program the entire rung.
4. It shall be possible to insert relay ladder diagram rungs anywhere in the program, even between existing rungs, in so far as there is accommodated these additions.
5. Timer instructions shall include selectable time bases in increments of 1.0 second and 10 milliseconds. The timing range of each timer shall be from 0 to 65,535 increments. It shall be possible to program and display separately the timer's preset and accumulated values.
6. The programmable controller shall store data in the following formats:
 - a. Single integer numbers ranging from 0 to 65,535.
 - b. Floating point numbers conforming to IEEE floating point format
 - c. Decimal numbers ranging from 0 to 9,999
7. At the request of the programmer, data contained in system memory shall be displayed on the CRT programming panel. This monitoring feature shall be provided for input/output status, timer/counter data, files, and system status. Ladder logic rungs shall be displayed on the CRT with rung numbers in sequential order.

8. The system shall have the capability to enter address comments and symbols.
9. The programming software shall also provide the following functions:
 - a. Full on-line and off line capabilities from one integrated software package.
 - b. Hot Keys: Keys for short cut to software functions.
 - c. File Management: Create, Delete, rename, and merge program files.
 - d. Memory Map: Display processor memory usage.
 - e. Data Monitor: Display the contents of data files.
 - f. Save & Restore: Save processor memory files to disk; restore processor memory files from disk.
 - g. I/O Configuration: Configure intelligent I/O modules.
 - h. General Utility: Display general system information and clear faults.
 - i. Forcing: Force I/O on and off.
 - j. Import & Export: Convert database files (which contain symbols, rung comments, instruction comments, and address comments) and processor memory files to ASCII and from ASCII to the programming software.
 - k. Display I/O module health status.
 - l. Password Protection: Allow up to eight password protected levels of functionality with each level increasing the capability to monitor, troubleshoot, and program.

2.04 SOFT STARTER MOTOR STARTERS

- A. Soft Start Motor starters shall be three phase, 60 Hertz, 480 Volt, open style, UL listed microprocessor based SCR controlled soft starter type with contactor bypass, overload protection and rated for motor horsepower size for the new submersible pumps. Each motor starter shall have LCD display, metering, run and alarm status dry contacts.
- B. The Soft Start Motor starters shall be capable of pump reduced voltage/current starting and then turning over to pump full rated voltage/current in line operation.

2.05 OPERATOR INTERFACE TERMINAL (OIT)

- A. An operator interface terminal shall be shall be configured to enable operators to monitor and control the OEM equipment processes. Communications between the operator interface and the PLC shall be completely transparent to an operator.

- B. The operator interface shall have a Windows-based graphic editor.
- C. The operator interface shall be powered from a 120 VAC, 60 Hz power supply. The operator interface shall be capable of operating in a temperature range of 0 to 55 C, and 5 to 95% relative humidity, non-condensing. The operator interface display shall be an Allen Bradley Panelview Plus 10" color touch screen or equal by other manufactures.

2.06 LEVEL ELEMENT/TRANSMITTER (SUBMERSIBLE PRESSURE TRANSMITTER)

- A. Type: Submersible pressure transmitter for wastewater applications with vented cable, two-wire, piezoresistive pressure sensing technology with welded 316 stainless steel diaphragm.
- B. Operation Purpose: To sense pressure and produce a standard 4-20 mA DC output signal linear with level; sensing element -piezoresistive pressure sensor.
- C. Functional: Pressure ranges - 0 to 5 through 0 to 300 psig; proof pressure limit 1.5 times full scale; burst pressure limit - 2.0 times full scale; power supply - DC (loop powered); output - 4-20 mA DC.
- D. Physical: Wetted parts - 316 stainless steel, fluorocarbon; operating temperature range - minus 10° to plus 60°C; compensated temperature range - 0° to 50°C; cable - polyurethane jacketed, shielded with polyurethane vent tube and vent filter/vapor trap; mounting - suitable for mounting in a 4-in stilling well, suspended from cable.
- E. Provide aneroid bellows venting accessories with connection to transducer, din-rail mounted terminal blocks for termination of transducer signal wire and control panel signal wire, and din-rail mounted surge protection devices; Accessories - vent-hole or breather element to maintain atmospheric pressure within enclosure.
- F. Performance: Static accuracy - ± 0.50 percent of best fit straight line (BFSL), including the combined errors due to nonlinearity, hysteresis, and non-repeatability at 25°C; thermal error - ± 0.05 percent full scale output per degree Celsius (maximum deviation from a BFSL).
- G. Provide and mount a perforated PVC stilling well for each transducer to minimize interference with rags and solids.

2.07 LEVEL SWITCH - FLOAT TYPE

- 1. Float switches shall be of non-mercury type, 3½-in diameter hermetically sealed, molded polypropylene construction and include a Form C, tilt-type, switch rated for switching 10 ampere resistive loads at 120 VAC. Switches shall include 40 feet of nitrile PVC jacketed, Type SO, 3-conductor, No. 14 AWG cable suitable for underwater service. Switches shall be rated for the NEMA area in which installed. Switches shall also include Type 316 stainless steel mounting hardware and weighted cord collar. Switches shall be installed per the manufacturer's requirements.
- 2. Level switches shall be manufactured by Consolidated Electric Co., Flygt, Magnetrol, or equal.

2.08 MAGNETIC FLOW METER

A. Flow Element (FE)

1. Type:
 - a. 316 SS self-cleaning bullet nose electrodes
 - b. Steel with Polyurethane Liner
 - c. Connections - ANSI Class 150, RF carbon steel flange
2. Operation:
 - a. Purpose - To produce a low-level voltage output signal proportional to flow rate.
 - b. Operating Principle - Induced voltage proportional to flow rate is produced by the measured fluid (conductor) moving through a magnetic field. Voltage sensed across a pair of diametrically opposed electrodes in a pipe section.
3. Functional:
 - a. Power Requirement - supplied by magnetic flow converter.
 - b. Max Power Consumption - 1 Watt per 5 mm (diameter).
 - c. Electrical Class - NEMA 4X plus temporary submergence at 25-ft for 48 hours.
4. Physical:
 - a. Electrodes - Type 316 SS, field replaceable, configuration for periodic electrode inspection or cleaning.
 - b. Body - Carbon Steel.
 - c. Liner - Polyurethane.
 - d. Coils - Completely potted with epoxy-based compound.
 - e. Ends - Carbon Steel flanges
 - f. Exterior Surface - Epoxy coated.
 - g. Grounding rings - Stainless steel grounding rings with grounding strap.
 - h. Approvals - FM.
5. Performance:
 - a. Accuracy - ± 0.5 percent of rate between 10 percent and 100 percent of flow (including transmitter).
 - b. Documentation Required - Certified hydraulic lab calibration data.

B. Flow Transmitter (FIT)

1. Type:

- a. Liquid crystal display with rate and total.
- b. 4-20 mA DC Output.
- c. NEMA 4X Enclosure.

2. Operation:

- a. Purpose - Provides coil drive current to the flow tube and convert the electrode signal from the flow tube into 4-20 mA signal linear with flow.
- b. Circuitry - Microprocessor-based with data stored in nonvolatile EEPROM memory, performing continuous self-diagnostics. Solid-state integrated circuitry, feedback electronically controlled. External contacts shall initiate circuitry that clamps the output to 4 mA under no flow conditions.

3. Functional:

- a. Input - Low level input from electromagnetic flow element.
- b. Power Requirement - 120 VAC \pm 10 percent, 60 Hz.
- c. Output - 4-20 mA DC into 0 to 750 ohms.
- d. Indicator - LCD.

4. Physical:

- a. Case Material - Cast aluminum.
- b. Case Type - NEMA 4X.
- c. Mounting – Integral mounted to Flow Element.

C. Performance:

- 1. Systems Accuracy - \pm 0.5 percent of rate between 10 percent and 100 percent of flow (including flow element).

D. Manufacturer: Endress & Hauser, Krohne, ABB, Foxboro or equal.

2.09 ULTRASONIC FLOW METER – CLAMP ON

A. Flow Element (FE)

- 1. Type: Clamp on design, externally mounted to pipe.

2. Operation:

- a. Purpose - To produce a low-level voltage output signal proportional to flow rate.
- b. Operating Principle - Transit time flow measurement technique with an

alternate Doppler measurement technique for liquids with high air or solid content. The meter shall auto toggle from Transit Time measurement to Doppler measurement if the signal decays due to high air or solid content, and toggle back automatically when the Transit Time signal recovers. The Transit Time/Doppler measurement shall be accomplished with a single set of flow transducers and with the use of only one metering channel.

3. Functional:

- a. Power Requirement - supplied by ultrasonic flow transmitter.
- b. Max Power Consumption - 15 Watts
- c. Electrical Class - NEMA 4X.

4. Physical:

- a. Transducer - Encased in fully sealed, water tight, stainless steel with integral armored stainless steel jacketed TRIAX cable. Provide manufacturer's coupling pads and stainless steel transducer track mounting system for permanent pipe installations. Frequent application of coupling pastes shall not be required for successful application.

B. Flow Transmitter (FIT)

1. Type:

- a. Liquid crystal display with rate and total.
- b. 4-20 mA DC Output.

2. Operation:

- a. Purpose - Provides power to the ultrasonic transducer and convert the signal from the transducer into 4-20 mA signal linear with flow.
- b. Circuitry - Microprocessor-based with data stored in nonvolatile EEPROM memory, performing continuous self-diagnostics. Solid-state integrated circuitry, feedback electronically controlled. External contacts shall initiate circuitry that clamps the output to 4 mA under no flow conditions.

3. Functional:

- a. Input - Signal input from transducer.
- b. Power Requirement - 120 VAC \pm 10%, 60 Hz.
- c. Output - 4-20 mA DC into 0 to 750 ohms.

- d. Indicator - LCD.
- 4. Physical:
 - a. Case Material - Polyester
 - b. Case Type - NEMA 4X.
 - c. Mounting - Wall mounted.
- C. Performance:
 - 1. Accuracy - $\pm 2\%$ of rate.
 - 2. Documentation Required -Wet flow calibration certificate accredited from an international standards agency with an accuracy of better than 1%.
 - 3. All calibration and transducer data must reside on a non-volatile memory chip located in the transducer junction box or flow meter.
- D. Flow meter shall be DM6.1 Doppler Flow Meter as manufactured by Greyline or approved equal.

2.10 GAS DETECTORS AND ALARM

- A. Provide combustible gas detectors, toxic gas detectors, oxygen gas detectors, and gas alarm station.
- B. Combustible Gas Detector Transmitter
 - 1. Type:
 - a. Relay contacts and 4-20 mA DC outputs.
 - b. Self-diagnostics of electronics.
 - c. Preset span calibration.
 - 2. Operation:
 - a. Purpose - To detect combustible gas (methane) in ambient air, indicate concentration.
 - b. Sensor – Remote, Infrared, dual wavelength.
 - 3. Functional:
 - a. Range - 0 to 100% lower explosion limit (LEL) for methane gas.
 - b. Analog Output - One non-isolated, 3-wire, 4-20 mA DC, proportional to concentration.
 - c. Power Requirements - 10 to 30 VDC, 3W nominal power consumption.

- d. Calibration – 365 day calibration interval.
 - e. Relay Output – (3) relay contact outputs for Alarm, Warning, and Trouble
4. Physical:
- a. Housing – Epoxy coated die cast aluminum, NEMA Type 4X, explosion proof.
 - b. Display - LED, numeric display of gas concentration and faults.
 - c. Mounting - Suitable for wall mounting, sensor to be mounted 1 foot below ceiling elevation as shown on the Drawings.
5. Approvals - UL, FM, CSA, suitable for Class I, Division 1, Groups B, C and D hazardous areas. ATEX approved.
6. Options/Accessories Required:
- a. Provide gas calibration kit and associated accessories for zero air adjustment including zero air and methane "bump" gas.
- C. Toxic Gas Detector Transmitter
1. Type:
- a. Relay contacts and 4-20 mA DC outputs.
 - b. Self-diagnostics of electronics.
 - c. Preset span calibration.
2. Operation:
- a. Purpose - To detect toxic gas (hydrogen sulfide)) in ambient air, indicate concentration.
 - b. Sensor – Remote, Electrochemical gas diffusion.
3. Functional:
- a. Range - 0 to 100 PPM.
 - b. Analog Output - One non-isolated, 3-wire, 4-20 mA DC, proportional to concentration.
 - c. Power Requirements - 10 to 30 VDC, 3W nominal power consumption.
 - d. Calibration – 180 day calibration interval.

- e. Relay Output – (3) relay contact outputs for Alarm, Warning, and Trouble
4. Physical:
- a. Housing – Epoxy coated die cast aluminum, NEMA Type 4X, explosion proof.
 - b. Display - LED, numeric display of gas concentration and faults.
 - c. Mounting - Suitable for wall mounting, sensor to be mounted 1 foot below ceiling elevation as shown on the Drawings.
5. Approvals - UL, FM, CSA, suitable for Class I, Division 1, Groups B, C and D hazardous areas. ATEX approved.
6. Options/Accessories Required:
- a. Provide gas calibration kit and associated accessories for zero air adjustment including zero air and Hydrogen Sulfide "bump" gas.
- D. Oxygen Gas Detector Transmitter
1. Type:
- a. Relay contacts and 4-20 mA DC outputs.
 - b. Self-diagnostics of electronics.
 - c. Preset span calibration.
2. Operation:
- a. Purpose - To detect oxygen gas in ambient air, indicate concentration.
 - b. Sensor – Integral, Electrochemical gas diffusion.
3. Functional:
- a. Range - 5 to 25% Vol.
 - b. Analog Output - One non-isolated, 3-wire, 4-20 mA DC, proportional to concentration.
 - c. Power Requirements - 10 to 30 VDC, 3W nominal power consumption.
 - d. Calibration – 180 day calibration interval.
 - e. Relay Output – (3) relay contact outputs for Alarm, Warning, and Trouble

4. Physical:
 - a. Housing – Epoxy coated die cast aluminum, NEMA Type 4X, explosion proof.
 - b. Display - LED, numeric display of gas concentration and faults.
 - c. Mounting - Suitable for wall mounting, sensor to be mounted 1 foot below ceiling elevation as shown on the Drawings.
5. Approvals - UL, FM, CSA, suitable for Class I, Division 1, Groups B, C and D hazardous areas. ATEX approved.
6. Options/Accessories Required:
 - a. Provide calibration kit equipment and accessories for zero and span adjustments.
- E. Combustible gas detectors, toxic gas detectors, and oxygen gas detectors shall be Sentry IT Model type 5100 manufactured by the Sierra Monitor Company, no equal.
- F. Provide a gas alarm station consisting of a 120VAC red alarm beacon, 120VAC 90dB horn mounted, and horn silence pushbutton with associated circulating in a NEMA 4X stainless steel enclosure. The Alarm station shall be pre-wired with din rail mounted relays and terminal blocks for field connections of power and each gas detector alarm relay contact.

2.11 DATA LOGGING CIRCULAR CHART RECORDER

- A. Type: Multiple print head microprocessor-based circular chart recorder with totalizer.
- B. Operation: To accept two (2) 4-20 mA DC input signals and data log the inputs signals on a circular paper chart via (2) separate color chart pens.
- C. Functional:
 1. Power – 120VAC \pm 10%, 50/60 Hz, maximum power consumption of 25 VA
 2. Input - 4-20 mA DC into 250 ohms
 3. Indication – 40 character display and keyboard
 4. Charts - 12 hour, 24 hour, or 7 day, configurable 1 to 4096 hours/revolution.
 5. Memory protection – configuration save in EEPROM.
- D. Physical: case size nominal 15.0-in wide by 15.0-in wide by 8-in deep suitable for wall mounting.
- E. Performance:

1. Input: $\pm 1\%$ of resolution , $\pm 0.01\%$ of operating gain span.
 2. Pen position resolution: $\pm 0.02\%$ of operating gain span.
 3. Display accuracy: second to full scale.
- F. Signal Retransmission: The recorder shall retransmit three configurable isolated 4-20 mA signals based on the input signals.
- G. Accessories: Furnish a one-year supply of pens, and a one-year supply of 24-hour charts and 7-day charts. Furnish as required 250 ohm input current shunts.

2.12 MISCELLANEOUS EQUIPMENT

A. INDUSTRIAL ETHERNET SWITCH

1. The industrial Ethernet switch shall have minimum four 10BASE-T/100BASE-TX RJ-45 ports and two 100Mbps fiber optic ports. RJ-45 ports shall support auto negotiation or manual configuration for 10/100 MHz or full/half duplex.
2. The industrial Ethernet switch shall be IEEE 802.3 compliant. The switch shall support 10BASE-T, 100BASE-TX and 100BASE-FX standards. The switch shall support IEEE 802.3x flow control. Port setting controls shall include enable/disable and speed selection. The switch shall use store-and-forward switching mode.
3. The industrial Ethernet switch shall have an LED power indicator and shall operate from a 24 VDC power source if panel mounted and 120 VAC otherwise. The switch shall have LEDs for link status. The switch shall have a fault relay contact. The switch shall be suitable for operating from 0°C to 50°C and from 10 percent to 95 percent non-condensing relative humidity. The switch shall be UL approved. The switch shall be suitable for DIN-rail mounting if mounted within a control panel.
4. The industrial Ethernet switch shall support a tree or ring network topology. The switch shall support SNMPv3 and IP addressing via BootP/DHCP. The port configurations shall be accessible through a standard Web browser.
5. The industrial Ethernet switch security features shall include capability to disable ports and password security for configuration. The switch shall support multicast messaging via IGMP protocol and shall utilize IGMP snooping. The switch shall support port based virtual LAN (VLAN) configuration. The switch shall support the IEEE 802.1p standard for QoS traffic prioritization. The switch shall come supplied with configuration and management software for installation on a Windows-based PC. The switch shall come supplied with all necessary cables to connect the switch to a Windows-based PC for configuration.

B. ELECTRICAL RELAYS

1. Electrical relays for handling power circuits shall be general purpose equal to IDEC, Omron, Allen-Bradley, Potter & Brumfield, or approved equal. Relays

handling control, telemetering or alarm functions shall be general-duty, plug-in type, complete with dust and moisture proof enclosure equal to IDEC, Omron, Allen-Bradley, Phoenix Contact, Potter & Brumfield, or approved equal. Units shall be provided with integral indicating light to indicate if relay is energized. Units shall have DPDT relay contacts and be rated for 10 A at 120 VAC, 10 A at 24 VDC

2. Time delay relays shall have DPDT relay contacts and be suitable for on-delay or off-delay operation. Rated load shall be 10 A at 120 VAC, 10 A at 24 VDC. Units shall be provided with integral time-delay adjustment knob. Relays shall be provided with dust and moisture resistant covers. Relays shall be suitable for operating in a temperature range from -30° to 55° C. Units shall be adjustable and available in a single range or multiple ranges from 0.1 second to 10 hours. Time delay relays shall be UL listed. Mounting sockets matched to relay and mounting rails/holders shall be provided as required. Time delay relays shall be as manufactured by IDEC, Allen Bradley, or Engineer-approved equal.

C. CURRENT-TO-CURRENT CONVERTERS

1. Current to current converters shall transform a current input signal (1-5, 4-20, or 10-50 mA) to a proportional 4-20 mA current output signal. The unit shall be of solid state electronic circuitry sealed in a protective epoxy compound, and shall be for surface or rear of panel mounting.
2. Current to current converters shall provide signal conversion capabilities, input/output isolation and output power boosting.
3. Signal output drive capability shall be 4-20 mA into 600 ohms load.
4. Accuracy shall be 0.25 percent of span.

D. INTRINSICALLY SAFE PANEL

1. Provide panels to house intrinsically safe current isolators and intrinsically safe relays. The panel shall have din-rail mounting terminal strips for all wiring and shall receive power from the RTU control panel.
2. Intrinsically Safe Current Isolators
 - a. Din rail mounted intrinsically safe current isolators shall be furnished for interconnection of each wetwell level transmitters.
 - b. Operating voltage shall be 115 VAC, 60 Hz.
 - c. The intrinsically safe control circuit shall be approved by Factory Mutual and the Canadian Standards Association for Class 1, 119 111; Division 1; Groups A, B, C, D, E, F, G hazardous locations.
3. Intrinsically Safe Relays (IS Relays)

- a. Din rail mounted intrinsically safe relays shall be furnished for interconnection of each float switch located in the wet well.
- b. Operating voltage shall be 115 or 230 VAC, 50/60 Hz.
- c. Load contacts shall be double pole, double throw and shall be rated for 10 amperes resistive load or 3 amperes inductive load at 120 VAC.
- d. The intrinsically safe control circuit shall be approved by Factory Mutual and the Canadian Standards Association for Class 1, 119 111; Division 1; Groups A, B, C, D, E, F, G hazardous locations.

E. LIGHTNING/SURGE PROTECTION

1. Lightning/surge protection shall be provided to protect the instrumentation system from induced surges propagating along the signal and power supply lines. The protection systems shall be such that the protective level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level, and be maintenance free and self-restoring. Ground wires for all surge protectors shall be connected to a good earth ground and where practical each ground wire run individually and insulated from each other.
2. Protection of all 120 volt ac instrument cabinet power supply lines and individual field instruments shall be provided. Cabinets shall be protected by isolation transformers and surge suppressers.
3. The unit shall be back panel mounted and is to be connected between the telephone line and the telemetry and control equipment. Transient voltages above 90V line to ground or 180V line to line will cause the gas discharge tubes to short to ground. If the peak lasts more than an instant, 1/4 amp fast blow fuses will open the line.
4. Protection of circuits connected over leased or private telephone lines shall be provided with surge and lightning protectors at signal terminal in addition to the normal fused lightning arrestor supplied by the telephone company.
5. Lightning/surge protection units shall be as manufactured by Joslyn Industries or equal.
6. All remote loop powered transmitters shall be provided with close-nipped lightning/surge protection units. The loop shall be terminated at the receiving device/panel with a receiving end lightning/surge protection unit. This shall be provided to all remote equipment for this project.

F. POWER SUPPLIES

1. All two-wire loop powered equipment and all devices requiring 24 VDC power shall be provided with individual power supplies or shall be powered from a redundant power supply configuration such that there is no interruption in power supplied upon a failure of one of the redundant power supplies.
2. The final requirements and exact locations for the power supplies shall be the responsibility of the Instrumentation and Control System Supplier. These units

shall be provided and sized to handle all possible load conditions with sufficient capacity.

3. All power supplies shall be of the same manufacturer and of the same type wherever possible. Power supplies shall be DIN-rail mounted.
4. All power supplies shall be regulated and shall be suitably protected during the operation of the unit and also incorporate protection to the equipment it serves.
5. Each power supply shall have a Form C dry contact wired to the PLC I/O for indication of power supply failure.
6. Power supplies shall be a manufactured by Sola, Phoenix Contact, Omron, or equal.

G. UNINTERRUPTIBLE POWER SUPPLY (UPS)

1. The Instrumentation and Control System Supplier shall provide UPSs, including internal/external batteries, for maintaining power to the control system devices and instrumentation as specified herein.
 - a. A UPS shall be provided within each control panel.
2. Each UPS shall protect the system from noise, dips, spikes and planned reductions in voltage by utility companies. The UPS shall meet ANSI C62.41/IEEE 578 A&B standards for transients/lightning protection.
3. Each UPS shall be true type that continuously operate from the inverter (zero transfer time) and shall output a true high quality low distortion sinusoidal waveform synchronized to the AC utility.
4. The batteries shall be sealed, maintenance free lead-acid type. The batteries shall provide 30 minutes of backup power at full load when fully charged.
5. Each UPS shall have a fail-safe transfer to bypass for UPS internal electronic failures.
6. A UPS installed in a control panel shall be wired into the control panel power distribution circuit so that the UPS can be easily and quickly bypassed while maintaining AC utility power to panel devices and instruments. A UPS installed in a control panel shall be DIN-rail or shelf mounted so that the UPS is above the bottom of the control panel.
7. Each UPS shall have dry contact failure alarm that shall be wired into the PLC as an alarm input.

2.13 EXISTING SCADA SYSTEM

- A. The existing SCADA system, including screens, report generations, software alarm dialer, historical trending, data archiving, alarm management, and ect. shall be modified

for the additional of the Headworks Equipment monitoring, alarming, control, data collection/data archiving and report generation.

- B. SCADA system software shall be fully customized and configured by the Instrumentation and Control System Supplier to perform the functions described in this Section. The system software shall be configured to provide all features including: equipment monitoring, process monitoring and control, data acquisition/data archiving, alarming and alarm management, alarm and event logging, real time and historical trending, report generation, security, application integration, cross-platform integration and all other features as specified herein for this SCADA system.
- C. The SCADA system shall be configured to collect, process, store, and report process variable data and user entered data, and automatically load such data into specifically designed Microsoft Excel spreadsheet files and/or pre-designed numerical, graph and report templates.
- D. The Instrumentation and Control System Supplier shall be responsible for arranging any necessary coordination for the SCADA system and shall insure and guarantee a complete, operational, and acceptable system.
- E. The SCADA system shall automatically collect and store a variety of measured process variable data, accept user entered data and shall be programmed to automatically generate daily, weekly, monthly, and annual hardcopy text reports and selected graphic reports.

2.14 SPARE PARTS

- A. Spare parts shall be provided as a part of the start-up services during the initial start-up and phase-in period. These items shall include accessories such as fuses, circuit breakers, power supplies, I/O cards, lights, etc. required to start-up and operate the system for a period of 60 days. These items shall be packaged in separate containers and shipped to the job site with the instruments and shall be tagged "INSTRUMENT START-UP EQUIPMENT".
- B. Spare parts above and beyond those being provided for start-up services shall be provided under this Section. All spare parts shall be packaged and shipped at one time. Separate shipment of spare parts shall not be acceptable. The Engineer shall be notified of the shipment release in writing indicating that all items have been shipped. Each item shall be checked by the Engineer as being received and that all components have been provided as specified.
- C. Furnish one box of spare fuses of each type supplied. A box shall consist of a minimum of 12 fuses.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Instrumentation and accessory equipment shall be installed in accordance with the best field and shop practices.
- B. The workmanship shall be in accordance with the best field shop practices for the

instrument and control systems.

- C. All workmen shall be skilled in the work to which they are assigned and all work shall be performed under the direct supervision of an experienced and competent instrument foreman.
- D. All wiring and piping shall be constructed perfectly plumb, square, level, and true to lines and surfaces indicated in a neat, substantial and workmanlike manner, and in such a way as to properly serve for the purpose intended. All members and parts, upon installation, shall be properly framed, secured together and anchored in place. All cuts shall be deburred and immediately cleaned from opposite end before connecting.
- E. All instruments shall be mounted, piped and connected in strict accordance with the manufacturer's instructions.
- F. All internal wiring of the instrument panel shall be done by the panel manufacturer in accordance with the drawings and instrument manufacturer's instructions.
- G. The loops on the drawings and the instrument specifications and index sheets indicate the intent of the interconnections between and the type of individual instrument. The proposed equipment shall be complete with all mounting hardware and accessories to satisfy the functional requirements.
- H. All work shall be executed in full accordance with codes and local rulings. Should any work be performed contrary to said rulings, ordinances and regulations, the Instrumentation and Controls Contractor shall bear full responsibility for such violations and assume all costs arising therefrom.
- I. All piping to and from field instrumentation shall be provided with necessary unions, test tees and shut-offs.
- J. Interfacing fixtures shall be compatible with the equipment to which they are attached and shall comply with the applicable specifications.
- K. In-line devices, flow or level elements, specified herein shall be installed under DIVISION 15 - MECHANICAL.
- L. Wiring of in-line devices, flow or level elements, specified herein shall be installed under DIVISION 16 - ELECTRICAL.
- M. Coordination with the process and equipment in addition to standard quoted fixtures require to conform the instrumentation to the process shall be the responsibility of the General Contractor. The Instrumentation and Controls Contractor shall provide detail information on the fixtures being supplied and the extent of the field installation required.
- N. Brackets and hangers required for mounting of equipment shall be provided as noted on the drawings or as required. They shall be done in a workmanlike manner and not interfere with any other equipment.

- O. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the building.
- P. The shield on each process instrumentation cable shall be grounded as directed by the manufacturer of the instrumentation equipment but in no case shall more than one ground be employed for each shield.
- Q. Maximum practical separation shall be maintained between signal (analog, alarm, and status) conduits and power feeders and AC systems.
- R. All conductors running from the field to the control panel shall be a single, continuous length without splices, except at approved junction boxes. The junction boxes shall have terminal blocks with 20% spare in addition to terminals for all wires including spare wires. Special care shall be exercised to carry grounding lines through such junction boxes with the least possible resistance.
- S. Multi-conductor cable may be used between junction boxes and control panels.
- T. All field conductors shall terminate at the control panel terminal board. Millivolt signal wires (i.e., thermocouple) may be connected direct to the input terminals of the receiving instrument if so specified.
- U. All wire ends shall be terminated with hook fork type non-split compression lugs.
- V. All wire ends shall be identified at both ends with wire markers.
- W. Entry to field enclosures shall be through the back, side, or bottom (not top) with weatherproof hubs. Wiring shall enter near the terminal point and not obstruct access to removal of components.
- X. Lifting rings from cabinets/assemblies shall be removed. Hole plugs shall be provided for the holes of the same color as the cabinet.

3.02 START-UP

- A. Prior to final connection to the main instrument control panel, the Instrumentation and Controls Contractor shall thoroughly clean all work completed including the interior of all panelboards; and remove all dirt, trash, and foreign material. The outside of all instrument panelboards are to be cleaned and damaged painted surfaces touched up as required to leave the equipment in an acceptable condition. This shall include all nameplates, tags, and identification of equipment and devices within or on the front of the panels.
- B. It shall be the responsibility of the vendor to provide a factory trained and qualified serviceman from the manufacturer's of the equipment to TEST AND CALIBRATE ALL EQUIPMENT and to INSTRUCT the Contractor on EQUIPMENT INSTALLATION and the ENGINEER on operation of the equipment.
- C. No other instrumentation system manufacturer's personnel other than those persons directly from the service department of the manufacturer of the equipment shall be

acceptable to perform this work.

- D. The start-up services shall be performed by qualified personnel from the service department of the equipment manufacturer with a minimum of five years experience on the equipment being provided by this contract, or equal.
- E. During the start-up, the Instrumentation shall provide sufficient personnel to aid with the start-up of the instrument and control equipment to be provided and installed by this Section and by this Contract. This shall include services to correct any faults and to make the necessary adjustments for the proper operation of the equipment and installation.

3.03 TESTING AND CALIBRATING

- A. Testing and calibration of equipment shall be done in the presence of the Engineer.
- B. Prior to electrical check out all breakers, switches and similar disconnect devices shall be placed in the off position.
- C. The panel and other equipment grounding shall be verified.
- D. Visual inspection and continuity testing shall be made to verify that no damaging wiring errors occur between power and signal wiring.
- E. The systems shall be checked for improper or accidental grounding.
- F. Each system and component shall be energized and their inputs simulated. The output shall be checked to verify the proper calibration and interaction with associated hardware.
- G. Hypotting shall not be permitted on instrument systems unless specific instructions are given to safeguard electronic equipment from damage.
- H. Prior to actuating a final control element (valve, level actuator, or variable frequency drive) the Instrumentation and Controls Contractor shall obtain the permission of the General Contractor and any other involved contractors to prevent damage to associated equipment.
- I. The factory serviceman shall verify the calibration and direction of the final control element in accordance with the requirements for each portion of the system.
- J. Instrument and control calibration and control loop checkout shall be the responsibility of the manufacturer of the equipment.
- K. The Instrumentation and Controls Contractor shall arrange for and obtain the services of a factory trained service qualified engineer from the manufacturer's of the equipment to perform the calibration and commissioning of the entire system.
- L. Each instrument shall be calibrated at 10 percent, 50 percent, and 90 percent using test instruments that are rated to an accuracy of at least five times greater than the instrument being checked. The test instrument shall have its accuracy traceable to the National

Bureau of Standard as applicable.

- M. Upon completion of the work, the Instrumentation and Controls Contractor shall demonstrate to the Owner the proper operation of all equipment and systems.
- N. The Instrumentation and Controls Contractor submit to the Engineer all test data, inspection test certificates, manufacturers' warranties certified calibration data, certified prints, manufacturers' installation, operation and maintenance manuals, electrical wiring and control diagrams with all noted field modification for an as-built record for the system, and required and suggested spare parts lists.
- O. A factory test shall be scheduled by the instrumentation system manufacturer for the entire system. A simulated system layout which shall include all equipment and interconnections shall be arranged to perform all system functions. The testing shall be performed in the presence of the Engineer. A two week written notification shall be provided to the Engineer to allow for scheduling the testing.
- P. Upon completion and satisfactory performance an approval notification shall be provided for this portion of the work for this Section. No equipment shall be allowed to be shipped from the factory without approval for this portion of the work.

3.04 USER INTERFACE

- A. Graphic screens shall be configured so that an operator can access the Main Menu screen with one action from any SCADA or OIT system screen, not including pop-up screens. Each screen, excluding pop-up screens, shall bear the screen title at the top with date/time information and user login information. Each screen, excluding pop-up screens, shall have an alarm banner that displays at least the three most current alarms and contains the following information: acknowledged/unacknowledged, time/date in, alarm description/message and value. Each screen, excluding pop-up screens, shall contain navigation buttons or a pull-down menu to enable operators to quickly access related screens.
- B. The Instrumentation and Control System Supplier shall follow the guidelines listed below when animating the graphic screens. The Instrumentation and Control System Supplier shall furnish, as part of the Software Submittal a animation plan addressing the items listed below for review by the Engineer and Owner prior to developing HMI graphic screens, historical trend charts and pop-up screens.
 - 1. Colors. HMI screen background color shall be muted. Equipment without conditional visibility shall be depicted in a muted color. Safe or off conditions shall use a vibrant green color. On, running or open conditions shall use a vibrant red color. Status indicators and process variables shall be black/blue text in a recessed white box. Alarm and warning messages shall be a vibrant red text, either stand-alone or in a non-recessed white box, and shall flash on/off until acknowledged. All equipment shall be identified with black/blue text. All process variables shall be identified by tag number and function with black/blue text.
 - 2. Visibility. Conditional visibility shall be used to indicate the current state of all process equipment and valves that have status inputs to the system. The HMI

graphic for motorized equipment and valves shall change to a vibrant red cooler when the motorized equipment is operating or the valve is open; the HMI graphic for motorized equipment and valves shall change to a vibrant green color when the motorized equipment is not operating or the valve is closed. Pushbuttons shall change color to indicate position (e.g., vibrant red when pushed to start equipment, vibrant green when pushed to stop equipment). Selector switches shall change position to indicate and highlight the selection (e.g., Hand, Off or Auto). Motorized equipment, valves, pushbuttons and selector switches shall also have text status indicators in addition to conditional visibility.

3. Storage vessels (tanks, wet wells, etc.) shall be animated to indicate current level and shall have dynamic level indication with the appropriate engineering units. Level indication shall be black/blue text in a recessed white box. Level instrument tag number shall be black/blue text.
 4. All analog process variables shall have dynamic indication with the appropriate engineering units. Process variable indication shall be black/blue text in a recessed white box. Process variable instrument tag number shall be black/blue text.
 5. Motorized equipment with a run status input to the system shall display accumulated runtime in black/blue text in a recessed white box.
 6. New alarms shall be annunciated audibly at the SCADA computers and OIT.
- C. The Instrumentation and Control System Supplier shall follow the guidelines listed below when creating pop-up screens for process equipment and valve control, and alarm and PID loop set point entry.
1. A pop up screen shall be superimposed on the HMI graphic screen when an operator uses the mouse to click on a piece of process equipment, a valve or an instrument. The pop up shall have a "RETURN" button to enable the operator to return to the HMI graphic screen without performing any control actions or set point changes.
 2. The pop up shall contain information about the equipment, instrument or devices current status such as on/off, local/remote, hand/off/auto, manual/auto, service designation (e.g., lead, lag, standby, etc.) alarm set points, PID loop set points and PID parameters, etc. as defined in the loop descriptions.
 3. The pop up shall also contain any interlock status information as defined in the loop descriptions.
- D. The Instrumentation and Control System Supplier shall modify and create as needed the following screens. This list is not comprehensive and the Instrumentation and Control System Supplier shall create additional screens as necessary to provide SCADA system functionality as specified and shown in the Contract Documents. Each screen shall have navigation buttons to access the Process Overview, Master Display, Alarm Summary, Help and Main Menu screens by one mouse click.

1. Main Menu - Listing of all process-related SCADA system screens with navigation buttons to access any of the screens with one mouse click
2. Process Overview - Geographic representation with links to remote site screens
3. Master Display - All process variables and major equipment operating states
4. Network and Remote Site Communication Status - status for office network and for each remote site and enable/disable communications for each remote site
5. Pump Station Screen with Real Time Trends
6. Process Equipment Runtimes
7. Flow Totalizations
8. Help - Explanation of the meaning of graphic symbols and text appearance
9. Alarm Summary that contains the following information: Acknowledged/Unacknowledged, Date/Time In, Node (if applicable), Tag Name and Description/Message (overall and one screen for each designated process, plant or system). The screen shall have a pushbutton that enables an operator to acknowledge all alarms with one mouse click.
10. Alarm Configuration (ability to set time delays, enable/disable individual alarms, set alarm priority) and Alarm Dialer operation
11. Historical Trends - up to four analog points per trend, grouped per the Owner's and Engineer's instructions
12. Analog Registers (process set points, alarm set points, time delays, etc. with tag number and description)
13. Reports/Manual Text Entry for Reports/Printing Reports

3.05 MANUFACTURER'S SERVICES

- A. The supervisory service of a factory-trained service engineer who is specifically trained on the type of equipment herein specified shall be provided for a period of not less than four 8-hour days during construction to assist the Instrumentation and Electrical Contractors in equipment installation, the location of sleeves, methods of installing conduit and special cable, mounting, piping and wiring of one of each type of device, and the methods of protecting all of the equipment prior to placing it into service. Upon completion of the installation, the services of the above service engineer shall be provided for a period of not less than six 8-hour days for calibration, testing and start-up of the equipment. The instrumentation system supplier shall conduct a group training program on the operation and routine maintenance of the system. The training shall be conducted at the installation site and consist of five classroom and field training sessions, 8 hours a day during normal working hours. The text shall be the loop diagrams, operation and maintenance manual and shall concentrate on the operation of the equipment as applied to this process. The minimum days specified above do not relieve

the manufacturer of providing sufficient service to place the system in satisfactory operation.

3.06 PRODUCT HANDLING

- A. Upon completion of shop assembly and testing, all control panels shall be enclosed in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving the equipment without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.
- B. Special instructions for proper field handling and installation required by the manufacturer for proper protection shall be securely attached to each piece of equipment prior to shipment.
- C. Each package shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package.
- D. A permanent stainless steel or other noncorrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number as given in the tabulation shall be provided on each piece of equipment supplied under this section.
- E. Equipment shall not be stored out-of-doors. Equipment shall be stored in dry permanent shelters and, including in-line equipment, shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired or the damaged equipment replaced by the Instrumentation and Controls Contractor at his own cost and expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such tests as directed by the Engineer. This shall be at the cost and expense of the Instrumentation and Controls Contractor or the apparatus shall be replaced by the Instrumentation and Controls Contractor at his own expense.

3.07 GUARANTEE

- A. For guarantee, refer to General Conditions.

CONTROL PANEL AND OPERATOR STATION LIST										
Designation	Description	Location	NEMA Rating	Material	Min. Height	Min. Width	Min. Depth	Mounting	UPS	OIT
PCP-1	Oakland Pump Station Pump Control Panel	Oakland Pump Station	12	Galvanized Steel	60-in	36-in	12-in	Wall	YES	YES
YA-0100	WWTF Headworks Gas Alarm	WWTF Headworks	4	Stainless Steel	12-in	12-in	6-in	Wall	NO	NO

INSTRUMENTATION LIST								
TAG #	FACILITY	FUNCTION	INSTRUMENT	TYPE	LOCATION	RANGE	UNITS	REMARKS
LT-0010	Oakland Pump Station	Wet Well Level	Level Transmitter	Submersible Pressure	Wet Well	0-30	FT	Provide Intrinsically Safe Current Barrier
LSH-0010A	Oakland Pump Station	Wet Well High Level	Level Switch	Float Switch	Wet Well	N/A	N/A	Provide Intrinsically Safe Relay Barrier
LSH-0010B	Oakland Pump Station	Wet Well High High Level	Level Switch	Float Switch	Wet Well	N/A	N/A	Provide Intrinsically Safe Relay Barrier
LSL-0010	Oakland Pump Station	Wet Well Low Level	Level Switch	Float Switch	Wet Well	N/A	N/A	Provide Intrinsically Safe Relay Barrier
FE-0013	Oakland Pump Station	Station Flow	Flow Element	Ultrasonic Clamp On	Ground Level	0-300	GPM	--
FIT-0013	Oakland Pump Station	Station Flow	Flow Transmitter	Electronic	Ground Level	0-300	GPM	--
FIR-0013	Oakland Pump Station	Station Flow	Dual Channel Chart Recorder	Circular Pen Chart Recorder	Ground Level	0-300	GPM	--
AIT-0101	WWTF Headworks	Headworks Combustible Gas	Combustible Gas Detector Transmitter	Electronic	Headworks	0-100	% LEL	--
AIT-0102	WWTF Headworks	Headworks Toxic Gas	Toxic Gas Detector Transmitter	Electronic	Headworks	0-500	PPM	--
AIT-0103	WWTF Headworks	Headworks Oxygen Gas	Oxygen Gas Detector Transmitter	Electronic	Headworks	5 - 25	% Vol	--
LT-0110	WWTF Headworks	Wet Well #1 Level	Level Transmitter	Submersible Pressure	Influent Wet Well #1	0-30	FT	Provide Intrinsically Safe Current Barrier

INSTRUMENTATION LIST								
TAG #	FACILITY	FUNCTION	INSTRUMENT	TYPE	LOCATION	RANGE	UNITS	REMARKS
LSH-0110	WWTF Headworks	Wet Well #1 High Level	Level Switch	Float Switch	Influent Wet Well #1	N/A	N/A	Provide Intrinsically Safe Relay Barrier
LT-0120	WWTF Headworks	Wet Well #2 Level	Level Transmitter	Submersible Pressure	Influent Wet Well #2	0-30	FT	Provide Intrinsically Safe Current Barrier
LSH-0120	WWTF Headworks	Wet Well #2 High Level	Level Switch	Float Switch	Influent Wet Well #2	N/A	N/A	Provide Intrinsically Safe Relay Barrier
FE-1000	WWTF Operation Building	Influent Flow	Flow Element	Magnetic Meter	Operations Building Sub- Basement	0-1000	GPM	--
FIT-1000	WWTF Operation Building	Influent Flow	Flow Transmitter	Electronic	Operations Building Basement	0-1000	GPM	--

IO AND ALARM LIST

IO Tag No	Service	Location	IO Description	IO Type	IO Signal Range	CP Termination	LRL	URL	Units	Alarm List	Remarks
LT-0010	Oakland Pump Station Wet Well Level	Oakland Pump Station Wet Well	Wet Well Level	AI	4-20 mA DC	PCP-1	0	40	Feet	TRUE	LAHH, LAH, LAL, LALL,
LSH-0010A	Oakland Pump Station Wet Well #1 Level	Oakland Pump Station Wet Well	Wet Well Level High	DI	--	PCP-1	--	--	--	TRUE	--
LSH-0010B	Oakland Pump Station Wet Well #1 Level	Oakland Pump Station Wet Well	Wet Well Level High High	DI	--	PCP-1	--	--	--	TRUE	--
LSL-0010	Oakland Pump Station Wet Well #1 Level	Oakland Pump Station Wet Well	Wet Well Level Low	DI	--	PCP-1	--	--	--	FALSE	--
YI-0011A	Oakland Pump Station Sewage Pump #1	Oakland Pump Station	Pump #1 HOA in Auto	DI	--	PCP-1	--	--	--	FALSE	--
YI-0011B	Oakland Pump Station Sewage Pump #1	Oakland Pump Station	Pump #1 Run Status	DI	--	PCP-1	--	--	--	FALSE	--
MSH-0011	Oakland Pump Station Sewage Pump #1	Oakland Pump Station	Pump #1 Seal Chamber Leak	DI	--	PCP-1	--	--	--	TRUE	--
TAH-0011	Oakland Pump Station Sewage Pump #1	Oakland Pump Station	Pump #1 High Motor Temperature	DI	--	PCP-1	--	--	--	TRUE	--
YA-0011A	Oakland Pump Station Sewage Pump #1	Oakland Pump Station	Pump #1 Soft Starter Alarm	DI	--	PCP-1	--	--	--	TRUE	--
YS-0011	Oakland Pump Station Sewage Pump #1	Oakland Pump Station	Pump #1 Start/Stop	DO	--	PCP-1	--	--	--	FALSE	--
YI-0012A	Oakland Pump Station Sewage Pump #2	Oakland Pump Station	Pump #2 HOA in Auto	DI	--	PCP-1	--	--	--	FALSE	--
YI-0012B	Oakland Pump Station Sewage Pump #2	Oakland Pump Station	Pump #2 Run Status	DI	--	PCP-1	--	--	--	FALSE	--
MSH-0012	Oakland Pump Station Sewage Pump #2	Oakland Pump Station	Pump #2 Seal Chamber Leak	DI	--	PCP-1	--	--	--	TRUE	--
TAH-0012	Oakland Pump Station Sewage Pump #2	Oakland Pump Station	Pump #2 High Motor Temperature	DI	--	PCP-1	--	--	--	TRUE	--
YA-0012A	Oakland Pump Station Sewage Pump #2	Oakland Pump Station	Pump #2 Soft Starter Alarm	DI	--	PCP-1	--	--	--	TRUE	--
YS-0012	Oakland Pump Station Sewage Pump #2	Oakland Pump Station	Pump #2 Start/Stop	DO	--	PCP-1	--	--	--	FALSE	--
FIT-0013	Oakland Pump Station Flow	Oakland Pump Station	Station Flow	AI	4-20 mA DC	PCP-1	0	300	GPM	TRUE	FAHH, FAH, FAL, FALL,

IO AND ALARM LIST

IO Tag No	Service	Location	IO Description	IO Type	IO Signal Range	CP Termination	LRL	URL	Units	Alarm List	Remarks
YA-0015A	Oakland Pump Station Generator	Oakland Pump Station	Generator Failure	DI	--	PCP-1	--	--	--	TRUE	--
YA-0015B	Oakland Pump Station Generator	Oakland Pump Station	Generator Alarm	DI	--	PCP-1	--	--	--	TRUE	--
YA-0015C	Oakland Pump Station Generator	Oakland Pump Station	Generator Low Fuel Level	DI	--	PCP-1	--	--	--	TRUE	--
YA-0015D	Oakland Pump Station Generator	Oakland Pump Station	Generator Fuel Tank Leak	DI	--	PCP-1	--	--	--	TRUE	--
YI-0015A	Oakland Pump Station Generator	Oakland Pump Station	Generator On	DI	--	PCP-1	--	--	--	FALSE	--
YI-0015B	Oakland Pump Station Generator	Oakland Pump Station	Generator Not in Auto	DI	--	PCP-1	--	--	--	FALSE	--
YI-0016A	Oakland Pump Station Transfer Switch	Oakland Pump Station	Normal Position	DI	--	PCP-1	--	--	--	FALSE	--
YI-0016B	Oakland Pump Station Transfer Switch	Oakland Pump Station	Emergency Position	DI	--	PCP-1	--	--	--	FALSE	--
JAL-0017A	Oakland Pump Station PCP	Oakland Pump Station PCP	120VAC Power Failure	DI	--	PCP-1	--	--	--	TRUE	--
JAL-0017B	Oakland Pump Station PCP	Oakland Pump Station PCP	Power Supply Failure	DI	--	PCP-1	--	--	--	TRUE	Power Supply Alarms are wired in series.
JAL-0017C	Oakland Pump Station PCP	Oakland Pump Station PCP	UPS Failure	DI	--	PCP-1	--	--	--	TRUE	--
YA-0018	Oakland Pump Station Building Intrusion	Oakland Pump Station Door	Pump Station Intrusion	DI	--	PCP-1	--	--	--	TRUE	--
YA-0019A	Alarm Dialer Interface	Oakdale Pump Station	Wet Well Level High	DO	--	PCP-1	--	--	--	False	--
YA-0019B	Alarm Dialer Interface	Oakdale Pump Station	Building Intrusion	DO	--	PCP-1	--	--	--	False	--
YA-0019C	Alarm Dialer Interface	Oakdale Pump Station	Generator Failure	DO	--	PCP-1	--	--	--	False	--
YA-0019D	Alarm Dialer Interface	Oakdale Pump Station	Transfer Switch in Emergency	DO	--	PCP-1	--	--	--	False	--
YA-0019E	Alarm Dialer Interface	Oakdale Pump Station	Power Failure Alarm	DO	--	PCP-1	--	--	--	False	--
YA-0019F	Alarm Dialer Interface	Oakdale Pump Station	Sewage Pump #1 Alarm	DO	--	PCP-1	--	--	--	False	--

IO AND ALARM LIST

IO Tag No	Service	Location	IO Description	IO Type	IO Signal Range	CP Termination	LRL	URL	Units	Alarm List	Remarks
YA-0019G	Alarm Dialer Interface	Oakdale Pump Station	Sewage Pump #2 Alarm	DO	--	PCP-1	--	--	--	False	--
RAL-0019	Pump Control Panel	Oakdale Pump Station	Alarm Horn/Beacon	DI	--	PCP-1	--	--	--	False	--
SAL-0019	Oakland Pump Station Alarm	Oakland Pump Station Exterior Wall	Pump Station General Alarm	DO	--	PCP-1	--	--	--	TRUE	--
YI-0104A	Headworks Exhaust Fan	Operations Building	Headworks Exhaust Fan HOA in Auto	Exist. Spare DI	--	MTU	--	--	--	FALSE	--
YI-0104B	Headworks Exhaust Fan	Operations Building	Headworks Exhaust Fan Run Status	Exist. Spare DI	--	MTU	--	--	--	FALSE	--
YA-0104	Headworks Exhaust Fan	Operations Building	Headworks Exhaust Fan VFD Alarm	Exist. Spare DI	--	MTU	--	--	--	TRUE	--
SI-0104	Headworks Exhaust Fan	Operations Building	Headworks Exhaust Fan VFD Speed	Exist. Spare AI	4-20 mA DC	MTU	0	100	%	FALSE	--
YS-0104	Headworks Exhaust Fan	Operations Building	Headworks Exhaust Fan Start/Stop	Exist. Spare DO	--	MTU	--	--	--	FALSE	--
SC-0104	Headworks Exhaust Fan	Operations Building	Headworks Exhaust Fan VFD Speed Command	Exist. Spare AO	4-20 mA DC	MTU	30	100	%	FALSE	--

Notes:

1. The IO and Alarm List contains a list of the physical IO points. Refer to the Loop Descriptions in this Section for additional IO points. For example, elapsed time meters (KQI-xxx), flow totalizers (FQI-xxx), motor state disagreement alarms (YA-xxx), software-based selector switches, start/stop or reset pushbuttons (HS-xxx), software-based timers (KC-xxx), level set points (LS-xxx), etc.
2. The IO point has one or more alarm points when “TRUE” appears in the “Alarm List” column. If no ISA identification letters appear in the “Alarm Remarks” column, then the alarm tag is the same as the tag in the “IO Tag No” column. When multiple sets of ISA identification letters appear in the “Alarm Remarks” column, create an alarm point for each set of ISA identification letters. Refer to the examples below. IO points with multiple alarm points are typical for *IT or *T ISA identification letters in the “IO Tag No” column, where * = first letter(s) of the set of ISA identification letters. Refer to the “Alarm Remarks” column for the specific alarms.

*AHH = * alarm high high. Initially set at LRL + 90% of span rising, adjustable
*AH = * alarm high. Initially set at LRL + 80% of span rising, adjustable
*AL = * alarm low. Initially set at LRL + 20% of span falling, adjustable
*ALL = * alarm low low. Initially set at LRL + 10% of span falling, adjustable
d*/dt = high rate of change alarm. Initially set at 5% of span/second, adjustable
*DAH = set point deviation alarm. Initially set at 5% of set point, adjustable

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DIVISION 14

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SECTION 14600

HOISTING EQUIPMENT

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Furnish, install, test and place in satisfactory operation the hoisting equipment, complete with all supports, fastenings, and other appurtenances, as indicated on the Drawings and as herein specified.
- B. The Specifications and Drawings direct attention to certain required features of the equipment but do not purport to cover all details entering into its design and construction. Nevertheless, the Contractor shall furnish, shop test, deliver, install and field test all materials, equipment and appurtenances for the hoisting equipment complete in all details and ready for operation as specified herein, whether specifically mentioned in these Specifications or not.

1.2 RELATED WORK

- A. Division 1 – General Requirements
- B. Division 5 - Metals
- C. Division 9 - Finishes
- D. Division 11 - Equipment
- E. Division 15 – Mechanical
- F. Division 16 – Electrical

1.3 QUALITY ASSURANCE

- A. The hoisting systems shall conform to the location, capacity, critical dimensions and other pertinent data listed in the “Equipment Schedule” included herein.
- B. All structural steel members of the handling system shall be designed in accordance with the specifications of American Institute of Steel Construction, current edition, and any welded construction shall be in accordance with the standards of the American Welding Society.

- C. Castings, forgings, stampings, etc., shall have a safety factor of at least 5.
- D. Provide service of factory train service technician with training specific to the hoisting equipment provided.
 - 1. Provide service of manufacturer's representative as specified in Section 01665

1.4 Submittals

- A. Product Data: For each type of product indicated.
- B. Maintenance Data: For each product to include in maintenance manuals.
- C. Warranties: As specified in the General Conditions.

PART 2 PRODUCTS

2.1 GENERAL

- A. All hoisting equipment shall conform to the current standards set forth by the following:
 - 1. Hoist Manufacturers Institute - HMI 100, HMI 200 and HMI 400.
 - 2. American National Standard Institute ANSI B30.11, ANSI B30.16 and ANSI C1.
 - 3. American Institute of Steel Construction
 - 4. American Welding Society
 - 5. Crane Manufacturers Association of American Inc., (C.M.A.A.).
 - 6. Occupational Safety and Health Administration (O.S.H.A.)
- B. All hoisting equipment parts shall be proportioned so that all stresses and vertical or lateral deflections will be within conservative limits with minimum vibration. Rated load safety factors of at least five, based upon ultimate strength of the materials used, shall be employed.
- C. The Contractor shall verify all dimensions and clearances in the field prior to erection of the hoisting equipment and shall be responsible for the proper fitting and operation of the equipment.
- D. The capacity of each hoist and trolley shall be permanently marked in a conspicuous manner.
- E. Safety Devices: Comply with applicable safety codes, as directed by local authority having jurisdiction, and as follows.
 - 1. Equip with end stops to limit movement of trolley.
 - 2. All hooks shall be safety type.

- F. Align structural beam with the monorail; determine hanger locations according to loading requirements.

2.2 ACCEPTABLE MANUFACTURERS

- A. Power Winch Operated Davit Crane: Davit shall be manufactured by Thern Incorporated, or be an acceptable equivalent product.
- B. Motor Operated Hoist: Hoisting equipment shall be manufactured by Yale Hoisting Equipment Division,; Shaw Box, ACCO-Wright, or be an acceptable equivalent product.

2.3 EQUIPMENT

A. Power Winch Operated Davit Crane

1. The hoisting equipment shall be the Series 5PT20X-E4X Davit Crane with electric winch, as manufactured by Thern Incorporated of Winona Minnesota, or approved equal.
2. Capacity of permanent power winch operated davit crane shall be 2000 pounds and shall have the following properties:
 1. Crane shall have lift capabilities of 36 feet.
 2. Hooks shall be of high grade, forged steel, and shall have swivel, antifriction bearings.
3. Fasteners
 - a. Studs, nuts, washers, and fasteners shall be Type 304 stainless steel and shall be furnished with the hoisting equipment.
4. Cable
 - a. Cable shall be 5/16" x 60 feet 304 stainless steel wire rope.
5. Crane
 - a. Crane shall have an internal mechanical brake that works instantly when operation is stopped, and holds the load.
 - b. Epoxy Finish Crane
 - c. Pedestal Base
 - d. Adjustable Boom with ratchet jack
 - e. Electric winch shall be 1.0 horsepower and epoxy finish

B.

C. Motor Operated Hoist

1. All components located within the headworks shall be rated for a Class 1 Division 1 Group D area.
2. System shall be equipped with a four button, push button operator with ballast resistors to cushion the start. Push Button Station.
3. Hooks and wheels shall be bronze.

4. Cable shall be stainless steel.
5. Power cord length specified is based on required travel distance. Additional cord shall be provided based on manufacturer's requirements.

D. EQUIPMENT SCHEDULE

Hoist Location	Upper Level	Wet Well Davit
Number Required	1	1
Rate Use	Indoor	Outdoor
Clearance Req.	Low Headroom	--
Suspension Type	Safety Hook	Safety Hook
Capacity	2 Ton	1 Ton
Lifting Speed	20 ft/min variable	--
Hoist Type	Motorized Wire Rope	Power winch
Distance from Hook to Operating Floor	30 feet	36 feet
Trolley	Motorized	--
Travel Distances	12 feet	--
Power	460V, 3-phase, 60 Hz	115V, 1-phase, 60 Hz
Hoist HP	4	1
Trolley HP	0.25	--

E. Pushbutton Control

1. The control provided shall have sufficient buttons to control all functions of the hoist and trolley operations.
2. Each button shall be clearly marked with its function.
3. The control cable shall be long enough to reach within 4-feet of the operating level. Provide support arm if required so controls will be kept readily available to the operator.

F. Safety Stops

1. Safety stops shall be provided for both ends of the trolley tracks. The stops shall be capable of safely stopping the trolley and hoist when in motion under full load.

G. Cable Reels

1. Power cable for the electric hoist and trolley shall be a self-winding spring operated reel installed at the approximate midpoint of travel. The reel shall have a fixed base and roller outlet

H. Fasteners

1. Studs, nuts, washers, and fasteners shall be Type 304 stainless steel and shall be furnished with the hoisting equipment.

2.4 PAINTING

- A. Primer and Finished Paint: All steelwork and machinery except bearing surfaces, shafts, chain, cable, and stainless steel shall be painted. Surfaces

to be painted shall be thoroughly dry and free from rust, grease or dirt. Primer and high solids epoxy shall be shop applied.

- B. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.
- C. Field painting as specified in Section 09900 - Painting.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All equipment shall be installed in accordance with the manufacturer's written instructions, as approved, and all equipment and materials required for proper installation shall be provided.
- B. It shall be the responsibility of the Contractor to coordinate the work included under this section of the specifications with other related work specified herein to insure that all the equipment shall operate to perform the designated functions in a proper and acceptable manner.
- C. Anchor bolts, expansion bolts, studs, nuts, washers and fasteners shall be set as per manufacturer's recommendations.

3.2 ADJUSTING

- A. Adjust hoists to operate smoothly under all load conditions, without malfunction.

3.3 FIELD ACCEPTANCE TESTS

- A. Test hoists, at the rated load, in the presence of the Engineer.

3.4 TOOLS AND LUBRICANTS

- A. Furnish a complete set of any special tools required for the maintenance and operation of this equipment, as designated by the equipment manufacturer.
- B. A one-year supply of each type of lubricant required for each piece of equipment and one grease gun for each type of lubricant required shall be furnished under this Section.

END OF SECTION

DIVISION 15

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SECTION 15050

PIPE PENETRATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing and installing pipe penetration assemblies. This Section covers materials for various pipe penetration configurations. Refer to the Contract Drawings for details of assembly and for location.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A53, Standard Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. American National Std. Institute (ANSI)/American Water Works Assoc. (AWWA)
 - 1. ANSI/AWWA C151/A21.51, Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids

1.03 SUBMITTALS

- A. Submit to in accordance with SECTION 01300, manufacturers' literature on all items to be furnished, installation instructions, and where applicable, fire rating and certified test results of the various components.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Unless otherwise shown all pipe sleeves shall be Schedule 40 galvanized steel pipe conforming to ASTM A53. Provide a 2-in minimum circumferential water stop welded to exterior of sleeve at its midpoint. Ends of sleeves shall be cut, ground smooth, and shall be flush with the wall or ceiling and extend 2-in above finished floors. Sleeves required to be sealed by caulking shall be sized as required. Sleeves required to be sealed with mechanical seals shall be sized in accordance with the seal manufacturer's recommendations, and shall be a single seal for wall thicknesses up to and including 12-in; two mechanical seals shall be provided for wall thicknesses greater than 12-in. Sleeves for insulated piping shall be sized to accommodate the approved insulation.

2.02 WALL CASTINGS

- A. Unless otherwise shown, wall castings shall be ductile iron conforming to ANSI/AWWA C151/A21.51, thickness Class 53, diameter as required. Flanges and/or mechanical joint bells shall be drilled and tapped for studs where flush with the wall. Castings shall be provided with an intermediate ½-in thick by 2-in minimum circumferential flange/waterstop, integrally cast with or welded to the casting, located such that it falls within the middle third of the wall.

2.03 SEALING MATERIALS

- A. Mechanical seals shall be modular, adjustable, bolted, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. The seal shall be rated by the manufacturer for 40 feet of head or 20 psig. Mechanical seals shall be Link-Seal, manufactured by Thunderline Corp., Wayne, MI., or equal.
- B. Caulking for iron, steel and copper piping shall consist of braided oakum packing followed by poured molten soft virgin lead. Minimum length of lead segment shall be one half of pipe diameter, or six inches, whichever is less. Lead shall be flush with end of sleeve. Cooled lead shall be expanded with a caulking iron to form a water seal.
- C. Sealant shall be a two part foamed silicone elastomer as manufactured by Dow Corning Co., product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303; or Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corporation. Packing shall be a fire retardant pliable material, Fig. 310 by Sealtite Co., White Oakum W.S.-600 by American Manufacturing Co., or equal. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.04 MISCELLANEOUS MATERIALS

- A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corporation, equal by Euclid Chemical Corporation; Master Buildings Company or equal.
- B. Non-shrink grout shall be Masterflow 713 by Master Builders Company, Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or equal.
- C. Galvanized escutcheon plates shall be provided for all exterior sleeved wall penetrations above finished grade.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Assemble and install components of pipe penetration assemblies as detailed in the Contract Documents.

END OF SECTION

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SECTION 15060

PROCESS PIPING

PART 1 PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to furnish, install, joint and test miscellaneous pipe, fittings, and appurtenances, (including special castings), indicated on the Drawings and specified in this Section.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading
2. Section 09900 - Painting
3. Section 15050 - Pipe Penetrations
4. Section 15140 - Hangers and Supports

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A47, Specification for Ferric Malleable Iron Castings.
2. A53, Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A182, Specification for Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service.
4. A183, Specification for Carbon Steel Track Bolts and Nuts.
5. A193, Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service.
6. A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service.
7. A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
8. A312, Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
9. A320, Specification for Alloy/Steel Bolting Materials for Low Temperature Service.
10. A403, Specification for Wrought Austenitic Stainless Steel Piping Fittings.
11. A536, Specification for Ductile Iron Castings.
12. A563, Specification for Carbon and Alloy Steel Nuts.
13. B 88, Specification for Seamless Copper Water Tube.
14. B 135, Specification for Seamless Brass Tube.
15. C552, Specification for Cellular Glass Thermal Insulation.
16. D1785, Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
17. D2513, Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

18. D2992, Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings.
 19. D2996, Specification for Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
- B. American Water Works Association (AWWA)
1. C606, Standard for Grooved and Shouldered Joints.
 2. C651, Standard for Disinfecting Water Mains.
- C. American National Standards Institute (ANSI)
1. A21.4, Standard for Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water.
 2. A21.10, Standard for Gray-Iron and Ductile-Iron Fittings, 3-inch. through 48-inch., for Water and Other Liquids.
 3. A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
 4. A21.15, Standard for Flanged Cast-Iron and Ductile-Iron Pipe with Threaded Flanges
 5. A21.50, Standard for Thickness Design of Ductile-Iron Pipe.
 6. A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds, or Sand-Lined Molds, for Water or Other Liquids.
 7. A21.53, Ductile Iron Compact Fittings for Water and Other Liquids.
 8. B16.1, Standard for Ductile Iron Pipe Flanges and Flanged Fittings.
 9. B 16.3, Malleable Iron Threaded Fittings, Class 150 and 300.
 10. B16.5, Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
 11. B 16.9, Factory-Made Wrought Steel Butt Weld Fittings.

1.03 SUBMITTALS

- A. In accordance with SECTION 01300 submit the following:
- B. Shop Drawings
1. Piping layouts in full detail.
 2. Location of pipe hangers and supports.
 3. Location and type of backup block or device to prevent separation.
 4. Large scale details of all wall penetrations and special castings.
 5. Schedules showing the material and thickness or class of all pipe, fittings, special castings, couplings, expansion joints, and other appurtenances.
 6. Details of pipe lining, coating, wrapping, insulation and painting of all pipe lines.
 7. Points of location of piping identification signs.
 8. Other piping appurtenances and data pertinent to the layout of pipe lines whether specifically mentioned in the Specifications or shown on the Drawings.
- C. Certificates
1. Sworn certificates in duplicate of shop tests showing compliance with appropriate standard.

2. Design Computations shall be included in the submittal, for the purpose of record only, and certified by piping manufacturer.
- D. Submit manufacturer's certificates of conformance.
- E. Submit certified copies of test reports.

1.04 QUALITY ASSURANCE

A. Ductile Iron Pipe

1. Inspect and test at foundry according to ANSI Standards.
2. Owner reserves right to inspect and/or test by independent service at manufacturer's plant or elsewhere at his own expense.
3. Owner reserves right to perform visual inspection and hammer test before installation.

PART 2 PRODUCTS

2.01 PIPE SCHEDULE

A. General

1. Unless otherwise called for by the Contract Drawings or elsewhere in these specifications, the following is a guide as to types of materials and jointing required for piping under this contract.
2. The lack of mention of any specific pipe shall not relieve the Contractor from the responsibility of furnishing and installing all piping required for completion of the Work.
3. Piping listed is exposed unless stated otherwise.

B. Well Water, Seal Water and Potable Water

1. Three inches and smaller
 - a. Type L (medium wall) hard temper copper with soldered fittings. Red brass pipe required around equipment, and in other locations where vibration may occur.
 - b. Buried service - Type K, soft temper.
2. Greater than three inches
 - a. Ductile-Iron pipe and fittings, flanged joint, cement lined.
 - b. Buried service – use restrained mechanical joint.

C. Plant Water, Process Wastewater, Vent, Supernatant, Other Process Recycle

1. Schedule 80 PVC of the material type required for the chemical to be handled. All fittings shall be of the same material and classification and shall be of the solvent-socket weld type unless noted otherwise on the Contract Drawings.

D. Dewatering, Primary Sludge and Scum

1. Schedule 80 PVC of the material type required for the chemical to be handled. All fittings shall be of the same material and classification and shall be of the solvent-socket weld type unless noted otherwise on the Contract Drawings.
 2. Tubing as recommended by the pump manufacturer, as detailed on the Contract Drawings or as specified.
- E. LP Gas, Natural Gas
1. See Plumbing Specification
- F. Chemical Process Piping, Sump Pump Piping
1. Schedule 80 PVC of the material type required for the chemical to be handled. All fittings shall be of the same material and classification and shall be of the solvent-socket weld type unless noted otherwise on the Contract Drawings.
 2. Tubing as recommended by the pump manufacturer, as detailed on the Contract Drawings or as specified.

2.02 DUCTILE-IRON PIPE AND FITTINGS

- A. Designed in accordance with ANS A21.50.
- B. Manufactured in accordance with ANS A21.15 or ANS A21.51.
- C. Ductile-iron pipe shall be at least thickness Class 52 for pipe 4-inch. and smaller and at least thickness Class 53 for pipe 6-inch. and larger, unless stated otherwise.
- D. Pipe for use with sleeve-type couplings
1. As specified in paragraph 2.02, A and B except that the ends shall be plain (without bells or beads).
 2. Ends shall be cast or machined at right angles to the axis.
- E. Pipe for use with Screwed on Flanges
1. As specified in paragraph 2.02, A and B with flanges in accordance with ANS A21.15, Class 125
 2. Ductile-iron pipe shall be at least thickness Class 53.
- F. Pipe for use with Grooved Couplings
1. As specified in paragraph 2.02, A and B except that the ends shall not have bells or beads but shall have cast or machined shoulders or grooves conforming to AWWA C606.
 2. Joints designed to be Rigid or Flexible as indicated on the Drawings in accordance with AWWA C606.
 3. Fabricators symbol to be visible on pipe conforming to AWWA C606.
- G. Grooved Fittings
1. In accordance with ANS A21.10 for Standard Fittings.
 2. In accordance with ANS A21.53 for Compact Fittings.
 3. Grooved in accordance with AWWA C606.
- H. Flanged Adapter, for connecting Grooved pipe to Flanged pipe

1. Manufactured of ductile iron in accordance with ASTM A536 or malleable iron in accordance with ASTM A47.
 2. Provide with key section that engages the groove and bolt circle to match Class 125 flanges.
- I. Couplings for Grooved Pipe
1. Housings made up with two (2) identical segments for pipe sizes 3 inch through 12 inches and four or more segments for pipe sizes 14 inches and larger all manufactured from ductile iron in accordance with ASTM A536 or malleable iron in accordance with ASTM A47.
 2. Gaskets to be center lug design in accordance with AWWA C606, suitable for service intended.
 3. Bolts and Nuts to be carbon steel heat treated and plated in accordance with ASTM A183.
- J. Flanged Fittings
1. Provide with working pressure of 250 psi.
 2. Faced and drilled in accordance with ANS A21.10, Class 125, except that special drilling or tapping shall be provided as necessary to ensure correct alignment and bolting.
 3. Flanged fittings which are not available under ANS A21.10 (e.g. laterals or reducing ells) shall be furnished to conform to the requirements of ANS B16.1, class 125.
- K. Base Elbows
1. Fittings shall be provided with standard bases in accordance with ANS A21.10 where so indicated.
- L. Nonstandard Fittings
1. Fittings having nonstandard dimensions and cast especially for this project shall be of acceptable design. They shall be manufactured to meet the requirements of the same specifications and shall have the same diameter and thickness as standard fittings, but their laying lengths and types of ends shall be determined by their positions in the pipelines and by the particular piping to which they connect.
- M. Gaskets, Bolts, and Nuts for Flanges
1. For flanged joints, gaskets shall be ring gaskets of rubber with cloth insertion. Gaskets 12-inch diameter and smaller shall be 1/16-inch thick; larger than 12-inch, to be 1/8-inch thick.
 2. Gaskets shall be of a composition suitable for exposure to the product which the pipe is intended.
 3. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same American National Standard as the flanges.
 4. Bolts and nuts shall, except as otherwise specified or noted on the drawings, be Grade B conforming to ASTM A307.
 5. Bolt studs and studs shall be of the same quality as machine bolts.
 6. Submerged flanged joints shall be made up with Type 316 stainless steel stud bolts and nuts.

N. Cement Mortar Lining

1. Inside of pipe and fittings shall be coated with double thickness cement lining and bituminous seal coat conforming to AN A21.4.
2. The cement mortar lining shall be given a seal coat of asphaltic material in accordance with ANS A21.4.

O. Glass Lining

1. General
 - a. Specially formulated internal coating on ductile iron pipe or ductile iron pipe fittings and specials.
 - b. All metal preparation, application and processing will follow the manufacturer's recommended procedures.
 - c. The glass lining shall be in accordance with the manufacturer's standard tolerances for coverage, continuity and gloss.
 - d. Pin holes, crazing or fishscales, which substantially expose the metal substrate, shall be cause for rejection of the pieces.
 - e. Sizes, details, handling, stacking, etc. shall be in accordance with the manufacturer's recommendations.
2. Application of Lining
 - a. The coating shall consist of special glasses and inorganic materials applied in a minimum of two (2) coats, separately fired, to internal surfaces prepared by blasting.
 - b. Following application of the ground (base) coat, the items shall be exposed to an appropriate maturing temperature (above 1400°F) to fuse the glass to the base metal forming an integral molecular bond with the metal.
 - c. The resulting bond shall be sufficient to withstand a metal yield point of 0.001-inch/inch without damage to the glass.
 - d. Subsequent coatings (finish coats) shall be processed in a similar manner, forming an integral molecular bond with the base coat.
3. Quality
 - a. The entire coating shall be from .008-inch to .012-inch thick.
 - b. It shall have a hardness of from 5 to 6 on the Mohs Scale, and a density of from 2.5 to 3.0 grams per cubic centimeter.
 - c. The green glass lining shall be capable of withstanding a thermal shock of 350°F to corrosion by solutions between pH-3 and pH-10 at 125°F.
 - d. There shall be no visible loss of surface glass on the glass lining after immersion of a normal production run sample in an 8 percent sulfuric acid solution at 148 degrees F for a period of ten (10) minutes.
 - e. In addition, when tested according to ASTM Designation C283-54, it shall show a weight loss of not more than 3 milligrams per square inch.
4. Flanges shall be factory assembled, aligned, faced and sealed in accordance with manufacturer's recommendations.
5. No cutting or tapping of glass-lined pipe in the field shall be permitted.
6. Glass lined pipe shall be Type SG-14 as manufactured by Ervite Corporation or Type SG-M as manufactured by Permutit Company, a Division of Sybron Corporation or an approved equal.

P. Coating

1. Asphaltic exterior coating for buried pipe and fittings to be in accordance with ANS A21.51.
2. Outside of pipe and fittings within structures are not to be coated but shall be thoroughly cleaned and given one shop coat of Intertol Rustinhibitive Primer 621 made by Koppers Co., Inc., Pittsburgh, Pa.; Multiprime made by PPG Industries, Inc., Pittsburgh, Pa; or an acceptable equivalent product.
3. Outside surfaces of castings to be encased in concrete shall not be coated.
4. Machined surfaces shall be cleaned and coated with a suitable rust-preventative coating at the shop immediately after being machined.

2.03 EXTERIOR DUCTILE IRON PIPE FOR BURIED SERVICE

- A. As specified in paragraph 2.02, A and B with restrained joint unless indicated otherwise.
- B. Class 52 or designed for laying condition in flat bottom trench with the backfill lightly consolidated to the centerline of pipe having a minimum of eight feet of earth cover, or at elevation shown on the Drawings.
- C. Push on joint and rubber gasket in accordance with ANS A21.11.
- D. Pipe to be TR Flex as manufactured by US Pipe, or equal.

2.04 COPPER PIPE AND FITTINGS

- A. Pipe
 1. In accordance with ASTM B 88.
- B. Fittings
 1. Cast bronze or wrought copper and bronze solder-joint pressure fittings.
 2. Manufactured by Mueller Company, NIBCO, Inc.; or equal.
- C. Unions
 1. Solder type, with brass-to-brass seats. Gasketed unions are not acceptable.
- D. Solder
 1. Silver solder shall be used for making all buried joints.
 2. For air piping, solder shall be 95 percent tin and 5 percent antimony.
- E. Insulating Union, where copper piping is connected to steel pipe.
 1. Manufactured by EPCO Sales, Incorporated, or Capital Manufacturing Co., or equal.
- F. Tapped Cap, where copper pipe is connected to ductile iron pipe, furnish and install a tapped cap, Flow F-1402, or ACIPCO Type A-338 or equal, and a brass corporation stop, Type H15025 by Mueller Co., or equal.
- G. Where more rigidity is required in erecting and supporting copper pipe, the Contractor may, at his option or when so directed by the Engineer, substitute brass pipe.

2.05 BRASS PIPE AND FITTINGS

- A. Pipe in accordance with ASTM B 135, drawn temper. Fittings shall be brass.

2.06 STEEL PIPE AND FITTINGS

A. Pipe

- 1. Black steel and Steel pipe to be in accordance with ASTM A53. Steel pipe shall be Schedule 40 and Schedule 80 as specified and shown in the Contract Drawings.

B. Fittings

- 1. Fittings used on black steel pipe lines two and one-half (2-1/2) inches or less in diameter, unless otherwise specifically called for, shall be standard weight, one hundred fifty (150) pound, beaded, malleable iron.
- 2. Fittings used on black steel pipe lines three (3) inches and larger shall be of the long radius design of standard weights in accordance with ANSI B16.9.
- 3. Fittings for compressed air shall be 300 lb. black malleable iron screwed fittings.
- 4. Malleable iron screwed fittings to be in accordance with ANSI B16.3.
- 5. Hot-dipped galvanized malleable iron fittings shall be used on all galvanized steel pipe lines. Malleable iron grooved end fittings to be in accordance with ASTM A47 and be hot-dipped galvanized.

C. Couplings

- 1. Couplings, used on black steel pipe lines three (3) inches and larger in diameter, shall be Style 38 steel compression couplings as manufactured by Dresser Industries, Type 411 steel compression couplings as manufactured by Smith-Blair, Inc., or equal.

D. Protective Coatings

- 1. All natural gas, and vent pipes shall be wrapped with a protective coal tar tape or heavily coated with Koppers Bitumastic No. 50 or equal. After testing, all joints shall be wrapped or heavily coated with Bitumastic No. 50 or equal.
- 2. All ungalvanized (black) steel piping for interior use, that is not covered by insulation, shall be primed and painted as specified under painting schedule of SECTION 09900.

2.07 SEAMLESS CARBON STEEL PIPE AND FITTINGS

A. Pipe and Fittings

- 1. In accordance with ASTM A53, Grade A.
- 2. Wall thickness 0.134 inches, minimum.

B. Fittings

- 1. Malleable Iron, 150 lb. service rating with threaded joints
- 2. Reducers and Increases to be concentric style.

2.08 STAINLESS STEEL PIPE AND FITTINGS

A. Pipe

1. In accordance with ASTM A312, Type 304 or Type 316 as specified, seamless annealed, pickled and passivated.
2. Type 304L or Type 316L for welded joints.

B. Fittings

1. Threaded Forged, in accordance with ASTM A182, Grade F304 or F316, 3,000 pound WOG.
2. Socket Weld Forger, in accordance with ASTM A182 Grade F304L or F316L, 2,000 pound WOG.
3. Butt Welded in accordance with ASTM A403 Grade WP304L or WP316L conforming to ANSI B16.9, fitting wall thickness to match adjoining pipe.
4. Long radius elbows unless indicated otherwise.

C. Flanges

1. Forged in accordance with ASTM A182 Grade F304L or F316L, Class 150 or 300, slip on welding neck, 1/16 inch raised face conforming to ANSI B16.5.

D. Gaskets

1. 1/16 inch, of material to suit intended use, and appropriate configuration for raised face or flat face flanges.

E. Bolting

1. General conditions, Type 316 in accordance with ASTM A193 Grade B8M hex head bolts and ASTM A194 Grade 8M hex head nuts.
2. Corrosive conditions, Type 304 stainless steel bolts in accordance with ASTM A320 Grade B8 with Copper silicon hex head nuts in accordance with ASTM B98 Grade A.
3. Mating to cast iron, and flat gasket, provide ASTM A307 Grade B hex head bolts and ASTM A563 Grade A heavy hex nuts.

F. Thread Lubricant

1. Teflon tape or Anti seize type.

2.09 STAINLESS STEEL TUBING AND FITTINGS

A. Tubing

1. In accordance with ASTM A312, Type 316 seamless, soft annealed, 0.083 inch, minimum wall thickness.

B. Fittings

1. Flareless Compression Forged in accordance with ASTM A182 Grade F304 or F316.
2. Socket Welded in accordance with ASTM A182 Grade F304L or F316L.

2.10 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Pipe

1. Rigid, unplasticized, and in accordance with ASTM D1785, Type 1, Class 1220.
2. Suitable for field cutting, welding, bending and couplings, and shall be Scheduled 80 unless otherwise shown on the Drawings.
3. Sizes shall be as shown on the Drawings.
4. Bundled or packaged in such a manner as to provide adequate protection for the ends, or plain, during transportation from the manufacturer to the Contractor.

B. Fittings and Appurtenances

1. Fittings to be solvent-socket weld type, or flanged as shown on the Contract Drawings.
2. Union connections and connection to pipe of other material shall be made with pipe flanges and 1/16 inch rubber gaskets.
3. Gaskets shall be resistant for the type of service intended.

2.11 ADAPTERS

- A. Where it is necessary to joint pipes of different type, furnish and install the necessary adapters unless solid sleeves are indicated on the drawings or permitted. Adapters shall have ends, conforming to the above specifications for the appropriate type of joint, to receive the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell-and-spigot type joints will be sufficient for proper jointing.

2.12 FLEXIBLE PIPE COUPLINGS

- A. Where flexible connections in the piping are indicated on the drawings, they shall be obtained by the use of sleeve-type couplings, split couplings or non metallic couplings.

B. Non-metallic coupling

1. Suitable for 200 psi working pressure.
2. Coupling body to be EDPM construction.
3. Retaining rings to be 316 stainless steel.
4. Minimum of 4 tie rods connecting flanges of the coupling.
5. Type J-1W, Wide Arch Expansion Joint manufactured by RedFlex or equal.

C. Sleeve-Type Couplings

1. To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe and shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed. Sleeve-type couplings shall be style 38 or 138, made by Dresser Mfg. Div., Bradford, Pa.; or be acceptable equivalent products.
2. All couplings shall be furnished with the pipe stop removed.
3. All couplings shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.
4. All gaskets provided with metallic tips for electrical continuity through joints.

D. Split Couplings

1. Split couplings may be used for connecting ductile-iron pipe. If split couplings are used with grooved pipe, the minimum pipe wall thickness shall be as specified under AWWA C606.
2. Split couplings shall be made of malleable iron and shall be NAPPCO couplings made by North American Pipe Products Co.; or acceptable equivalent products.
3. Where split couplings are furnished in lieu of flanged joints the joint shall be of the rigid type with pipe grooves cut to bring the ends of the pipe solidly together. The beam strength of the joint shall be equal to or greater than that of a flanged joint.
4. Where split couplings are indicated to provide for expansion or flexibility, the pipe grooves shall be cut to provide the necessary expansion or flexibility.

2.13 FILLING RINGS

- A. Provide suitable filling rings where the layout of the flanged piping is such as to necessitate their use. In materials, workmanship, facing, and drilling, such rings shall conform to ANSI Class 125 standard.
- B. Filling rings shall be of suitable length with nonparallel faces and corresponding drilling, if necessary, to ensure correct assembly of the adjoining piping or equipment.

2.14 WALL CASTINGS

- A. Wall castings shall be of the sizes and types indicated on the drawings. Flanges, facing and drilling shall conform to ANS A21.10 except that where required, as where a flange is substantially flush with the face of a masonry wall, flanges shall be drilled and tapped for studs. Other dimensions shall be substantially equal to corresponding parts of standard fittings. A central fin not less than ½-inch thick and 1-1/2-inch to 2-inch high shall be cast on the barrel at a point that will locate it midway through the wall to form a water stop.

2.15 RESTRAINTS

A. General

1. All valves and fittings shall be restrained, so that all thrusts shall be supported independent of the piping system.
2. All restraints shall conform to pipe manufacturer's recommendation.

B. For interior piping, restraints shall be located as follows:

1. Anchors shall be placed so all forces will be balanced.
2. Tiedowns shall be used to hold the pipe in position where velocity and surge forces will cause pipe movement. They shall control stress due to thermal expansion at wall pipes, sleeves and equipment.
3. Guides shall be used to prevent transverse motion at flexible couplings used as expansion joints.

C. Tie Rods

1. On piping, where flexible couplings are located near fittings or valves, stainless steel tie rods shall span the coupling from the two adjacent flanges.
2. Where the Engineer intends to have flexible couplings used as expansion couplings, tie rods may be omitted.
3. All tie rods shall be sized, spaced and installed according to the manufacturer's recommended procedure, or as directed by the Engineer.

D. Thrust Blocks

1. Constructed at all exterior pipe fittings 22-1/2° and over, and valves, unless specifically ordered otherwise by the Engineer.
2. The blocks shall be placed against undisturbed soil or against soil which has been compacted as specified in Division 2 for structures and pipes.
3. Concrete used for thrust blocks shall be 3000 psi strength.

2.16 HANGERS AND SUPPORTS

A. In accordance with SECTION 15140.

B. In addition to the hangers and supports spaced as specified elsewhere in this specification, furnish and install additional hangers and supports at all valves, fittings and pipe line equipment. Holding devices for valves and other pipe line appurtenances shall be designed and constructed to hold each unit securely.

C. Where indicated on the Drawings or otherwise required, piping supports shall consist of concrete piers or fabricated steel supports. In these instances, materials and workmanship shall be in full compliance with Division 3 of these specifications.

D. Furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner (as determined and/or directed by the Engineer) at the lines and grades indicated on the drawings or specified. The design and fabrication of such supports shall be the responsibility of the Contractor as part of the work.

E. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, the Contractor shall submit a certification from the manufacturer stating that such requirements have been complied with.

2.17 PIPE PENETRATIONS

A. In accordance with SECTION 15050.

2.18 PIPE INSULATION (FOR EXPOSED WATER AND FORCE MAINS)

A. Buried or exposed Service

1. Cellular glass type made specifically for thermal insulation of underground piping and is compatible with the piping material.

2. Insulation composed of all glass sealed cells having no binders or fillers.
3. The completed product shall be rigid and impermeable with ultimate compressive strength shall be at least 100 psi.
4. Thermal conductivity of the cellular glass shall be no higher than 0.40 BTU/sq ft/F°/in.
5. Cellular glass thickness shall be 2-inches thick and comply with all requirements of federal specification HH-1-551 and ASTM C552.
6. Bands for securing the insulation to the pipe shall be 0.5 inches wide by 0.020 inches thick and shall be made of stainless steel.
7. Jacketing for buried insulation
 - a. Flexible laminate consisting of asphalt and glass fabric.
 - b. Fabricated so that it can be wrapped around the insulation and easily secured in place.
 - c. Flexible and tough enough to be wrapped tightly around the insulation and secured without tearing or cracking.
8. Jacketing for above ground insulation
 - a. Standard gauge aluminum jacketing with stainless steel bands.

2.19 PAINTING AND IDENTIFICATION

- A. In accordance with SECTION 09900.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Coordinate work with the other trades, so that interferences between piping, duct, equipment, architectural and structural features, and other work will be avoided.
2. Anchors, bolts, inserts, supports, wall fittings, sleeves and all other appurtenances required to be built in to the work prior to the installation of pipe work shall be furnished and installed accurately and maintained in position during placement of the surrounding concrete and or masonry.
3. Drawing are diagrammatic and do not attempt to show all offsets or fittings. Install piping to conform to structures, equipment, approved shop drawings and fit work of other trades as approved by the Engineer at no additional expense to the Owner.
4. Install piping as closely as possible to walls, ceilings, columns, and other structural parts (consistent with proper space for covering, removal of pipe and access to equipment) so as to occupy the minimum of space, and all offsets and fittings required to accomplish this must be furnished by the Contractor without additional expense to the Owner.
5. In case interference develops, the Engineer will decide which work is to be relocated regardless of which was first installed.

B. Protection Against Settling

1. Where a cast pipe passes through a concrete structure into fill, whether shown or otherwise, there shall be a flexible pipe coupling at or within 12-inches of the concrete face. A second flexible joint (flexible pipe coupling or bell and spigot) shall be provided within 3 feet of the first, whether shown or not.

C. Ductile-Iron Pipe

1. Care shall be taken in handling and installing pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coatings.
2. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the Work.
3. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is installed so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.
4. Cutting shall be done with a machine having rolling wheel cutters, knives, or saws adapted to the purpose. Hammer and chisel or so-called wheel span cutters shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.
5. Castings to be encased in masonry shall be thoroughly cleaned of all rust, scale and other foreign material. Then accurately set with the bolt holes, if any, carefully aligned.
6. Appurtenances shall be set and jointed as indicated on the drawings.
7. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces.
8. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.
9. Flanged joints shall be made up tight, care being taken to prevent undue strain upon pump nozzles, valves, and other pieces of equipment.

D. Tapped Connections in Ductile Iron Pipe

1. Tapped connections shall be made in such manner as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses, shall not exceed the listed size in the appropriate table of the Appendix to the above-mentioned ANS A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
2. Where the size of the connections exceeds that given above for the pipe in question, the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or permitted by the Engineer.
3. All drilling and tapping shall be done normal to the longitudinal axis of the pipe; fitting shall be drilled and tapped similarly, as appropriate. Drilling and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.

E. Copper Pipe

1. Joints for piping except where buried shall be made up with 95-5 solder.
2. Joints for supply piping buried or installed below slab shall be made up with at least 1000 degree silver solder, and installed with minimum amount of buried joints.

F. Brass Pipe

1. Install in place of copper pipe when more rigidity is required as stated in article 2.02, B, 7.

G. Black Steel Pipe

1. All threads to be clean, machine cut, and all pipe to be reamed before erection. Each length of pipe as erected shall be up-ended and rapped to dislodge dirt and scale.
2. Screwed joints to be made up with good quality thread compound and applied to the male thread only. After having been set up, a joint must not be backed off unless the joint is completely broken, the threads cleaned, and the new compound applied. All joints shall be airtight.
3. All interior steel piping to have a sufficient number of unions to allow convenient removal of piping. Install rigid joint and flexible couplings as required.

H. Seamless Carbon Steel

1. Maximum length of pipe to be twenty feet.
2. Joint broken after thread compound has set will be cleaned and new compound applied.
3. Joints to be air tight.
4. Install a sufficient number of unions to allow convenient removal of piping.

I. Stainless Steel Pipe

1. Install in accordance with the manufacturer's technical data and printed instructions.
2. Weld joints except flanged where required or screwed where shown on the Drawing.

J. Polyvinyl Chloride (PVC) Pipe

1. Install in accordance with the manufacturer's technical data and printed instructions.
2. Solvent weld joints except flanged where required or screwed where shown on the Drawing. In making solvent welded connections, clean dirt and moisture from pipe and fittings, bevel pipe ends slightly with emery cloth if necessary, and apply solvent cement of the proper grade.
3. Install expansion joints every 50 feet on straight runs in accordance with the manufacturer's recommendations and Engineers approval. Expansion joints shall be used outside adjacent to the structures. Exterior expansion joints shall be installed within an approved sleeve to keep joint free from dirt.
4. Install valves and fittings in accordance with the manufacturer's instructions. Particular care shall be taken not to overstress threaded connections at sleeves. In making solvent weld connections, the solvent should not be spilled on valves or allowed to run from joints.

5. All complete pipelines shall remain undisturbed for 24 hours to develop complete strength at all joints after which they shall be tested as specified.
6. Where PVC passes through wall sleeves, joints shall be caulked with a sealing element or link type seal as shown on the Contract drawings.
7. Install flexible couplings in accordance with the manufacturer's instructions.

K. Fiberglass Reinforced Plastic (FRP) Pipe

1. Cut, fabricate and install in accordance with the manufacturers written instructions.
2. Provide manufacturers representative for instructing workers with proper jointing procedures.

3.02 SLEEVE-TYPE COUPLINGS

- A. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8-inches.
- B. Soapy water may be used as a gasket lubricant.
- C. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint.
- D. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid.
- E. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.
- F. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.
- G. The correct torque as indicated by a torque wrench shall not exceed the values indicated in the tabulation titled TORQUE.

TORQUE

Nominal pipe size, <u>in.</u>	Bolt diameter, <u>in.</u>	Maximum torque, <u>ft.-lb.</u>
3-24	5/8	75
30-36 (1/2 in. mid ring)	5/8	65
30-36 (3/8 in. mid. ring)	5/8	70
30-48	3/4	80
48-72	3/4	70

3.03 HANGERS AND SUPPORTS

- A. In accordance with SECTION 15140.

3.04 TRENCHING AND BACKFILL FOR BURIED PIPELINES

A. In accordance with SECTION 02200.

3.05 CLEANING

A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

3.06 TESTING

A. General

1. All piping and piping systems are to be pressure or leak tested by the Contractor in the presence of the Engineer.
2. Leak testing (exfiltration test) shall be performed on all lines designated for gravity service.
3. Pressure testing shall be performed on all lines designed to transfer product under pressure.
4. No leakage will be permitted.
5. Piping not passing pressure or leak testing shall be repaired or replaced by the Contractor and retested to the satisfaction of the Engineer at no additional expense to the Owner and without extension of time for completion of the Work.
6. Furnish and install suitable temporary testing plugs or caps; pressure pumps, pipe connections, meters, gages, relief valves, blow offs and other necessary equipment; and all labor required, to test the pipe specified in this Section.
7. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires with the following exceptions:
 - a. Pipelines embedded in concrete shall be tested prior to placing of the concrete.
 - b. Exposed piping shall be tested prior to field painting.

B. Ductile Iron Pipe

1. Section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants or blow offs are not available at high points for releasing air the Contractor shall make the necessary taps at such points and shall plug said holes after completion of the test.
2. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
3. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe but not to exceed 200 psi. Care shall be taken not to apply this pressure to items of equipment known to be incapable of withstanding such pressure.

4. If the specified pressure cannot be achieved and maintain it for a period of **one (1) hour with no additional pumping**, the section shall be considered as having failed to pass the test.
 5. If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure may be made as required and approved by the Engineer, but in any event the Contractor shall be fully responsible for the ultimate tightness of the line within the above leakage and pressure requirements.
- C. Copper Pipe and Carbon Steel Pipe
1. After installation, the piping shall be tested for **one (1) hour at 1.5 times the designed operating pressure**.
- D. PVC Pipe
1. Pipe lines shall be subject to a hydrostatic pressure test for **one (1) hour at 1.5 times the designed operating pressure** or as required by the Engineer.

END OF SECTION

SECTION 15100

VALVES, GATES, HYDRANTS, AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and installing valves, gates, hydrants, and miscellaneous piping appurtenances, as indicated on the Drawings and as specified.
2. The Drawings and Specifications direct attention to certain features of the equipment, but may not cover all the details of their design. The equipment furnished shall be designed and constructed equal to the high quality equipment manufactured by such firms as mentioned, or as permitted by the Engineer. The Contractor shall furnish and install the equipment complete in all details and ready for operation.

B. Related Work

1. Section 09900 - Painting

1.02 DESIGN REQUIREMENTS

- ###### A. Enclosures shall be suitable for the atmosphere in which they are installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- ###### A. All gate, globe, angle, and check valves shall be the product of one manufacturer.

2.02 RESILIENT SEAT GATE VALVES

A. Gate valves larger than 2 inches

1. Resilient seated gate valve in accordance with AWWA C509.
2. Primary sludge and scum valves shall be OS&Y (rising stem).
3. Mechanical joint or flanged ends as indicated on the Drawings or herein specified.
4. All valves shall be designed for a minimum of 250 psi working pressure.
5. Face-to-face dimensions of flanged valves shall conform to the ANS B16.10.
6. Stem material shall be silicon bronze or an acceptable equivalent having high resistance to dezincification.
7. All exposed nuts, bolts and washers shall be stainless steel.
8. Valves shall be capable of being repacked under line pressure.
9. Valves shall be turned to the **left (counterclockwise)** to open.

B. Gate valves 2 inches and smaller

1. 200 lb. WOG minimum bronze valves with screwed ends to suit the piping in which they are installed.
2. Body material shall conform to ASTM B62.
3. Valves shall have union bonnet, rising stem, inside screw, and solid wedge gate.

C. Process Valves

1. In accordance with AWWA Specification C-500.
2. Iron body, bronze trim, solid wedge with tapered seat or double revolving disc, parallel seat construction.
3. If of the parallel seat type, the discs and wedges shall be free of pockets and rib.

D. Potable Water Valves

1. Manufactured in full compliance with the content and intent of the specification.
2. Gate valves shall be double disc, parallel seat.
3. O-ring type stuffing box with double Buna O-rings and non-rising stem.
4. Valves shall have a two-inch operating nut or hand-wheel as required for the particular application and as shown on the drawings.
5. Gate valves shall conform in every respect to AWWA.

E. Exterior valves

1. O-ring seals. O-ring stuffing boxes may be used.
2. Mechanical joint ends.
3. Non rising stem, inside-screw, two (2) inch operating nut.
4. Bituminous coated.

F. Interior Valves

1. Stuffing box follower bolts shall be of steel and the nuts shall be of bronze.
2. Hand wheel with chain operator for valves with operating stem height six (6) feet above finished floor.
3. O.S. & Y. except where N.R.S. is called for, and have a packing seal.
4. Flanged unless otherwise shown on the drawings.
5. Flanges shall be drilled to the ANSI 125/150 pound standard.

G. Actuators

1. Means of actuation by wheel, lever, tee wrench, or motorized actuator, as specified or as shown on the drawings.
2. Interior gate valves
 - a. Hand-wheel operated.
 - b. Hand wheels shall be of ample size for ease of operation and shall have an arrow and the word OPEN cast thereon to indicate the direction of opening.
3. Exterior gate valves
 - a. Provide extension stem with two-inch operating nut, to terminate 18 inches below finish grade.
 - b. Provide valve boxes.
 - c. All exterior valves shall be equipped with the specified actuator and shall be suitable for buried service.
4. Valves 12 inches and larger

- a. Equip valves 12 inches and larger with gear actuators.
- b. Actuator gear box shall be of totally enclosed oil or grease bath lubricated type, suitable for operation at any angle and provided with the appropriate filling and drain plugs.
- c. Shaft bearings furnished with permanently lubricated bronze bearing bushings.
- d. Actuator shall clearly indicate valve position and an adjustable stop shall be provided.
- e. Construction of actuator housing shall be semi-steel with exposed nuts, bolts, and washers to be zinc plated.
- f. All valve actuators shall be as recommended by the valve manufacturer.

2.03 NEEDLE VALVES

- A. Bronze bodies with screwed ends and long tapered plugs and seating surfaces suitable for close regulation of flows.
- B. In sizes up to 3/4 inches, spindles and seats shall be bronze. Valves shall be Walworth Co. No. 120; Crane Co. No. 88; Jenkins Bros., No. 741-G; or acceptable equivalent product.
- C. In sizes over 3/4 inches, tapered plug type globe or angle valves as specified shall be used.

2.04 CHECK VALVES

- A. Check valves 3 inches and larger
 1. Iron-body, bronze-mounted, full-opening, swing-type check valves with bolted covers and flanged ends.
 2. Flanges shall be faced and drilled in accordance with the 125-lb. AN Standard.
 3. Valves shall have bronze faced cast iron disc plate suspended at the top from a stainless steel shaft.
 4. Valve shaft shall be supported by bronze bushings and bearings and shall be packed through externally accessible stuffing box.
 5. Disc shall seat against resilient seat installed in the valve body.
 6. Valve closure shall be assured by means of outside lever and weight.
 7. Shop primed on the outside with a rust inhibitive priming system.
- B. Check valves smaller than 3-inches
 1. 300 pounds bronze curving design with screwed-in bonnet, regrinding bronze disc, and screwed ends.
 2. Disc shall be suspended at the top with a stainless steel shaft.
 3. All check valves shall be horizontally mounted.

2.05 PLUG VALVES

- A. General

1. Nonlubricated eccentric type with resilient faced plugs for service in sewage and sludge piping.
2. Valves shall be DeZurik Series 100 Eccentric Plug Valves, Valves by Pratt, Clow or approved equal. All valves furnished shall be by the same manufacturer.
3. Proof of design and cycle life testing shall be in full conformance to AWWA Standard C504.
4. Valves shall provide bi-directional sealing at 175 psi differential in sizes up to 12 inches and 150 psi differential for sizes 14 inches and larger.
5. Valve seating shall provide a consistent opening/closing torque that is not dependent on adjustment of stop. Resilient seating shall be field replaceable on the existing plug.
6. Valves shall be of the bolted bonnet, top entry design, capable of repacking without removing the bonnet or valve from the pipe line.
7. All exposed nuts, bolts and washers shall be stainless steel.

B. End Connections

1. Flanged ends to be in full compliance with ANSI B16.1-125 lb. /ANSI B16.5 - 150 lb standards including facing, drilling and thickness.
2. Mechanical Joint ends to be in accordance with AWWA C111.
3. Grooved ends to be in accordance with AWWA C606.
4. Screwed ends to be NPT Standard.

C. Port areas

1. Unobstructed when open and have smoothly shaped waterways of not less than 80 percent of full pipe area.

D. Valve body

1. Cast iron conforming to ASTM A-126 Class B.

E. Plug

1. ASTM A536, Grade 65-45-12 ductile iron with upper and lower shafts internal. The plug shall be resilient faced with neoprene, suitable for use with sewage.
2. Bearing areas to be isolated from solid particulates.

F. Coatings

1. All surfaces are to be protected, both internally and externally, with a factory coated heat fused thermoset epoxy or thermoplastic nylon complying fully with AWWA Standard C-550.
2. Epoxy coatings are also acceptable.

G. Actuators

1. Valves larger than eight inches.
 - a. Provided with manual gear operators having a maximum rim pull of 80 pounds as per AWWA C-504.
 - 1) Gear operators shall be enclosed and provided with seals on all shafts to prevent entry of water, allow submerging of the operator and suitable for running the gears in oil.
 - 2) All shaft bearings shall be furnished with permanently lubricated bronze bearing bushings. Adjustable stops shall be provided.

- b. Provide with hand wheels.
- 2. Valves above six feet six inches from the finish floor or in inaccessible locations.
 - 1) Operated by a chain operator and chain wheel provided by the valve manufacturer to operate that particular valve.
- 3. Valves eight inches and smaller located within six feet six inches of the finished floor in accessible locations.
 - 1) Operated by a portable lever.
 - 2) One portable level shall be provided for 50 percent of the valves or 15 portable levers whichever is less.
- 4. Valves in inaccessible locations shall be operated by extension stem, stem guides, 2-inch operating nut with mounting bracket or floor box, or floor stand, and lever or hand wheel as appropriate.
- 5. The plug valve manufacturer shall provide all operator accessories as required to make each operator system completely operational.
- 6. Design criteria for extension stems and stem guides shall be as specified under the section title -Miscellaneous Metal Work.
- 7. Buried or submerged service valves
 - 1) Seals on all shafts and gaskets on the valve and actuator covers shall prevent the entry of water.
 - 2) Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals.
 - 3) All exposed nuts, bolts, springs and washers used in buried service shall be stainless steel.
- 8. Actuator shall clearly indicate valve position.

2.06 BALL VALVES.

A. General

- 1. Straight-through passageway, and shall be of the full-port design.
- 2. Rated for 150-psi service.

B. Construction

- 1. Type 316 stainless steel, except for those valves specified PVC construction or installed in PVC piping.
- 2. Body shall be of rigid construction and symmetrically cast.
- 3. The shaft and ball shall be integrally cast.
- 4. Seats and seals shall be Teflon and shall be recessed in a machined groove.
- 5. Shaft packing
 - a. Braided band.
 - b. Tightened by means of a gland bearing strip.
 - c. Replacement of the packing shall be accomplished without removing the actuator.

C. Valves shall be by Apollo or equal.

2.07 PVC VALVES

A. General

1. Polyvinyl Chloride (PVC) valves shall be manufactured of the same PVC Type 1 Grade 1 molding compound used for the fittings to assure proper compatibility of system components.
- B. Ball valves and ball check valves
1. True union PVC valves.
 2. Design to allow for entire valve body removal by turning back the union nut at both ends of the valve.
 3. Teflon seats and packing.
 4. Pressure rating of 150 psi at 75 degrees F water.
- C. Diaphragm Valves
1. Constructed of PVC, except diaphragm, including bonnet and hand wheel.
 2. Diaphragm shall be replaceable and fully supported in any position.
 3. Non-rising stem with a diaphragm position indicator.
 4. Diaphragm constructed of Teflon and be replaceable without removing valve from the line.
 5. Valve shall be socket ends.
 6. Valves shall be by Nibco or equal.
- D. The valves shall be pneumatically or manually operated as shown on the drawings. Valve operators shall be supplied as specified under the valve operation Section 2.10.

2.08 PINCH VALVES

A. General

1. Open body, full port design for service up to 75 psig.
2. Designed for a minimum of 50,000 cycles of operation.
3. Incorporate a positive opening device to prevent collapsing under vacuum service.
4. Manufacturer to furnish certified test data of a bubble tight leakage test performance on each valve supplied.

B. Construction

1. Valves are to be of the full cast metal body, mechanical pinch type with flange joint ends on both the body and the sleeve trim.
2. The flanges shall be drilled to mate with ANSI B16.1, Class 125/ANSI B16.5, and Class 150 flanges
3. The sleeve trim shall be one piece construction with integral flanges drilled to be retained by the flange bolts.
4. The sleeve trim shall be reinforced with calendared nylon or calendared polyester fabric to match service conditions.
5. The sleeve trim shall be connected to the pinch bar by tabs imbedded in the sleeve trim-reinforcing ply.
6. All internal valve metal parts are to be completely isolated from the process fluid by the sleeve trim.
7. The port areas shall be 100% of the full pipe area at the valve ends.
8. The steel mechanism shall be double acting with pinching of the sleeve trim occurring equally from two sides. ACME threads shall be used on all valve mechanisms. There shall be no cast parts in the operating mechanism. The stem

shall be non-rising and have a non-rising handwheel. The handwheel shall be constructed of welded, tubular steel and be connected to the stem by means of a single retaining bolt. The handwheel shall be fitted with a lubrication fitting to allow lubrication of the stem. A valve position indicator rod shall pass through the center of the stem, retaining bolt, and handwheel to provide visual position indication. Bevel gear operators shall be provided on all valves over 8" size. Lifting eyelets shall be provided on the top of the valve body where applicable.

9. Valve body halves are to be sealed with an elastomer sheet gasket cut to fit the contour of the valve body. Body shall be epoxy coated for additional corrosion protection.
10. Valves shall be manufactured in the USA.

C. Operation

1. Rotating the handle clockwise simultaneously lowers a pinch bar above the sleeve and raises a pinch bar below the sleeve, pinching the sleeve closed at the center of the valve.
2. Turning the handle counter-clockwise separates the two pinch bars to open the valve.

D. Pinch valves shall be Series 75 as manufactured by the Red Valve Co., Inc. of Carnegie, PA, or approved equal.

2.09 MUD VALVES

A. General

1. Mud valves shall be rising stem, open left.

B. Construction

1. Mud valves shall be of the iron body, bronze mounted type with rising stems, flanged ends, extension stem, 2" square operating nut, and open by turning left.
2. The frame, yoke and gate shall be sturdily proportioned for strength and rigidity and be of cast iron conforming to ASTM specifications A126 Class B.
3. The stem, stem nut and seats shall be bronze. The stem shall be machined with accurately cut modified acme threads.
4. The gate seat shall be rolled into a dovetailed groove under pressure to make one inseparable unit. The body (frame) seat ring shall be threaded and screwed into place in the frame.
5. Both gate and body seat ring faces shall be machined to a smooth finish.

2.10 VALVE OPERATORS

- A. Valve operators shall be designed in accordance with the requirements of AWWA Specifications, C504-80 and shall furnish sufficient torque to open and close at 125 percent of the rated working pressure for the valve.
- B. Valves 6 inches and larger shall be gear operated with hand wheels and valves smaller than 6-inches shall be wrench operated, except as hereinafter specified or indicated on the drawings.

- C. Where there is a lack of space for the valve wrench to operate gear-operators, hand wheels shall be provided in lieu of the wrench.
- D. Chain operators, consisting of sprocket wheels, chain guides and operating chains shall be provided for all valves with operator centerlines located more than 6 feet - 6 inches above the operating level. Operating chain shall be galvanized and shall extend within 3 feet of the operating level. Operators shall develop their maximum capacity with not greater than a 40-lb. pull on the wheel.
- E. Gear operators shall be totally enclosed, worm-gear type, permanently lubricated, and shall be watertight and dust tight.
- F. Gear operators shall be provided with adjustable stops for the open and closed position to prevent over travel, and shall have a valve disk position indicator.
- G. A suitable lever or wrench shall be provided for each six wrench-operated valves and at least one wrench for each operating station. Wrenches or wheels and chains shall be of suitable size and sufficient length for easy operation of the valves at their rated working pressure.
- H. The valve assembly including valve and operator shall be tested to requirements specified herein at the valve manufacturer's factory.

2.11 CHAIN OPERATORS

- A. Valve hand wheel centerlines located more than 6 feet - 6 inches above the floor or operating platforms shall be considered as being inaccessible and shall be provided with chain operators.
- B. Chain wheels and chains shall be provided by the valve manufacturer to operate the particular valve.
- C. Where indicated on the drawings or inaccessible due to size or location, valves shall be provided with chain operators and, where required, angle drives with chains extending to within 3 feet of the floor or operating platform.
- D. Chains shall be galvanized.
- E. Sprocket wheels shall be provided with chain guides.

2.12 FLOOR STANDS FOR VALVES

- A. General
 1. Provided where shown on the Drawings,
 2. Straight type design with a 15-inch long hand crank operator, and an operating reduction ratio of two to one.
 3. Rising stem type with a life nut, with Acme type threads, which shall engage an Acme threaded valve extension stem to raise or lower the valve. The threads and

diameter of the lift nut shall be compatible with threads and diameter of the associated valve extension stem.

4. The two to one reduction shall be accomplished with steel or cast iron gears which shall be designed for smooth operation and shall be able to support the operating loads without undue stress.

B. Construction

1. The lift nut shall be of bronze and shall be mounted with roller bearings, which shall properly support the upward and downward thrusts encountered when operating the valves.
2. The pinion shaft shall be mounted with roller and/or needle bearings.
3. Lubrication fittings shall be provided for all bearings.
4. All gearing, bearings, shafts, and the lift nut shall be housed in a weatherproof cast iron housing.
5. Nuts and bolts shall be rust proofed steel.
6. Seals shall be provided on all shafts and on the lift nut, where required, to exclude dirt and moisture, and to prevent leakage of lubricant.
7. Floor stands shall be provided with stainless anchor bolts for installation.

2.13 VALVE EXTENSION STEMS AND ACCESSORIES

A. General

1. Furnish as required and as shown on the Drawings.
2. Shaft lengths shall suit the particular installation.
3. All exterior valves shall be provided with valve extension stems and valve boxes.
4. Stems shall have a two-inch operating nut and a two-inch coupling for connection of the valves.
5. All operating nuts shall be located 18 inches below finished grade (buried service) or within 6 inches of the walkway surface.
6. Unless specified elsewhere, all valve, gate and extension stems shall be high tensile strength bronze or steel.
7. The sections of extension stems shall be joined together by solid couplings of a material to match the stems, and shall be threaded and keyed to the stems. All couplings of the same size shall be interchangeable.
8. Stems shall be furnished with adjustable, bronze-bushed stem guides, as required. Guides shall be adjustable and supported by cast iron brackets bolted to the concrete. Guide spacing shall be such that the l/r ratio of the stems does not exceed 200, or shall be 10-feet center to center, whichever is less.

2.14 T-HANDLE OPERATING WRENCH

- A. Provide in the number and lengths to operate buried valves by workers of average height working in normal position.

2.15 SOLENOID VALVES

A. General

1. Direct acting packless two-way solenoid valve for water service.

2. Normally closed, unless otherwise shown.
 3. Provide for operation with 120 volt, 60 Hertz power and have continuous duty Class A insulation.
 4. Valve body to be forged brass with safe body working pressure of at least 250 psi.
 5. NPT connections unless indicated otherwise.
 6. Buna-N seat.
 7. Wetted parts to be stainless steel.
- B. Valves shall operate satisfactorily when mounted in any position.
- C. Valves shall be by ASCO or equal.
- D. Provide enclosures to meet NEMA Type 7 requirements with coils epoxy encapsulated and suitable for high ambient temperatures (140 degrees F). Refer to Electrical Drawing and Specifications.

2.16 PRESSURE REDUCING VALVES. (LARGER THAN TWO INCH).

A. General

1. Flanged globe body, bronze mounted, external pilot operated with a free floating piston and shall operate without springs, diaphragms or levers.
2. Single seat with the seat bore equal to the size of the valve.
3. Piston travel shall be a minimum of 25 percent of the seat diameter. The piston shall be guided above and below the seat no less than a length equal to 75 percent of the seat diameter. The piston shall be cushioned and designed to insure positive closure.
4. The valve shall be suitable for 150 pound flanged service and shall conform to AWWA standards for flange thickness, drilling and the wall thickness of the body and caps. The valve body shall be constructed of gray iron, free from cold shuts and defects and having a minimum tensile strength of 35,000 psi.
5. The valve shall be hydrostatically tested at a minimum of two times the rated service pressure. All iron castings shall be coated on all surfaces with two coats of asphaltic base metal paint.

B. Construction

1. Packed with leather and shall be furnished with an indicator rod to show the piston position.
2. Gauge petcocks shall be furnished on the valve body.
3. The pilot valve
 - a. Easily accessible and shall be removable from the main valve under pressure.
 - b. Adjustable without special tools or the removal of springs or weights.
4. The main valve shall be designed to facilitate repairs internally without removing the valve from the line.
5. The valve shall be designed to maintain a preadjusted downstream pressure for varying rates of flow by piston positioning without water hammer.

2.17 PRESSURE REDUCING VALVES (TWO INCHES AND SMALLER)

A. General

1. Single seated balanced design type globe body with threaded inlet and outlet ports.
2. Valves shall be diaphragm operated, spring loaded, and permitting convenient adjustment.

B. Construction

1. The body shall be of bronze construction with stainless steel stem.
2. Furnished with a replaceable rubber seat.

C. Valves shall be G-A Industries Figure 43-D, Watts No. 223, or equal.

2.18 PRESSURE RELIEF VALVE

A. Construction

1. Cast iron frame and cover with a bronze body ring and rubber flap ring.
2. Hinge pin shall be bronze and secured with cotter pins.
3. Valve shall have two pivot points and shall have a flanged end.

B. No leakage shall occur on a valve with at least 18 inches of water cover above the installed valve.

2.19 VACUUM BREAKERS

A. Construction

1. Breakers shall be of Type 1, Grade 1 construction
2. Stainless steel fasteners.
3. Provide with one inch NPT connection.

B. Breakers shall be series "VB" as manufactured by Past-o-matic Valves, Inc., Totowa, NJ, or equal.

2.20 SAMPLING VALVES

A. General

1. Sampling valves and fittings shall be provided on the discharge lines of pumps as shown on the Drawings.

B. Construction

1. Valves shall be one inch stainless steel ball valves manufactured by Apollo or equal
2. Discharge side of each valve shall be provided with a 90 degree stainless steel elbow facing downward.

2.21 VALVE BOXES

A. General

1. Each buried stop and valve shall be provided with a suitable valve box.

B. Construction

1. Adjustable, telescoping, heavy-pattern type with the lower and the upper part of cast iron.
 2. Designed and constructed as to prevent the direct transmission of traffic loads to the pipe or valve.
 3. The upper or sliding section of the box shall be provided with a flange having sufficient bearing area to prevent undue settlement.
 4. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and rest on the valve bonnet.
 5. Adjustable through at least 6 inches vertically without reduction of the lap between sections to less than 4 inches.
 6. The inside diameter of boxes for valves shall be at least 4-1/2 inches, and the lengths shall be as necessary for the depths of the valves or stops with which the boxes are to be used.
 7. Covers
 - a. Cast iron close fitting and substantially dirt-tight.
 - b. The top of the cover shall be flush with the top of the box rim.
 - c. Letters to indicate the service similar to "WATER" or "SEWER" shall be cast in the top of the valve covers as appropriate.
- C. Boxes for curb stops shall be threaded internally to fit the threads on the bonnet of the curb stop.

2.22 CURB STOPS

- A. Bronze, inverted-key stop with threaded end and combined cap and tee handle.
- B. Minneapolis pattern with externally threaded body to accommodate the threaded service box.
- C. Connections to suit piping service.

2.23 HOSE BIBS

- A. General
 1. 3/4 inch bronze gate valve with a 3/4 inch NPT discharge connection.
 2. A cap and chain shall be supplied for the outlet.
 3. Provide Model 372 as made by Jenkins or similar models from Lunkenheimer or Crane or equal.

2.24 QUICK DISCONNECT COUPLINGS.

- A. General
 1. Couplings and adapters shall be furnished in the quantities, types and sizes as shown on the Drawings or specified herein.
 2. The couplings and adapters shall be designed for a working pressure of 200 psig.
 3. Couplings and adapters shall be of aluminum and shall utilize a cam-type mechanism for connecting the coupler and adapter pieces to provide a leak proof connection.

4. No springs, ball bearings or snaps shall be used to make the connection.
5. The couplings shall be fitted with Buna-N gaskets recessed into the coupling to prevent the gasket from falling out.
6. The disengagement handle pins shall be of stainless steel and stainless steel rings shall be furnished on the handles.

2.25 POLYVINYL CHLORIDE TUBING (FLEXIBLE PVC).

A. Construction

1. Nylon braiding incorporated within the walls of the tubing.
2. The nylon braiding shall be completely protected by a smooth outside covering of PVC, thus shielding the mesh from conditions detrimental to exterior mesh tubing.
3. The tubing shall have a working temperature of minus five degrees F to 175 degrees F.

2.26 VALVE TAGS.

A. General

1. 1 ½ inch, square, brass.
2. Stamped ½ inch characters to be black filled.
3. Numbered to owners identification system, if no system is required then number sequentially.
4. Provide each tag with No. 16 brass jack chain in suitable length to attach tag to valve.

2.27 TAPPING SLEEVE AND VALVE.

A. General

1. Conform to the latest specifications adopted by the AWWA and be of the specific size to suit the existing conditions.

B. Construction

1. Mechanical joint, two part castings flanged on the vertical centerline, and come complete with all joint accessories.
2. The surface area of each flange shall be thoroughly machined, and the sleeve flanges shall be fitted with lead gaskets.
3. Each gasket shall cover the entire surface area of each joint for the full length of the sleeve.
4. Bolts used to assemble the sleeves shall pass directly through each flange and through each gasket and be properly spaced to insure uniform gasket pressure and compression.
5. Sleeve outlets shall have counter bored flanges to insure proper centering of the tapping valve.
6. All tapping valves shall be mechanical joint.
7. Tapping valves shall conform to the specifications for gate valves (Municipal water lines).

2.28 DUPLEX STRAINERS.

A. General

1. Provide manual duplex units with cast iron bodies and threaded connections.
2. Sizes shall be as indicated on the Drawings.
3. Flow capacities shall be as indicated on the Drawings.
4. Operating pressure drop shall not exceed 0.25 psig when measured with clean baskets and water.

B. Construction

1. Quick-opening, yoke type with Buna-N gaskets and elastomers.
2. Bodies shall have NPT plugged drains.
3. Baskets shall be type 316 stainless steel with 1/8-inch perforations and bow-type handles.
4. Flow diverters shall be tapered bronze vane plugs.

- C. Provide standard Model #50 Series Manual Duplex Strainers manufactured by Hayward or equal.

PART 3 EXECUTION

3.01 GENERAL

- A. Valves shall be installed as nearly as possible in the positions indicated on the drawings consistent with conveniences of operating the hand wheel or wrench. All valves shall be carefully erected and supported in their respective position free from all distortion and strain in appurtenances during handling and installation. All material shall be carefully inspected for defects in workmanship and material, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.
- B. Valves shall not be installed with stems below the horizontal.
- C. Valves shall be set plumb and supported adequately in conformance with the instructions of the manufacturer. Valves mounted on the face of concrete shall be shimmed vertically and grouted in place. Valves in the control piping shall be installed so as to be easily accessible.
- D. Where chain wheels are provided for remote operation of valves two S-shaped hooks shall be provided for each valve to enable the chains to be hooked so as not to interfere with personnel traffic.
- E. Valves shall be provided with extension stems where required for convenience of operation. Extension stems shall be provided for valves installed underground so that operating nuts are located 18 inches below finished grade and elsewhere so that the operating wrench does not exceed 8 feet in length.

- F. A permanent type gasket of uniform thickness shall be provided between flanges of valves and sluice gates and their wall thimble.
- G. Wall thimbles shall be accurately set in the concrete walls so that the gates can be mounted in their respective positions without distortion or strain.

3.02 PLUG VALVES

- A. Plug valves in horizontal sewage and sludge piping shall be installed with the shaft horizontal such that when in the open position, the plug is located in the upper part of the valve body. Valves shall be oriented so that in the closed position, the plug is at the upstream end of the valve.

3.03 VALVE TAGS.

- A. Tag valve in visible location, free from interference with operating device, other equipment and personnel.
- B. Develop and provide to Owner, valve chart indicating all valves with corresponding identification number.

3.04 SUPPORTS FOR TERMINAL CLEAN-OUT PIPING

- A. Support to maintain required pitch, prevent vibration, and provide for expansion and contraction.

3.05 FIRE HYDRANTS

- A. Fire hydrants and appurtenances shall be installed in accordance with the local municipal fire codes.

3.06 PAINTING

- A. Shop and Field Painting shall be as specified under SECTION 09900.

END OF SECTION

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SECTION 15130

GAUGES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to furnish and install gauges at locations indicated on the Drawings and as specified.

PART 2 PRODUCTS

2.01 GENERAL

- A. Gauges include pressure, vacuum and compound gauges of the dial indicating Bourdon tube-type.
- B. Gauges shall be Helicoid Gauges as manufactured by the American Chain and Cable Co., Ashcroft Duragauges by Manning, Maxwell and Moore, Inc., or approved equal.
- C. Pressure gauges shall be designed to indicate pressures above atmospheric pressure only.
- D. Vacuum gauges shall be designed to indicate pressures below atmospheric pressure only.
- E. Compound gauges shall be designed to indicate pressures above and below atmospheric pressure.

2.02 LOCATION

- A. Gauges shall be provided where shown on the Drawings, specified in the Specifications or required for a complete installation. Indicating pressure gauges shall be provided downstream of each pressure regulating valve where shown, specified or required; in the seal water piping of each pump; and on both the suction and discharge piping of each pump except where otherwise specified.

2.03 ACCURACY

- A. Grades of accuracy shall conform to the requirements of American Standard A.S.A. B40.1. The Contractor shall submit manufacturer's certifications indicating that the gauges provided have met the accuracy requirements specified.

- B. Pressure, vacuum and compound gauges shall be Grade AA gauges with an error not exceeding $\frac{1}{2}$ of 1 percent of full-scale range.
- C. Gauges with a flexible seal between the Bourdon tube and the medium to be measured shall have an overall accuracy of Grade A with an error not exceeding one percent of scale range for the middle half and 1-1/2 percent for the remainder of the scale.

2.04 GAUGE CONSTRUCTION

- A. Gauges shall be weatherproof, designed and constructed to meet all requirements for satisfactory operation.
- B. Pressure, vacuum and compound gauges shall be constructed of sound, durable material, free from all defects and imperfections that in any way may affect the accuracy and serviceability of the gauges.
- C. Gauge cases shall be of aluminum, phenolic or polypropylene. Dial shall be 4 1/2 inches nominal diameter with black lettering and scales on a white background, and shall bear a legend showing service and units of graduation. Gauge dial shall be clear and blemish free and sealed to prevent entrance of moist air. Bourdon tube shall be phosphor bronze with forged brass socket. Set point shall be of stainless steel. Socket stem shall extend at least 1-1/4 inches below the gauge case and shall have a large wrench flat.
- D. Pressure gauges shall be graduated in psi unless otherwise specified. Vacuum gauges shall be graduated in inches of mercury; compound gauges shall be graduated in inches of mercury, psi or feet of water as specified.
- E. Maximum scale reading for pressure and compound gauges shall be approximately twice the maximum operating pressure of the fluid to be measured. Vacuum and compound gauges shall have minimum scale readings at 30 inches of mercury unless otherwise shown or specified.
- F. Unless otherwise shown or specified, all pressure, vacuum and compound gauges shall have bottom 1/2-inch NPT male connections.

2.05 DIAPHRAGM PROTECTED GAUGES

- A. The Contractor shall provide diaphragm seals on sludge gauges to prevent the fluid to be measured from clogging or corroding the Bourdon tube of pressure, vacuum and compound gauges.
- B. Diaphragm seals shall be suitable for the gauge furnished; gauges to be used with diaphragm seals shall be Grade AA gauges conforming to the requirements specified

herein. Chemical gauges shall have the diaphragm seal as an integral part. Overall accuracy for diaphragm protected units shall be Grade A.

- C. Diaphragms shall have an overall diameter of not less than 2-1/2 inches and shall be made of a material that is corrosion resistant and compatible with the process fluid. Diaphragm protected gauges shall be factory filled with Glycerin oil or approved equal and calibrated by the gauge manufacturer. Unless specified otherwise, diaphragm protected gauges shall be provided with sintered metal snubbers or pulsation dampers.
- D. Diaphragm housing assembly shall be of durable stainless or cadmium plated with a 3/4 inch NPT process connection. The lower housing shall have a 1/4 inch NPT flushing connection and 1/4 inch NPT plug, to allow venting or the introduction of cleaning fluid on the process side of the diaphragm seal. The bottom housing shall be made of a material that is corrosion resistant and compatible with the process fluid. A clean out ring shall be provided to hold the diaphragm captive in the upper housing so that the assembly may be removed for recalibration or cleaning of the process side without loss of instrument fluid. Diaphragm protected gauges and seals shall be ACCO Helicoid Diaphragm Seal Type 100 HACF, Ashcroft Diaphragm Seal Type 101, or equal.

2.06 GAUGE PROTECTION AND ACCESSORIES

- A. Unless otherwise shown or specified, pressure gauges shall have under pressure protection and vacuum gauges shall have overpressure protection. For helical roller type pressure gauges, the gauge shall have a left hand movement for under pressure protection; for all other gauges, under pressure protection stops shall be provided. For vacuum gauges with helical roller movement, gauges shall have right hand movement for overpressure protection; all other gauges shall have suitable overpressure protection stops.
- B. Unless otherwise shown or specified, all pressure, vacuum and compound gauges shall be provided with stainless steel sintered metal snubbers of porosity suitable for this service. Snubbers shall be ACCO Helicoid No. S-2 or S-4, Ashcroft Chemquip No. 1112S or equal.
- C. Diaphragm protected gauges for normal service shall be provided with rough plumbing 3/4 inch stop valves for shut-off cocks, and 3/4 inch red brass pipe. Valves shall have a bronze body, stainless steel ball, and teflon seats, valves shall have a spring-closing handle.
- D. Gauges other than diaphragm protected gauges shall be installed complete with incidental shut-off cock and tees with test cock with a female outlet. All pipe and fittings shall be brass. The gauge shall be mounted directly in the outlet of the tee-bearing test cock.

END OF SECTION

SECTION 15140

PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Furnish all labor, materials, equipment and incidentals required to install, and make completely ready for operation, pipe hangers, supports, concrete inserts, and anchor bolts including, metallic hanging and supporting devices as specified herein and as shown on the Drawings.

B. Related work

1. Section 03300 – Cast-In-Place Concrete
2. Section 09900 – Painting

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME)

1. ASME B31.1, Power Piping

B. Manufacturers Standardization Society Standard Practice (MSS-SP)

1. MSS-SP-58, Pipe Hangers and Supports, Materials, Design and Manufacture.
2. MSS-SP-69, Pipe Hangers and Supports, Selection and Application.

1.03 REQUIREMENTS

A. Design Requirements

1. The equipment specified herein is intended to support the various types of pipe and piping systems required for the Work.
2. The details shown on the Drawings are intended to indicate the generally desired methods of support under normal conditions.
3. All supports shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces, and all probable external forces such as equipment, pipe, and personnel contact through 360 degrees in all three dimensions.
4. It shall be the responsibility of the Contractor to provide a Professional Mechanical Engineer licensed in the **State of Rhode Island**, with a minimum of 5 years of demonstrated experience in the design of supports and connections, to design the supports and connections for all equipment for all weights and applied pressures as indicated on the Drawings.
5. In the design of hangers, supports and anchors, pipe pressures shall be taken as the maximum rated pressure specified for pipe lines carrying gases and air and twice the maximum rated pressure specified for pipe lines carrying liquids.

6. Payment for such design services shall be included in the Prices bid for furnishing and installing pipe lines.
7. Hangers and supports shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions.
8. All supporting equipment, with the exception of springs, shall be designed with a minimum working factor of safety of five based on the ultimate tensile strength of the material.
9. Where additional structural members are required, they shall be designed for the specific loads they are to support in accordance with the requirements of **Rhode Island Building Code**.

B. Performance Requirements

1. All hangers, supports and appurtenances shall conform to the latest requirements of the following listed references except as supplemented or modified by the requirements of this Specification.
 - a. ANSI B 31.1.
 - b. MSS-SP-58.
 - c. MSS-SP-69.

1.04 SUBMITTALS

A. In accordance with SECTION 01300.

1. Representative catalog cut for each different type of pipe hanger or support indicating the materials of construction, important dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers are not suitable, submit detailed drawings showing materials and details of construction for each type.
2. Complete piping drawings indicating type of hanger, location, and magnitude of load transmitted to the structure. Submittals shall use detail numbers as shown on the Drawings to indicate type of support proposed wherever possible.

B. Design computations shall not be submitted for review. Any design computations submitted shall be returned without comment. A design certificate shall be submitted prior to installation of any piping.

1.05 DELIVERY, STORAGE AND HANDLING

- A. All supports and hangers shall be crated, delivered and uncrated so as to protect against any damage.
- B. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.
- C. Finished iron or steel surfaces not galvanized or painted shall be properly protected to prevent rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Unless otherwise specified herein, pipe hangers and supports shall be as manufactured by the following:
1. Grinnell Corp., Providence, Rhode Island.
 2. Carpenter & Patterson, Inc., Woburn, Massachusetts.
 3. F&S Central, Brooklyn, New York.
 4. Elcen Metal Products Co., Franklin Park, Illinois.
 5. Unistrut Northeast, Woburn, Massachusetts
- B. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary. Any item comparable in type, style, quality, design and performance shall be considered as equal.
- C. The Drawings and Specifications indicate general and specific methods and details of supporting the various piping systems. Any changes to the support details shown shall be submitted to the Engineer for review.
- D. All uninsulated non-metallic piping such as PVC, fiberglass, etc. shall be protected from local stress concentrations, at each support point by galvanized steel protection shields or other method as approved by the Engineer where pipes are bottom supported 180 degree arc shields shall be furnished. Where 360 degree arc support is required, such as U Bolts, protection shields shall have a 50 mils minimum thickness, not be less than 12 inches in length and be securely fastened to pipe with stainless steel or galvanized metal straps not less than 1/2 inch wide.
- E. All insulated pipe shall be furnished with a rigid foam insulating saddle at each pipe support location as specified under insulation. Provide galvanized protection shields as specified in Paragraph 2.01D above at each location.
- F. Where pipe hangers and supports come in contact with copper piping provide protection from galvanic corrosion by the following:
1. Wrap pipe with 60 mils thick neoprene sheet material and galvanized protection shield.
 2. Provide isolators similar to Elcen figure number 228.
 3. Provide copper plated or PVC coated hangers and supports.
- G. Pipe supports shall be provided as follows:
1. Cast iron soil pipe: maximum support spacing of 5.0 feet with a minimum of one support per pipe section at the joints.
 2. Steel pipe: maximum support spacing of 10 feet with a minimum of one support per pipe section at the joints.
 3. Fiberglass pipe: as recommended by the manufacturer except that support spacing shall not exceed 5 feet.

4. PVC pipe: as recommended by the manufacturer except that support spacing shall not exceed 3 feet. For pipe equal to or less than 1 inch in diameter and 5 feet for all other pipe sizes.
5. Support spacing for steel pipe 2 inches and smaller and copper tubing shall not exceed 5 feet.
6. Ductile iron pipe: maximum support spacing of 10 feet with a minimum of one support per pipe section at the joints.
7. All vertical pipe shall be supported at each floor or at intervals of not more than 12 feet by approved pipe collars, clamps, brackets, or wall rests, and at all points necessary to insure rigid construction.
8. Pipe supports shall not induce point loadings but shall distribute pipe loads evenly along the pipe circumference.
9. Effects of thermal expansion and contraction of the pipe shall be accounted for in the pipe support selection and installation.

2.02 SINGLE PIPE HANGERS

- A. Single pipes shall be supported by hangers suspended by galvanized steel rods from structural steel members, concrete ceilings and beams, bottom of trapeze hangers and wall mounted steel angle brackets.
- B. Hanger rods shall be hot rolled steel, machine threaded and galvanized after fabrication. The strength of the rod shall be based on its root diameter.
- C. Except as otherwise specified herein, pipe hangers shall be adjustable clevis type similar to Grinnell Figure Numbers 65, 260, and 590 as required. Hangers shall be carbon steel with a galvanized finish.
- D. Hanger rods shall be attached to concrete structures using concrete inserts similar to F&S Figures 180, 571 or 150. Inserts shall be malleable iron, or steel with galvanized finish. Beam dampers, C clamps or welded beam attachments shall be used for attaching hanger rods to structural steel members. Where necessary and approved by the Engineer double expansion shields shall be used for attaching to concrete structures.
- E. Where pipes are near walls, beams, columns, etc. and located an excessive distance from ceilings or underside of beams, welded steel wall brackets similar to Carpenter and Patterson Figure numbers 69-68, 84 or 139 shall be used for hanging pipe. Brackets shall be galvanized. Where single pipes rest on top of bracket pipe supports, attachments shall meet requirements as specified under multiple pipe hangers.

2.03 MULTIPLE PIPE HANGERS

- A. Suspended multiple pipes, running parallel in the same horizontal plane, which are adjacent to each other shall be suspended by trapeze type hangers or wall brackets. Trapeze hangers shall consist of galvanized structural steel channel supported from galvanized threaded rod or attached to concrete walls, columns or structural steel support members as required to meet the intent of this specification. Channel shall be

similar to F&S Figure 710, rods, concrete inserts, "C" Clamps, beam clamps, welded beam attachments, and expansion shields shall be as specified in 2.02 Single Pipe Hangers.

- B. Except as otherwise specified herein pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets shall be anchor or pipe chair similar to F&S Figures 158, 419, 160A, 160B as required. Materials of construction shall be galvanized steel. Chair "U" bolts shall be tightened to allow freedom of movement for normal expansion and contraction except when pipe must be anchored to control direction of movement or act as a thrust anchor.

2.04 SINGLE AND MULTIPLE PIPE SUPPORTS

- A. Single pipes located in a horizontal plane close to the floor shall be supported by one of the methods specified herein or as shown on the Drawings.
- B. Pipes 3-inch diameter and larger shall be supported by adjustable stanchions similar to F&S Figure 427, constructed of galvanized steel. Stanchions shall provide at least 4-inch adjustment and be flange mounted to floor,
- C. Pipes less than 3-inches in diameter shall be held in position by supports fabricated from steel "C" channel, welded post base similar to Unistrut Figure P2072A and pipe clamps similar to Unistrut Figures P1109 thru P1126. Where required to assure adequate support, fabricate supports using two vertical members and post bases connected together by horizontal member of sufficient load capacity to support pipe. Wherever possible supports shall be fastened to nearby walls or other structural member to provide horizontal rigidity. More than one pipe may be supported from a common fabricated support. All supports unless specified elsewhere shall be galvanized.
- D. Where required, pipe shall be supported using concrete anchor posts constructed in accordance with SECTION 03300. Pipe shall be securely fastened to concrete anchor posts using suitable metal straps as required and approved by the Engineer.

2.05 WALL SUPPORTED PIPES

- A. Single or multiple pipes located adjacent to walls, columns or other structural members shall whenever deemed necessary shall be supported using welded steel wall brackets similar to Carpenter and Patterson Figure numbers 69-78, 84, or 134; or "C" Channel with steel brackets similar to Unistrut pipe clamps. All members shall be securely fastened to wall, column, etc. using double expansion shields or other method as approved by the Engineer.
- B. Pipe shall be attached to supports using methods hereinbefore specified to meet the intent of this Specification.
- C. All supports shall be galvanized.

2.06 BASE ANCHOR SUPPORT

- A. Where pipes change direction from horizontal to vertical via a bend, a welded or cast base anchor support shall be installed at the bend to carry the load. The bend anchor shall be fastened to the floor with double expansion shields or other method as approved by the Engineer.
- B. Where shown on the Drawings, pipe bends shall be supported using concrete anchor posts. Pipes shall be securely fastened to concrete supports with suitable metal bands as required and approved by the Engineer.

2.07 VERTICAL PIPE SUPPORTS

- A. Where vertical pipes are not supported by a Unistrut system as specified in Paragraph 2.08, they shall be supported in one of the following methods.
 - 1. For pipes 1/4-inch to 2-inch in diameter, an extension hanger ring shall be provided with an extension rod and hanger flange. The rod diameter shall be as recommended by the manufacturer for the type of pipe be supported. The hanger ring shall be galvanized steel or PVC clad depending, on the supported pipe. The hanger ring shall be equal to Carpenter & Peterson Figure number 81 or 81CT. The anchor flange shall be galvanized malleable iron similar to Carpenter & Patterson Figure number 85.
 - 2. For pipes equal to or greater than 1/2-inch in diameter extended pipe clamps similar to Carpenter and Patterson Figure number 267 may be used. The hanger shall be attached to concrete structures using double expansion shields, or to steel support numbers using welding lugs similar to Carpenter & Patterson Figure number 220.
 - 3. Pipe riser clamps shall be used to support all vertical pipes extending, through floor slabs. Riser clamps shall be galvanized steel similar to Carpenter & Patterson Figure number 126. Copper clad or PVC coated clamps shall be used on copper pipes. Insulation shall be removed from insulated pipes prior to installing riser dampers.
 - 4. Unless otherwise specified, shown, or specifically approved by the Engineer, vertical runs exceeding 11 feet, pipes shall be supported by approved pipe collars, clamps, brackets or wall rests at all points required to insure a rigid installation.

2.08 SPECIAL SUPPORTS

- A. Pipe supports shall be provided for closely spaced vertical piping systems as shown on the Drawings or as otherwise required to provide a rigid installation. The support system shall consist of a framework suitably anchored to floors, ceilings and walls and be as manufactured by the Unistrut Corporation, Globe-Strut as manufactured by the Metal Products Division of U.S. Gypsum, or equal.
- B. Vertical and horizontal supporting members shall be U shaped channels similar to Unistrut Series P1000. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps equal to Unistrut series P1100M and series P2558. All components shall be of mild steel.

- C. The assemblies shall be furnished complete with all nuts, bolts, and fittings required for a complete assembly including end caps for all members.
- D. The design of each individual framing system shall be the responsibility of the Contractor. Shop drawings, as specified above shall be submitted and shall show all details of the installation, including dimensions and types of supports. In all instances the completed frame shall be adequately braced to provide a complete rigid structure when all the piping has been attached.
- E. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes in accordance with AISC Specifications, have anchor hardware similar to items previously specified herein, shall meet the minimum requirements listed below and be subject to the approval of the Engineer.
 - 1. Pipe support systems shall meet all requirements of this Section and all related Sections of the Specification.
 - 2. Complete design details of the entire pipe support systems shall be provided, for review by the Engineer.
 - 3. The pipe support system shall not impose loads on the supporting structures in excess of the loads for which the supporting structure is designed.

2.09 SURFACE PREPARATION AND SHOP PAINTING

- A. All surfaces shall be prepared and shop painted as part of the work of this Section. Surface preparation and shop painting shall be as specified in SECTION 09900.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Pipe and appurtenances connected to the equipment shall be supported in a manner to prevent any strain from being imposed on the equipment or piping system.
- B. Pipe and tubing shall be supported as required to prevent damaging stresses in the pipe or tubing material, valves and fittings, and to support and secure the pipe in the intended position and alignment. Supports shall be sufficiently close together such that the sag of the pipe is within limits that will permit drainage and avoid excessive bending stresses from concentrated loads between supports.
- C. Pipes, horizontal and vertical, requiring rigid support shall be supported from the building structure by approved methods. Supports shall be provided at changes in direction and elsewhere as shown in the Drawings or specific herein. No piping shall be supported from metal stairs, ladders and walkways unless specifically directed or authorized by the engineer.
- D. Where flexible couplings are required at equipment, tanks, etc. the end Opposite to the piece of equipment, tank, etc. shall be rigidly supported.

- E. Pipe supports shall be installed to minimize, lateral forces through valves, both sides of split type couplings and sleeve type couplings, and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connection pipes.

END OF SECTION

CERTIFICATE OF DESIGN FOR PIPE HANGERS AND SUPPORTS

(Owner)

Contract Reference: _____

_____, dated _____.

In accordance with the provisions of the above referenced Contract, as the designated Contractor,

(Contractor's Name and Address)

hereby certifies that _____

(Contractor's Name and Address)

(1) Is properly licensed and currently registered as a Professional Engineer in the State (or Commonwealth) of _____;

(2) Is fully qualified to design and supervise the _____

(Item of work and location)

In accordance with the provision specified under the appropriate Section and/or Subsections of the Contract Documents:

(3) Has successfully designed and supervised _____

(Item of work)

before and demonstrates a minimum of ten (10) documented years of proven experience in such field;

(4) Has personally examined the type(s) and locations(s) of the Work required under this Contract, and the overall conditions associated therewith, to the extent necessary to fully satisfy his or her professional responsibilities for designing and supervising the above referenced work;

- (5) Has prepared the attached design in full compliance with the applications and requirements of the Contract Documents, sound engineering practice, modern accepted principles of construction, and all applicable federal, state and local laws, regulations, rules and codes having jurisdiction over the Work;
- (6) Will provide sufficient supervision and technical guidance to the Contractor throughout the Work to ensure compliance with the design and all quality assurances necessary to successfully complete the Work;
- (7) Hereby indemnifies and holds harmless the _____

_____ and BETA Group, Inc.,
 (name of owner)

and their agents, employees and representatives, from and against any and all claims, whether directly or indirectly, arising out of, relating to or in connection with the Work; and

- (8) This "Certificate of Design" together with all applicable designs, drawings, details, specifications on other related documents necessary to complete the Work as specified, have been signed and sealed pursuant to applicable state law.

In recognition and observance of the above referenced statements, the undersigned parties hereby acknowledge and accept the responsibilities and obligations associated therewith.

CONTRACTOR:CONTRACTOR'S ENGINEER

 (Contractor's Name)

 (Engineer's Name)

By: _____

By: _____

 (Name and Title)

 (Name and Title)

Date: _____
 (SEAL)

Date: _____
 (P.E. STAMP)

(Note: Contractor to fully reference all attachments below)

END OF SECTION

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SECTION 15400

PLUMBING

PART 1 GENERAL

1.01 SCOPE

- A. The Work of this section includes all labor, tools, material, fittings, accessories and equipment necessary to provide plumbing system(s), complete and operable.
- B. Attention is directed to the DOCUMENT 00700, GENERAL CONDITIONS and all sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this section of the Specifications.
- C. The Work includes, without limiting the generality thereof:
 - 1. Storm Water Drain piping
 - 2. Sanitary Drain, Waste and Vent piping.
 - 3. Plumbing Demolition.

1.02 SUBMITTALS

- A. Shop drawings, brochures and samples, as listed, shall be submitted for all items to be furnished in accordance with the provisions of DOCUMENT 01300, SUBMITTALS.
- B. Provide submittals for the following items consisting of manufacturer's published data. All submittals shall show compliance with the referenced specification.
 - 1. Sanitary Drain, Waste and Vent piping and fittings
 - 2. Storm Water Drain piping and fittings
 - 3. Hangers and supports
 - 4. Cleanouts
 - 5. Piping insulation

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 02220, EARTHWORK - Excavation, filling, sheeting, shoring, pumping, dewatering.
- B. SECTION 03300, CAST-IN-PLACE CONCRETE – as required.
- C. SECTION 07841, PENETRATION FIRE STOPPING - for sleeves in floors and walls.

D. SECTION 07920, JOINT SEALANTS – caulking for sleeves in floors and walls.

E. SECTION 16120, WIRE AND CABLES - Power wiring.

1.04 ITEMS INSTALLED BUT NOT FURNISHED

A. None.

1.05 ITEM FURNISHED BUT NOT INSTALLED

A. Furnish pipe sleeves for placement in concrete and masonry construction.

1.06 DESIGN CRITERIA

A. The Work of this section shall comply with the requirements of the current Rhode Island Plumbing Code and of any other authorities having jurisdiction.

B. The equipment covered by the Specifications is intended to be standard equipment of proven quality as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practice of the industry and shall operate satisfactorily when installed in accordance with the Contract Documents. The Specifications call attention to certain details, but do not purport to cover all details entering into the construction of the equipment.

C. All material shall be new and shall bear the manufacturer's full identification.

D. Requirements of the Regulatory Agencies

1. The final, complete installation shall comply with all state and local statutory requirements having jurisdiction. Arrange for all necessary permits, pay all fees and arrange for all required inspections by local authorities. In general, all Work shall comply with the requirements of the rules, regulations, standards, codes, ordinances and laws of local, state and federal governments, and other authorities that have legal jurisdiction over the Project. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

- a. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
- b. National Fire Protection Association (NFPA).
- c. Occupational Safety and Health Act (OSHA).
- d. Underwriter's Laboratories (UL).
- e. Material and equipment shall be listed by Underwriter's Laboratories (UL) and approved by ASME and AGA for intended service.

2. When requirements cited in the Specifications conflict with each other or with Contract Documents, most stringent shall govern Work.
3. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:
 - a. American National Standards Institute (ANSI).
 - b. American Society of Mechanical Engineers (ASME).
 - c. National Electric Manufacturers Association (NEMA).
 - d. American Society for Testing and Materials (ASTM).
 - e. American Water Works Association (AWWA).
 - f. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
 - g. American Society of Plumbing Engineers (ASPE).
 - h. Thermal Insulation Manufacturers Association (TIMA).
 - i. Institute of Electrical and Electronics Engineers (IEEE).
 - j. Insulated Cable Engineers Association (ICEA).
 - k. Cast Iron Soil Pipe Institute (CISPI).
 - l. Plumbing and Drainage Institute (PDI).
 - m. National Association of Plumbing-Heating Cooling Sub-Contractors (NAPHCC).

1.07 PRODUCT HANDLING

- A. All materials and equipment shall be shipped, stored, handled and installed in such manner as not to degrade quality, serviceability, or appearance.
- B. Store all materials and equipment on site in a location approved by the Engineer.
- C. Protect all Work, the Owner's property and the property of others from injury or loss caused by operations associated with the Work of this section. Make good any such injury or loss, at no cost to the party suffering the injury or loss.

1.08 PROCEDURE

- A. Secure all permits, inspection, and approvals and pay all costs and fees.

- B. Unless the Specifications state "No Substitutions", substitutions will be considered for any specified item.
- C. Coordinate safety program with that of the Contractor. Cooperate with other trades to establish lines, levels, openings, chases, clearances, and locations to avoid interference, and to protect the Work.
- D. Deliver all materials as needed to avoid delaying any other contractor.
- E. Store all materials and equipment on the Project Site in a location approved by the Engineer.

1.09 INTERPRETATION OF DRAWINGS

- A. Listing of Contract Drawings does not limit responsibility of determining full extent of Work required by Contract Documents. Refer to Architectural, Plumbing, Electrical, Structural and other Contract Drawings and other sections that indicate types of construction in which Work shall be installed and Work of other trades with which Work of this section must be coordinated.
- B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the Contract Drawings or Specifications or both, carries with it the instruction to provide the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. Item referred to in singular number in Contract Drawings shall be provided in quantities necessary to complete Work.
- D. Contract Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting and component. The purpose of the Contract Drawings is to indicate a systems concept, the main components of the system, and the approximate geometrical relationships, the Subcontractor shall provide all other components and materials necessary to make the systems fully complete and operational.
- E. Information and components shown on riser diagrams but not shown on the Contract Drawings and vice versa, shall be provided as if expressly required on both.
- F. Data that may be furnished electronically by the Engineer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Engineer's sealed or stamped construction documents.

1.10 DISCREPANCIES IN DOCUMENTS

- A. Where Contract Drawings or Specifications conflict or are unclear, advise the Engineer in writing before Award of Contract. Otherwise the Engineer interpretation of Contract

Documents shall be final, and no additional compensation shall be permitted due to discrepancies or incongruities thus resolved.

- B. Where Contract Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert the Engineer in writing before installation. Otherwise, make changes in installed Work as the Engineer requires at no additional cost to the Owner.
- C. If the required material, installation or Work can be interpreted differently from drawing to drawing, or between Contract Drawings and Specifications, the Subcontractor shall provide that material, installation, or Work which is of the higher standard.
- D. Provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the Contract Documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the Subcontractor has failed to notify the Engineer of the situation in accordance with the Specifications, the Subcontractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by the Contract Documents, where the Subcontractor needs engineering guidance, submit a sketch identifying the proposed solution to the Engineer for approval.

1.11 MODIFICATIONS IN LAYOUT

- A. HVAC, Plumbing, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other Work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.
- B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from the Engineer.
- C. Check Contract Drawings as well as Shop Drawings of all trades to verify and coordinate spaces in which Work of this section will be installed.
- D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with Work of other trades and to coordinate as specified herein. Systems shall be run in a rectilinear fashion.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to the Engineer for review and approval.

1.12 RECORD DRAWINGS

- A. Refer to SECTION 01700, CONTRACT CLOSEOUT for record drawing requirements.
- B. As Work progresses and for duration of Contract, maintain complete and separate set of prints of Contract Drawings at Project Site at all times. Record Work completed and all changes from original Contract Drawings clearly and accurately including Work installed as a modification or addition to the original design.
- C. At Completion of Work prepare a complete set of reproducible record drawings.
- D. The Engineer will not certify the accuracy of the record drawings; this is the sole responsibility of the Contractor.
- E. Submit the record set for approval by the building department in a form acceptable to the department, when required by jurisdiction.
- F. Record drawings shall show record condition of details and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.13 MATERIAL LIST

- A. Within 4 weeks of Award of Contract, the Subcontractor through the Contractor shall submit a "Plumbing Equipment and Material List".
- B. The list shall contain all categories of material required with names of intended manufacturers. The list does not replace submittals specified herein.

1.14 WARRANTIES

- A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this section. Such warranties shall be in addition to and not in lieu of all liabilities, which the manufacturer and the Subcontractor may have by law or by provisions of the Contract Documents.
- B. All materials, equipment and Work furnished under this section shall be guaranteed against all defects in materials and workmanship for a minimum period of one year commencing with the Date of Substantial Completion. Any failure due to defective material, equipment or workmanship which may develop shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.
- C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Contract Drawings.
- D. Upon receipt of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.15 SURVEY AND MEASUREMENTS

- A. Base all required measurements, horizontal and vertical, from referenced points established by the Contractor and be responsible for correctly laying out the Work required under this section of the Specifications.
- B. In the event of discrepancy between actual measurements and those indicated, notify the Contractor, in writing, and do not proceed with the related Work until instructions have been issued.

1.16 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 MATERIALS AND EQUIPMENT.
- B. All manufactured materials shall be delivered to the Project Site in original packages or containers bearing the manufacturer's labels and product identification.
- C. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.
- D. Deliver products to the Project Site and store and protect same as recommended by the manufacturers'.
- E. Inspect all Plumbing equipment and materials, upon receipt at the Project Site, for damage and correctness.

1.17 PROTECTION OF WORK AND PROPERTY

- A. Care and protect all Work included under this section until it has been tested and accepted.
- B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment.
- C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by Work or workmen under this section and make good damage thus caused.

1.18 SUPERVISION

- A. Supply the service of an experienced and competent supervisor who shall be in charge of the plumbing work at the Project Site.

1.19 SAFETY PRECAUTIONS

- A. Comply with all of the safety requirements of OSHA throughout the entire construction period of the Project.

- B. Provide and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and/or property.

1.20 SPARE PARTS

- A. Furnish spare parts data for each different item of equipment furnished. The data shall include a complete list of parts and supplies, with current unit prices and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 180 days at the particular installation. The foregoing shall not relieve the Subcontractor of any responsibilities under the guarantees specified herein.

1.21 HOISTING, SCAFFOLDING AND PLANKING

- A. The Work shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, scaffolds, staging, planking, ladders, etc. as required for the Work.

1.22 SLEEVES, INSERTS, ANCHOR BOLTS, AND PLATES

- A. Be responsible for the location of and the maintaining in proper position all sleeves, inserts and anchor bolts supplied and/or set in place. In the event that failure to do so requires cutting and patching of finished work, it shall be done at this Subcontractor's expense without any additional cost to the Owner.

1.23 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

- A. Provide all supplementary steel, channels and supports required for the proper installation, mounting and support of all plumbing equipment, piping, etc., required by the Specifications.
- B. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Engineer.
- C. The type and size of the supporting channels and supplementary steel shall be determined by the Sub-contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

1.24 CERTIFICATES OF INSPECTION/APPROVAL

- A. Furnish upon completion of all Work, certificates of inspections from the manufacturers stating that authorized factory engineers have inspected and tested the operation of their respective equipment and found same to be in satisfactory operating conditions.

1.25 ACCESSIBILITY

- A. All Work shall be installed so that parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to

accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Engineer.

1.26 DEFINITIONS

- A. As used in this section, the following terms are understood to have the following meanings:
1. "Furnish" shall mean purchase and deliver to the project site, complete with every necessary accessory and support.
 2. "Install" shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting, proper location and operation in the project.
 3. "Provide" shall mean furnish and install.
 4. "Work" shall mean all labor, materials, equipment, apparatus, controls, accessories, and all other items required for a proper and complete installation.
 5. "Piping" shall mean, in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.
 6. "Concealed" shall mean hidden from sight in chases, furred spaces, shafts, embedded in construction or in crawl space.
 7. "Exposed" shall mean not installed underground or concealed as defined above.
 8. "Furnished by others" shall mean materials or equipment purchased and set in place under other sections of the general contract and connected to the systems covered by this section of the specifications by this trade contractor.
 9. "Coordinate" shall mean all work provided under this section of the specification shall be in compliance with work of other trades.

PART 2 MATERIALS

2.01 DRAIN, WASTE AND VENT PIPE AND FITTINGS

- A. Below grade (as applicable) shall be service weight cast iron soil pipe and fittings, ASTM A74, coated with tar or asphaltum, resilient gasket joints.
- B. Above grade shall be service weight cast-iron with no hub joints, except piping two inch or smaller may be schedule 40 galvanized steel with 150 lb. galvanized malleable iron drainage fittings, or type DWV copper with wrought copper drainage fittings.
- C. Cleanouts
1. ANSI A112.36.2M; provide threaded bronze cleanout plugs.

2. Floor Cleanouts (As applicable)

- a. Provide cast-iron or ductile-iron floor cleanout with anchor flange, adjustable height polished bronze, nickel bronze, stainless steel, or chromium-plated copper alloy rim and scoriated floor plate with "CO" cast in the plate, and countersunk screws for installing floor plate flush with finished floor.

2.02 STORM WATER DRAIN PIPING ABOVE FLOOR

- A. Piping shall be no-hub service weight cast iron soil pipe except at cleanouts and joints just prior to exiting the building which shall be service weight hub and spigot with lead and oakum joints.
- B. Couplings for joining no-hub cast iron soil pipe: Couplings shall have a shield constructed of corrugated 304 stainless steel and provide a shield thickness of 0.16 inches or greater. Shield shall be a minimum width of 3 inches for pipe sizes 1-1/2 inch through 4 inch, and a minimum width of 4 inches for pipe sizes 5 inch through 10 inches. Couplings with at least four (4) sealing bands shall require 80 inch pounds of torque per band. Tightening screws shall be 3/8 inch hexagon head. Couplings with only two (2) sealing bands on sizes 1-1/2 inch through 4 inches shall require 125 inch pound of torque per band. Gaskets shall be neoprene rubber conforming to ASTM C-564.

2.03 STORM WATER DRAIN PIPING BELOW FLOOR (AS APPLICABLE)

- A. Piping below floor shall be service weight cast iron hub and spigot.
- B. Joints in cast iron soil piping below ground shall be code approved compression type, made with rubber gaskets conforming to ASTM Specification C564. Joints in cast iron soil pipe and fittings using a double seal, compression type molded neoprene gasket shall be provided with a modified hub as required to provide a positive seal. No-hub pipe will not be allowed below ground.

2.04 HANGERS AND SUPPORTS

- A. Pipe hangers shall conform to MSS SP 58 and SP 69. Pipe hangers for piping 4 inch and larger shall have rolls either of the Harvard type or 2 rod type. Pipe hangers for 3 inch pipe and under shall be clevis type. Pipe hangers for pipe less than 2 inch may be 1A band type in lieu of clevis type. Hangers in contact with copper tubing shall be copper plated; all other hangers shall be 316 ss if available or electro galvanized if ss is not offered.
- B. All hangers on insulated piping shall be sized to fit the outside of the covering. Provide spacer blocks and 16 gauge galvanized protection shields (12 inches long) at hangers, when pipe is installed.
- C. All hanger rods shall be hung from wood frame ceiling structure using wood screws designed for use with threaded rod adapters or through-bolted with double nuts and flat washers.

- D. Where support points are required to avoid other Work, provide a system of channels and angles between support points as required. Provide all necessary supports and cross framing. No part of piping, ductwork, equipment, and the building shall be stressed beyond its normal allowable working strength.

2.05 SLEEVES

- A. Sleeves shall be sized to allow 1/2 inch of annular space between the covering (or bare pipe) and the inside of the sleeve.
- B. Pipe penetrations through floors and exterior walls shall be sleeved and sealed using Thunderline Link-Seal wall sleeves and seals or approved equal.
- C. In other areas, pack the annular space with non-combustible (as defined by ASTM E136) fire stopping material, and seal with non-combustible caulking flush with finish surface.
- D. Sleeves in concrete construction shall be galvanized steel pipe, except where passing through exterior walls they shall be ductile iron. Sleeves passing through floors shall project 1 inch above the finish floor. Sleeves in frame and dry wall construction shall be 18 gauge galvanized steel sheet metal.
- E. Provide escutcheons at all exposed pipe penetrations in finished areas. Escutcheons shall be chrome plated, sized to cover the sleeve, with set screw.

2.06 PIPING INSULATION

A. General

1. The pipe covering specified herein for piping system shall be provided to strict accordance with the manufacturer's printed instructions, the best practice of the trade and to the full intent of this Specification.
2. Flame/Smoke Ratings: Provide complete fibrous glass pipe insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
3. Manufacturer: Subject to compliance with requirements, provide products of Armstrong World Industries, Inc., Knauf Fiber-Glass, Owens Corning or approved equal.
4. Apply insulation after systems have been tested, proved tight and approved by Architect. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.
5. No leaks in vapor barrier or voids in insulation will be accepted.
6. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and

through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and piping, to provide firestop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

- B. Sanitary Drain, Waste, Vent and Storm Water Drain Piping:
 - 1. 1 inch thickness fiberglass piping insulation
 - 2. Fire retardant foil face jackets for piping insulation: ASTM C-921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at installation option.
 - 3. Encase piping fittings insulation with one piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
 - 4. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

PART 3 EXECUTION

3.01 OPENINGS

- A. The responsibility for determining the exact size and location of openings is part of the Work of this section. If this responsibility is not met, cutting and patching to achieve the correct size and location of openings and chases is part of the Work of this section.

3.02 CUTTING AND PATCHING

- A. Do all cutting and patching required for the Work of the section, except cutting and patching of finish (visible) materials. Cutting and patching of masonry walls, partitions, ceilings and floors is included. Concrete cutting shall be done with abrasive wheels or saws, and coring with a diamond core bit. The use of jackhammers is prohibited.

3.03 INSTALLATION OF EQUIPMENT (As Applicable)

- A. Equipment shall be installed in strict accordance with manufacturer's instructions, unless otherwise specified herein, or on the Contract Drawings. In case of discrepancies, contact the Engineer for instructions.

3.04 INSTALLATION OF PIPING

- A. Provide a shutoff valve on each pressure piping connection at each item of equipment, except vent and overflow connections.
- B. Provide a union or flange at each connection at each item of equipment.
- C. Install piping parallel to or perpendicular to the lines of the building.

3.05 CLEANING

- A. Clean all debris resulting from the work of the section, and remove it from the Project Site, daily.
- B. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all Work, thoroughly clean all fixtures, exposed materials and equipment.

3.06 TESTS

- A. Test drain-waste piping by tightly plugging all openings except for the highest opening in the system. Fill all systems to overflowing. Systems shall be tight throughout with no drop in water level for a minimum period of 2 hours.

3.07 DISINFECTION OF WATER SUPPLY SYSTEM

- A. Fill all systems with a water and chlorine solution which contains 50 parts per million of available chlorine and allow it to stand 6 hours before flushing. Fill each system with a solution which contains 100 parts per million of available chlorine; allow it to stand 2 hours and flush it.

3.08 PAINTING

- A. Clean all surfaces free of dirt, oil, grease, etc. Surfaces shall be clean and dry before any paint is applied.
- B. Restore to original condition and appearance any equipment which has sustained damage to the manufacturer's prime and/or finish coat.

3.09 OPERATING AND MAINTENANCE MANUALS

- A. Furnish to the Owner operations and maintenance instructions of all mechanical, electrical and manually operated equipment furnished and/or installed under the Contract, as specified. See SECTION 01730, OPERATION AND MAINTENANCE MANUALS.

END OF SECTION

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SECTION 15500
HEATING, VENTILATION AND AIR CONDITIONING

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Work of this section includes all labor, tools, material, fittings, accessories and equipment necessary to furnish and install, place in operation and test, adjust and balance the heating and ventilating systems as specified herein and as shown on the Drawings. The work of DIVISION 15 – HEATING, VENTILATION AND AIR CONDITION requires the subcontractor to perform all work specified under DIVISION 15 – HEATING, VENTILATION AND AIR CONDITIONING.
- B. Reference Drawings
 - 1. The work of DIVISION 15 – HEATING, VENTILATION AND AIR CONDITION is shown on drawing(s) numbered: H- 0.1, 1.1, 1.2 and 1.3.
- C. The Work includes, without limiting the generality thereof:
 - 1. Demolition and removal of existing hot water unit heaters and portions of the hot water supply and return piping.
 - 2. Demolition and removal of existing supply ductwork.
 - 3. Demolition and removal of Odor Control Blower and enclosure.
 - 4. Demolition and removal of existing Odor Control ductwork.
 - 5. Supply Ductwork
 - 6. Electric Unit Heaters for Hazardous Service.
 - 7. FRP Odor Control Blower EF-1.
 - 8. FRP Odor Exhaust Ductwork.
 - 9. Air Balancing.
 - 10. Startup and placing in service.

1.02 SUBMITTALS

- A. Submit on the following in accordance with Section 01300:
 - 1. Supply Ductwork Construction Standards
 - 2. Supply Ductwork Accessories
 - 3. Electric Unit Heater for Hazardous Service
 - 4. FRP Odor Control Blower
 - 5. FRP Ductwork Construction Standards

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16085, Miscellaneous Equipment
- B. Section 16120, Wire and Cables

1.04 DESIGN CRITERIA

- A. The Work of this section shall comply with the requirements of the Rhode Island State Building Code and of all other authorities having jurisdiction.

- B. The equipment covered by the Specifications is intended to be standard equipment of proven quality as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practice of the industry and shall operate satisfactorily when installed in accordance with the Contract Documents. The Specifications call attention to certain details, but do not purport to cover all details entering into the construction of the equipment.
- C. All material shall be new and shall bear the manufacturer's full identification.
- D. Requirements of Regulatory Agencies
 - 1. The final, complete installation shall comply with all state and local statutory requirements having jurisdiction. Arrange for all necessary permits, pay all fees and arrange for all required inspections by state and local authorities.
 - 2. In general, all Work shall comply with the requirements of rules, regulations, standards, codes, ordinances, and laws of local, state, and federal governments, and other authorities that have legal jurisdiction over the Project Site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:
 - a. Local and state building, HVAC, plumbing, mechanical, energy conservation, electrical, fire and health department codes.
 - b. National Fire Protection Association (NFPA).
 - c. Occupational Safety and Health Act (OSHA).
 - d. Underwriters' Laboratories (UL).
 - e. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME for intended service.
 - 3. When requirements cited in the Specifications conflict with each other or with Contract Documents, most stringent shall govern Work.
 - 4. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:
 - a. American National Standards Institute (ANSI).
 - b. American Society of Mechanical Engineers (ASME).
 - c. National Electric Manufacturers Association (NEMA).
 - d. American Society for Testing and Materials (ASTM).
 - e. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
 - f. Air Moving and Conditioning Association (AMCA).

- g. Sheet Metal and Air Conditioning Contractors National Association (SMACNA). SMACNA FRP THERMOSET DUCT CONSTRUCTION MANUAL.
- h. Air Conditioning and Refrigeration Institute (ARI).
- i. Thermal Insulation Manufacturers Association (TIMA).
- j. Institute of Electrical and Electronics Engineers (IEEE).
- k. Insulated Cable Engineers Association (ICEA).
- l. International Energy Conservation Code 2015 ed.

E. Tests and Adjustments

- 1. Test all systems furnished under this section and repair or replace all defective Work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of all systems.
- 2. Defined to include, but not necessarily limited to, air distribution systems, and associated equipment and apparatus of mechanical Work. Work consists of recording data, conducting tests, preparing and submitting reports, and recommending modifications to Work as required by the Contract Documents.
- 3. Startup the following pieces of equipment in strict accordance with manufacturer instructions.
 - a. Unit Heaters
 - b. Odor Control Blower

1.05 PRODUCT HANDLING

- A. All materials and equipment shall be shipped, stored, handled and installed in such manner as not to degrade quality, serviceability, or appearance.
- B. Store all materials and equipment on site in a location approved by the Engineer.
- C. Protect all work, the Owner's property and the property of others from injury or loss caused by operations associated with the Work of this section. Make good any such injury or loss, at no cost to the party suffering the injury or loss.

1.06 PROCEDURE

- A. Secure all required permits, inspections, and approvals and pay all costs and fees.
- B. Unless the Specifications state "No Substitutions", substitutions will be considered for any specified item.

- C. Coordinate safety program with that of the Contractor. Cooperate with other Subcontractors to establish lines, levels, openings, chases, clearances, and locations to avoid interference; and to protect the Work.
- D. Deliver all materials as needed to avoid delays.

1.07 INTERPRETATION OF DRAWINGS

- A. Listing of Drawings does not limit responsibility of determining full extent of Work required by the Contract Documents. Refer to Architectural, HVAC, Electrical, Structural, and other Contract Drawings and other sections that indicate types of construction in which Work shall be installed and Work of other trades with which Work of this section must be coordinated.
- B. Except where modified by a specific notation to the contrary, the indication and/or description of any item, in the Contract Drawings or Specifications or both, carries with it the instruction to provide the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete Work.
- D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the Contract Drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.
- E. Data that may be furnished electronically by the Engineer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for the Engineer's sealed or stamped construction documents.

1.08 DISCREPANCIES IN DOCUMENTS

- A. Where Contract Drawings or Specifications conflict or are unclear, advise the Engineer in writing before Award of Contract. Otherwise, the Engineer's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies thus resolved.
- B. Where Contract Drawings or Specifications do not coincide with manufacturers' recommendations or with applicable codes and standards, alert the Engineer in writing before installation. Otherwise, make changes in installed Work as the Engineer requires at no additional cost to the Owner.
- C. If the required material, installation, or Work can be interpreted differently from drawing to drawing, or between Contract Drawings and Specifications, the Subcontractor shall provide that material, installation, or Work which is of the higher standard.

- D. Provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the Subcontractor has failed to notify the Engineer of the situation as specified, provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by Paragraph (D) above, where the Subcontractor needs engineering guidance, submit a sketch identifying his proposed solution and the Engineer shall review, note if necessary, and approve the sketch.

1.09 MODIFICATIONS IN LAYOUT

- A. Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other Work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.
- B. Check Contract Drawings as well as Shop Drawings of all trades to verify and coordinate spaces in which Work of this section will be installed.
- C. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- D. Make reasonable modifications in layout and components needed to prevent conflict with Work of other trades and to coordinate as specified. Systems shall be run in a rectilinear fashion.
- E. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to the Engineer for review and approval.

1.10 RECORD DRAWINGS

- A. Record drawings shall be provided under this Section in accordance with Section 01780 and as specified herein.
- B. As Work progresses and for duration of the Contract, maintain complete and separate set of prints of Contract Drawings at the Project Site at all times. Record Work completed and all changes from original Contract Drawings clearly and accurately including Work installed as a modification or addition to the original design.
- C. At completion of Work prepare a complete set of reproducible record drawings showing all systems as actually installed.
- D. The Engineer will not certify the accuracy of the Record Drawings. This is the responsibility of the Subcontractor.
- E. This trade shall submit the record set for approval by the building department in a form acceptable to the department, when required by the jurisdiction.

- F. Drawings shall show record condition of details, sections, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.11 ELECTRICAL WORK

- A. Except for electrical apparatus specifically called for as part of this Section, all switches and controllers required will be provided under DIVISION 16 - ELECTRICAL.
- B. All electrical apparatus and controls furnished as a part of the Work of this section shall conform to applicable requirements under DIVISION 16 - ELECTRICAL. Enclosure types shall be as indicated on the Contract Drawings.
- C. All electrical apparatus furnished under this section shall be approved by UL and shall be labeled or listed where such is applicable.

1.12 WARRANTIES

- A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this section. Such warranties shall be in addition to and not in lieu of all liabilities, which the manufacturer and the Subcontractor may have by law or by provisions of the Contract Documents.
- B. All materials, equipment and work furnished under this section shall be guaranteed against all defects in materials and workmanship for a minimum period of 1 year commencing with the Date of Substantial Completion and Final Acceptance by the Owner. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.
- C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Contract Drawings.
- D. Upon receipt of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be placed.

1.13 SURVEY AND MEASUREMENTS

- A. Base all required measurements, horizontal and vertical, from referenced points established by the Contractor and be responsible for correctly laying out the Work required under this section of the Specification.

1.14 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 and as specified herein.
- B. All manufactured materials shall be delivered to the Project Site in original packages or containers bearing the manufacturer's labels and product identification.

- C. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.
- D. Deliver products to the Project Site and store and protect same as recommended by the manufacturers'.
- E. Inspect all HVAC equipment and materials, upon receipt at the Project Site, for damage and correctness.

1.15 PROTECTION OF WORK AND PROPERTY

- A. Care and protect for all Work included under this section until it has been tested and accepted.
- B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment.
- C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this section and make good damage thus caused.

1.16 SAFETY PRECAUTIONS

- A. Comply with all of the safety requirements of OSHA throughout the entire construction period of the Project.
- B. Provide and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and/or property.

1.17 SPARE PARTS

- A. Furnish spare-parts data for every component that is required to be maintained for normal service of equipment furnished. The data shall include a complete list of parts and supplies, with current unit prices and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the Contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 180 days at the particular installation. The foregoing shall not relieve the Subcontractor of any responsibilities under the guarantees specified herein.

1.18 HOISTING, RIGGING, SCAFFOLDING AND PLANKING

- A. The Work to be done under this section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, scaffolds, staging, planking, ladders, etc. as required for the Work.

1.19 SLEEVES, INSERTS, ANCHOR BOLTS, AND PLATES

- A. Be responsible for the location of and the maintaining in proper position all sleeves, inserts and anchor bolts supplied and/or set in place. In the event that failure to do so requires cutting and patching of finished Work, it shall be done at this Subcontractor's expense without any additional cost to the Owner.

1.20 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

- A. Provide all supplementary steel, channels and supports required for the proper installation, mounting and support of all HVAC equipment, piping, etc., required by the Specifications.
- B. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Engineer.
- C. The type and size of the supporting channels and supplementary steel shall be determined by the Subcontractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.
- D. All steel used for supplementary steel, channels and supports shall be 316 stainless steel.

1.21 CERTIFICATES OF INSPECTION/APPROVAL

- A. Furnish upon completion of all Work, certificates of inspections from the manufacturers stating that authorized factory engineers have inspected and tested the operation of their respective equipment and found same to be in satisfactory operating conditions.

1.22 ACCESSIBILITY

- A. All Work shall be installed so that parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the Contract Drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to receipt of written approval from the Engineer.

1.23 DEFINITIONS

- A. As used in this section, the following terms are understood to have the following meanings:
 - 1. "Furnish" shall mean purchase and deliver to the project site, complete with every necessary accessory and support.
 - 2. "Install" shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting, proper location and operation in the project.
 - 3. "Provide" shall mean furnish and install.
 - 4. "Work" shall mean all labor, materials, equipment, apparatus, controls, accessories, and all other items required for a proper and complete installation.
 - 5. "Piping" shall mean, in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.
 - 6. "Concealed" shall mean hidden from sight in chases, furred spaces, shafts, embedded in construction or in crawl space.
 - 7. "Exposed" shall mean not installed underground or concealed as defined above.

8. "Furnished by others" shall mean materials or equipment purchased and set in place under other sections of the general contract and connected to the systems covered by this section of the specifications by this trade contractor.
9. "Coordinate" shall mean all work provided under this section of the specification shall be in compliance with work of other trades.

PART 2 PRODUCTS

2..01 HANGERS AND SUPPORTS

- A. Equipment supports shall be 316 stainless steel.
- B. Where support points are required to avoid other Work, provide a system of channels and angles between support points as required. Provide all necessary supports and cross framing.

2..02 SUPPLY DUCTWORK

1. Provide all sheet metal ductwork required for the supply air system. Unless otherwise indicated on the Contract Drawings or in these specifications, ductwork shall be 316 stainless steel duct, all ductwork and sheet metal plenums shall be constructed meeting the requirements of ASTM A 653, lock-forming quality. Stainless steel sheet metal shall conform to ASTM A 167. All ductwork, except where specified otherwise herein, shall be fabricated in accordance with the "HVAC Duct Construction Standards for Metal Ducts" published by the Sheet Metal and Air Conditioning Contractors National Association, Incorporated (SMACNA), 2 inch water gauge Pressure Class.
2. Ducts shall be true to the inside dimensions indicated on the Contract Drawings. Cross break all duct panels over 12 inches wide. Support ducts rigidly and securely. Support horizontal ducts not over 8 feet on center. Ducts shall be straight and smooth on the inside with neatly finished joints and all transverse joints and longitudinal seams of all low pressure ducts shall be sealed in conformance with SMACNA seal classification B.
5. Elbows narrower than 16 inches shall be full radius elbows with inside radius equal to the dimension of the duct in the plane of the elbow or offset. Elbows wider than 16 inches may be full radius elbows or square elbows with air foil section turning vanes (Duct Manual Figure 2-3) and 6 inch inside radius. Vanes shall be "Runner" Type 2, 3 1/4 inches on centers. Install outside vane flush against the outside of the elbow.
6. Transitions in duct mains and branches shall be made with sides sloping at not more than 1 inch in 7 inches on the side of the transformation for diverging transitions and 1 inch in 4 inches for converging transitions. Transitions in ductwork to pieces of equipment shall be made with a 20 degree maximum angle projected from the straight duct side on a diverging transition and a 30

degree maximum angle projected from the straight duct side on a converging transition. Any conditions requiring deviations from the above shall be brought to the attention of the Engineer for approval.

7. All notches for connecting sections of duct, including longitudinal seam notches, shall not be cut any deeper than 1 7/8 inches to insure tight corners in 2 inch deep slip joints.
8. Slips shall be at least 2 gauges heavier than the duct and all joints shall be made in a neat and workmanlike manner and in all cases shall be tight. All ducts shall have all joints sealed with EC-800 as manufactured by 3M, Hardcast or approved equal.
9. Duct penetrations of walls or decks shall have the annular space between the duct and the structure sealed with approved material.

2.03. SUPPLY DUCTWORK ACCESSORIES

1. Wire Mesh Screen: 1/2 inch x 1/2 inch 316 series stainless steel welded wire mesh. Brush screen with chemically resistant sealant equal to Ceilcote 242 Flakeline.
2. Volume Dampers
 - i. Provide volume dampers where indicated on the Contract Drawings.
 - ii. Dampers less than 12 inches in height shall be Young Regulator manual adjustable rectangular opposed blade dampers.
 - iii. Dampers 12 inch and larger in height shall be opposed multi-blade equal to Greenheck, Nailor, or Vent Products.
 - iv. Damper frame shall be constructed of 316 series stainless steel channel with minimum thickness of .050 inches. Opposed damper blades shall be 316 series stainless steel with minimum thickness of .050 inches and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8 inch square steel control shaft.
 - v. Damper blades shall be 2 gauges heavier than adjoining ductwork, and shall be riveting to supporting rods. Hem over edges parallel to rods.
 - vi. Brackets shall be galvanized metal, secured to ductwork with sheet metal screw with locking quadrant arms. Provide 2-inch handle extension for all dampers on externally insulated ductwork.
3. Sheet Metal Access Panels
 - i. Provide access panels of the proper size and at all locations in ductwork necessary to service control devices, fan bearings and as required to service all systems.
 - ii. Access panels shall have foam gasketing, fixed hinges and compression type latches as manufactured by Ventlock, Duro-Dyne or approved equal.

Access doors for insulated ducts shall be insulated with 1 inch thick 1 ½ lb density coated duct liner. Panels shall be 316 stainless steel.

4. Diffusers, Registers and Grilles

i. Supply Grille, Supply Register:

- a. Minimum 22 gauge type 316 stainless steel construction.
- b. 1 1/4-inch margins, mitered corners, and countersunk mounting holes.
- c. Double deflection.
- d. Vertical front blades and horizontal rear blades.
- e. Individual adjustable front and rear blades on ¾-inch centers.
- f. Mill finish.
- g. Register to be provided with integral opposed blade type 316 stainless steel damper adjustable from face.
- h. Nailor.

ii. Exhaust Registers, Exhaust Grilles:

- a. Minimum 22 gauge type 316 stainless steel construction.
- b. 1 1/4-inch margins, mitered corners, and countersunk mounting holes.
- c. Fixed vertical zero deflection bars.
- d. Mill finish.
- e. Register to be provided with integral opposed blade type 316 stainless steel damper adjustable from face.
- f. Nailor.

5. Control Dampers

- i. Furnish motor operated control damper for duct connected to Inlet Louver. Provide direct connected damper actuator for each damper.
- ii. Damper Assembly: Damper shall conform to SMACNA HVAC Duct Construction Standards. A single damper section shall have blades no longer than 48 inches and shall be no higher than 72 inches. Maximum damper blade width shall be 8 inches. Larger sizes shall consist of a combination of sections. Damper shall be 316 stainless steel. Flat blades shall be made rigid by folding the edges. Provide blades with compressible seals at points of contact. Provide channel frames of dampers with jamb seals to minimize air leakage. Dampers shall not leak in excess of 10 cfm per square foot at 4 inches water gage static pressure when closed. Seals shall be suitable for an operating temperature range of minus 40 degrees F to 200 degrees F. Dampers shall be rated at not less than 2000 fpm air velocity. Moving parts of operating linkage in contact with each other shall consist of dissimilar materials. Damper axles shall be 0.5 inches minimum plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically shall be supported by non-ferrous dissimilar thrust bearings. Pressure drop through dampers shall not exceed 0.05 inch water gage at 1,000 fpm in

the wide-open position. Frames shall not be less than 2 inches wide. Dampers shall be tested in accordance with AMCA 500-D.

- iii. Operating Links: Operating links external to dampers, such as crank arms, connecting rods, and line shafting for transmitting motion from damper actuators or dampers, shall withstand a load equal to at least twice the maximum required damper-operating force. Rod lengths shall be adjustable. Links shall be 316 stainless steel. Mating parts shall consist of dissimilar materials. Working parts of joints and clevises shall be brass, bronze, or stainless steel. Adjustments of crank arms shall control the open and closed positions of dampers.

2.04 ELECTRIC UNIT HEATERS

- A. Explosion Proof Unit heater shall be equal to model GUX by Q Mark or approved equal.
 - 1. KW rating, voltage and phase shall be as scheduled. Unit heaters shall be fan forced type, UL and cUL Approved for Class 1, Divisions 1 and 2, Group C and D; Class II, Divisions 1 and 2, Groups E, F and G. The heat exchanger shall be liquid-to-air design, utilizing a steel tube core with integral aluminum fins. Nontoxic, inhibited, propylene glycol heat transfer fluid shall be used to provide freeze protection down to -49 deg F. A pressure relief plug shall be furnished and installed to provide overpressure protection. The heat exchanger shall include industrial grade electric heating elements. The heat exchanger and aluminum fan blade shall be enclosed in an industrial grade, corrosion resistant cabinet fabricated from polyester powder-coated 14-gauge steel. The heater shall have adjustable outlet louvers with minimum opening safety stops. The fan motor shall include permanently lubricated ball bearings and built-in thermal overload protection. Motor shall operate at line voltage and shall be prewired to the control enclosure to eliminate the need for separate field wiring to the motor.
 - 2. Accessories:
 - a. Disconnect Switch with external handle rated for 60 amps (factory mounted and wired).
 - b. Manual reset thermal cutout for over temperature protection, controlling magnetic contactor and 24-volt control circuit transformer housed in a NEMA 7, 9 cast aluminum enclosure.
 - c. Fan only switch (factory mounted and wired).
 - d. Wall mounting kit designed to bear the weight of the scheduled unit heater assembly.
 - e. Wall mounted explosion proof thermostat.

2.05 FRP HIGH VELOCITY LOW VOLUME BLOWER:

- A. Provide where shown on Drawings FRP High Velocity Low Volume centrifugal blower of sizes and capacities as listed in Schedule and arranged as shown on the drawings. Blower shall be suitable for outdoor installation.
- B. Blower shall bear the AMCA seal and shall comply with the following standards:
 - 1. AMCA 204-05 Balance Quality and Vibration Levels for Fans
 - 2. AMCA 205-12 Energy Efficiency Classification for Fans
 - 3. AMCA 210-07 Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
 - 4. AMCA 311-05 Certified Ratings Program
 - 5. ASTM D4167-97 Standard Specification for Fiber-Reinforced Plastic Fans and Blowers
- C. Blower shall be provided with following:
 - 1. FRP housing with fiberglass reinforcement. Housing and all blower components shall include UV inhibitors for outdoor installation. Casing fastening bolts shall be encapsulated in FRP. No coated metal fan parts are allowed. **Fan housing shall be internally coated with 100% high melt polyester with resin binder equal to Nexus.**
 - 2. Weathertight enclosure for motor and electrical components.
 - 3. Belt guard.
 - 4. Casing drain and plug at lowest point.
 - 5. Flanged outlet and smooth aerodynamic inlet.
 - 6. Solid molded FRP impeller with backward curved airfoil blades. Impeller shall be statically and dynamically balanced to AMCA standard as noted above. **Hub seal shall be Teflon or neoprene.**
 - 7. Premium efficiency explosion proof motor suitable for inverter duty service.
 - 8. Motor junction box access panel.
 - 9. Provide regreasable, spherical pillow block bearings and belt tensioning variable pitch pulleys for belt driven fans.
 - 10. Formed steel fan support base coated with baked polyester.
 - 11. Vibration isolation support base with support rails and spring isolators rated for 1" deflection.
 - 12. Spare set of belts.

F. Blower shall be by MK Plastics or approved equal.

2.06 FIBERGLASS REINFORCED PLASTIC (FRP) DUCTWORK:

A. All new exhaust and Odor Control System ductwork shall be FRP as specified below.

B. The following is a specification for glass fiber reinforced process ducting and fittings for products intended for use in aggressive chemical and/or wastewater environments.

C. ACCEPTABLE MANUFACTURERS: Viron® International Corporation or approved equal.

D. DESIGN STANDARDS

1. Fiberglass reinforced plastic ductwork and accessories shall be constructed and inspected according to the following standards:

a. NBS PS 15-69: Standard for Contact-Molded Reinforced Polyester Chemical Resistant Process Equipment.

b. ASTM E 84-89: Standard Test Method for Surface Burning Characteristics of Building Materials.

c. ASTM C 582-87: Standard Specification for Contact-Molded Reinforced Thermosetting Plastic Laminates for Corrosion Resistant Equipment.

d. ASTM D 2563-70: Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts.

e. ASTM D 2996-88: Standard Specification for Filament Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

f. ASTM D 4097-88: Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Chemical Resistant Tanks.

g. SMACNA Thermoset FRP Duct Construction Manual: First Edition, June 1997.

h. In the event of conflict between these references, the most appropriate and stringent source shall be followed.

E. QUALITY ASSURANCE

1. All FRP duct components shall be fabricated by qualified, experienced personnel with a minimum of 5 years' experience with the lay-up, fabrication and joining of FRP materials.

2. Beside meeting the requirements of this section, resins used in the fabrication of the FRP ductwork shall be approved and applied in accordance with the resin vendor's published technical criteria.

3. Factory Inspection:

a. The Owner shall maintain the right to tour the FRP duct fabrication facility anytime that fabrication is being performed on ductwork intended for the project.

b. The fabricator shall notify the Owner when production has been completed on the first 50 lineal feet of fabricated ductwork. Any time after that date, the Owner may exercise the option, without advanced

notice, to tour the plant and inspect all stages of fabrication to ensure that quality control is being maintained.

- c. This visitation and inspection option shall remain in effect throughout the entire cycle of production for materials used on this project.
- d. **Factory Supplied Test Sample:** The fabricator shall provide a minimum of three sample specimens for mechanical property tests and lamination lay-up analysis. Test specimens shall be submitted to the vendor of the resin used in the duct construction process.
- e. **Acceptance of Fabricated Ductwork:**
 - i. Acceptance of factory fabricated ductwork shall be based on laboratory analysis of the factory-supplied and field-supplied test sample specimens and Owner's inspection of the ductwork during the fabrication procedure.
 - ii. No ductwork shall be installed on the project until the Owner approves all test results to verify the fabricated product complies with the technical requirements specified herein.
 - iii. The installing contractor shall bear the costs required by the resin vendor for performing the duct sample tests indicated herein.
 - iv. All factory and field test sample specimens shall be analyzed at the laboratory of the resin vendor to determine:
 - Tensile and flexural strength
 - Barcol hardness
 - Glass content
 - Edge compression properties
 - Thickness measurement
 - Visual quality inspection of laminate
- f. Cure development testing shall be performed on each duct section of each production run, in accordance with ASTM D 3418. Testing shall be performed at a minimum of each side midpoint at $1/3$ and $2/3$ straight wall distances on both the inner and outer surfaces (16 points total) of each duct section.
- g. A visual quality inspection of laminate shall be performed on each duct section in accordance with ASTM D 2563. Acceptable ductwork shall have no visual surface defects greater than Level III, smooth with no glass fibers exposed. There shall be no foreign inclusions, dry spots, air bubbles, cracks, crazing, pinholes, or delamination. Inspections shall be done and recorded by the fabricator and the installing contractor.
- h. If the duct samples fail to meet the requirements of the resin vendor's technical data, or meet the fabrication steps of these specifications, The fabricator shall comply with the following additional test steps:
 - i. Test all pieces manufactured during the production run.
 - ii. Submit a list of three independent testing laboratories for selection by the Owner of one laboratory to provide a separate opinion.
 - iii. Contact with the chosen laboratory for services for the same test procedures described above on ten new sample specimens

removed from ductwork stockpiled on the project construction site.

- iv. Written acceptance by the Owner will provide necessary clearance of stockpiled material to be installed by the installing contractor.
- v. Written rejection by the Owner of any or all of the ductwork shall constitute noncompliance. The fabricator shall remove all nonconforming material from the construction site and replace with new material fabricated to conform to these requirements. Test sample specimens shall be taken from all the ductwork fabricated as replacement to nonconforming material, and tests will be repeated.

F. DESIGN CRITERIA

1. Duct Pressures: FRP exhaust ductwork shall be suitable for 5 inches W.C. negative and 4 inches positive internal pressures.
2. Stiffening: All rectangular duct sections shall be constructed with integral stiffeners which limit maximum deflection to ½ inch across any span when subjected to -5.0 inches W. C. static pressure.
3. Exhaust Contaminants: The duct system will be designed to withstand airstream contaminants typically found in Wastewater Pump Station Wet Wells.
4. Field Joints: Field joints shall be butt and wrap type wherever possible. All joints shall be constructed to ensure the bottoms of adjacent duct sections are relative to each other such that no pockets or low spots are created where condensed liquid can collect. Internal wraps shall include a minimum 20 mil synthetic veil in contact with the airstream. External wraps shall include a gel coat with UV inhibitors.
5. Duct Length: To the extent possible, the length of the duct sections shall be constructed so that the field joints are minimized while shipping is optimized.
6. Packaging and Loading: All ductwork and components shall be packaged and loaded to protect against damage during shipping, offloading and handling.
7. Shipping: All ductwork shipments will be coordinated with the installing contractor.
8. Unloading and Storage: Upon receipt at the jobsite, the installing contractor shall be responsible for unloading, inventory, and inspection of the ductwork for damage caused in transit. The duct components shall be stored in a clean, dry location until installed.
9. Warranty: The ductwork shall have a one-year guarantee carried by the fabricator that will provide for repair or replacement of defective materials at no cost to the owner.

G. FRP DUCTWORK CONSTRUCTION

1. Internal Corrosion-Resistant Surface: The interior liner in contact with the contaminated exhaust airstream shall be a minimum of 100 mil thick and constructed of materials resistant to the chemicals listed in paragraph E.3 above. The corrosion liner shall be laid-up as a separate corrosion barrier from the intermediate structural layers.

2. The internal liner shall be formed with a 10 mil C-glass veil for superior corrosion resistance. Two layers of 1.5 ounce per square foot chopped strand mat and spray-up chopped borosilicate glass shall make up the balance of the internal liner to achieve 100 mil total thickness.
3. The corrosion liner shall gel completely prior to continuing with the structural layer.
4. Resin used for the internal corrosion-resistant liner shall be Reichhold Dion Ver 9300 FR or equal. Resin-to-glass ratios shall be 90% resin, 10% glass.
5. The resin shall carry a flame spread rating of 25 or less, and smoke contribution rating of Unrated (in excess of 1000) with the addition of 3% antimony trioxide.
6. Intermediate Structural Layer:
 - a. The intermediate layer of duct wall thickness shall be fabricated by either filament wound or hand lay-up techniques to the dimensional thickness and strength as required by NBS PS 15-69 standards.
 - b. Resin for the intermediate structural layer shall be Reichhold VER 9300 FR or equal. Resin to glass ratios shall be 66% resin, 33% glass.
 - c. The resin shall carry a flame spread rating of 25 or less, and smoke contribution rating of Unrated (in excess of 1000) with the addition of 3% antimony trioxide.
 - d. The outer surface shall be relatively smooth with no exposed glass fiber ends.
7. External Layer:
 - a. The exposed external surface of all FRP ductwork installed whether indoors on grade or on the roof, shall provide protection against ultraviolet degradation and weather erosion. The duct shall carry a flame spread rating of 25 or less and a smoke contribution rating of Unrated (in excess of 1000).
 - b. All ductwork shall be identified by a finished appearance in the white color spectrum. Gel coat color shall be white.
 - c. External duct protection shall be provided by an ultraviolet stabilizer added to the final coat of resin that also incorporates paraffinated wax curing elements and color pigment.

H. DAMPERS

1. Exhaust branch duct balancing dampers shall be manufactured using the same materials as the ductwork. Round dampers shall be single butterfly blade type; rectangular dampers shall be parallel blade type. Blade shaft shall be fiberglass with Teflon shaft seals. All dampers shall be suitable for 6 inches WC pressure differential. Blade shaft shall be designed to provide a 10:1 safety factor for operating torque requirements. The shaft shall be glassed into the damper blade, such that the center portion of the blade is

significantly thicker than the outer perimeter with a smooth, even taper from the center to perimeter. Dampers shall be by the fabricator. Manual dampers to be equipped with manual stainless steel adjustable locking handles or worm gear operators. Automatically controlled dampers to be equipped with automatic electric or pneumatic actuators supplied by the Controls Subcontractor and installed by HVAC Subcontractor.

I. PRESSURE RELIEF DOORS (PRD)

1. Provide factory manufactured pressure relief doors as manufactured by Greenheck, Ajdoor or equal as follows.
2. Application: The positive pressure relief doors are designed to open automatically at 1 in. wg above normal operating system pressure. The function of these doors is to prevent wastewater influent from backing up into the duct system. By opening outward at a specified pressure setting, the doors permit rapid neutralization of the pressure differential between the inside and outside of the HVAC system. The pressure relief setting is factory set and tested prior to shipment. The pressure setting of the door can be factory adjusted from 2 in. wg to 12 in. wg in 1 in. increments.
3. Construction:
 - a. Frame: .062 in. thick aluminum extrusion, Z & T-shape
 - b. Door: .050 in. thick aluminum extruded perimeter with 24 to 16 ga. skin and polyurethane filled seal core (NFPA 90A compliant).
 - c. Trim Flange: 1 in. around perimeter
 - d. Seal: Co-extruded PVC leaf gasket
 - e. Range of Settings: Factory adjusted pressure settings range from 2 in. wg to 12 in. wg. Door is specifically set 1 in. above normal operating system pressure, unless otherwise specified.
 - f. Cable Assembly with Spring: Cable assembly limits door opening to 80°, preventing door and duct damage.
 - g. Latch: Adjustable magnet assembly is factory set at desired relief pressure. Pressure must be given at time of order to properly place latch. Latch is field adjustable.
 - h. Service Temperature: -40°F to 120°F
 - i. Door size: 10 in. W x 10 in. H

J. FABRICATION

1. All ductwork to be supplied as butt and wrap joints except as necessary for connection to equipment and dampers. All butt and wrap joints shall be constructed to ensure the bottoms of adjacent duct sections are relative to each other such that no pockets or low spots are created where condensed liquid can collect.
2. Butt joints over 24" diameter shall be internally, as well as externally wrapped. Internal wraps shall include a minimum 20 mil synthetic veil in contact with the airstream. External wraps shall include a gelcoat finish as specified above.

3. Strength of the butt joint shall be at least equal to that of the duct. Total minimum width of the joint shall be 3" for 1/8" thickness, 4" for 3/16" thickness and 6" for 1/4" thickness.
4. Where flanges are necessary, they shall be made by hand lay-up. The face of the flange shall be smooth with no projections or depressions greater than 1/32" and shall be perpendicular to the duct centerline within 1/2 degree. Machine facing of the back of the flanges is not acceptable. Flange thickness shall be in accordance with ASTM D 4097-88. Flange height shall be a minimum of 2 inches. The duct wall at the hub of the flange shall be a minimum of 1.5 times the nominal duct thickness and taper to the normal thickness over a distance of at least one flange width. Fillet radius shall be a minimum of 3/8" at the point where the hub meets the back of the flange.
5. Flange drilling, nuts, bolts, washers, and gaskets shall be provided by the installing contractor.
6. Drains shall be installed at locations indicated on the drawings. Drains shall be 1" diameter FRP 1/2 threaded couplings glassed into the bottom of the duct. The fitting shall be trimmed flush with the interior surface of the duct and the duct shall be recoated at the connection.
7. Access openings shall be provided where located on the drawings and shall be rigidly framed and fitted with airtight covers which can easily be removed and installed. Cover plate and end caps shall be flanged as described in paragraph 2.3 A.4, a minimum thickness of 1/4", and shall be reinforced as necessary to comply with design pressure criteria of the system. Access doors will be complete with Type 304 stainless steel hardware and full-face type gaskets. Gaskets shall be chemically resistant to the contaminants normally present in wastewater treatment facility atmospheres.
8. Flexible connections and expansion joints shall be provided by the installing contractor where shown on the drawings.

K. INSTALLATION

1. Installation to be by HVAC Subcontractor.
2. Field quality control, inspections, tests, and cleaning shall be by others.

2.07 INSULATION:

- A. All insulation, adhesives, tape, etc. shall conform to NFPA 90A. No voids in insulation will be permitted.
- B. Duct Insulation

1. Lightweight blanket type thermal insulation duct wrap equal to Johns Mansville Microlite EQ with FSK foil facing. Compressed thermal conductivity shall be 0.24 BTU in/(Hr ft² °F).
2. Extend insulation to standing seams, reinforcing, and other vertical projections 1" and less; do not carry over. Cover shall be continuous across seams, reinforcing and projections. Insulation and cover shall be carried over projections that exceed insulation thickness.
3. Transverse joints shall be butted tightly. Longitudinal joints shall be butted, ship lapped or 45° mitered. Seal joints with 4" wide strips of approved adhesive, or with approved pressure sensitive tape.
4. Cover breaks, ribs and standing seam penetrations with patch of cover material no less than 2" beyond break; secure with adhesive and staple. Seal staples and joints with brushed coating.
5. **Extent:** Insulate Odor Control ductwork outside building from roof penetration to fan inlet flange. Place multiple layers of duct wrap to result in an insulation value of R-12. Cover insulation outdoors with 0.024" thick aluminum jacketing with stucco embossed finish equal to Aluminum Roll Jacketing by GLT Products. Attach jacketing with stainless steel bands.

2.08 SEQUENCE OF OPERATION

A. Control sequences of operation shall be as indicated as follows:

1. ELECTRIC UNIT HEATER

Unit Heater shall cycle from a wall mounted thermostat as needed to maintain a room setpoint temperature of 55 deg F (adjustable).

2. NEW ODOR CONTROL BLOWER

New fan shall run continuously. The fan speed shall be set via a signal from the SCADA system. The associated Motor Operated Damper on the inlet ductwork shall open fully whenever the Odor Control Blower is running. When the Odor Control Blower is stopped, the Motor Operated Damper shall close.

PART 3 EXECUTION

3.01 GENERAL

- A. Install all items specified under this section according to the manufacturer's requirements, shop drawings, the details as shown on the Contract Drawings and/or as specified.
- B. Install all Work so that parts requiring inspection, replacements, maintenance and repair shall be readily accessible. Minor deviations from the Contract Drawings may be made to accomplish this, but any substantial change shall not be made without prior written approval from the Owner.

3.02 CUTTING AND PATCHING

- A. Do all cutting and patching required except cutting and patching of finish (visible) materials. Cutting and patching of masonry walls, partitions, ceilings and floors is included. Concrete cutting shall be done with abrasive wheels or saws, and coring with a diamond core bit. Jackhammers are prohibited.

3.03 CONNECTIONS TO EQUIPMENT

- A. Connections shall be provided by the Contractor of this section unless otherwise indicated. Unless otherwise indicated, the size of the connections to each piece of equipment shall be not smaller than the connections on the equipment. No bushed connections shall be permitted. Change in sizes shall be made with reducers or increasers only.

3.04 MISCELLANEOUS IRON AND STEEL

- A. All Work shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets, and framework shall be properly sized and firmly constructed.
- B. Measurements shall be taken on the job and worked out to suit adjoining and connecting Work. All Work shall be by experienced metal working mechanics. Members shall be straight and true and accurately fitted. Scale, rust, and burrs shall be removed. Welded joints shall be ground smooth where exposed. Drilling, cutting and fitting shall be done as required to properly install the work and accommodate the work of other trades as directed by them.
- C. Members shall be generally welded, except that bolting may be used for field assembly where welding would be impractical.
- D. All shop fabricated iron and steel work shall be cleaned and dried and given a shop coat of paint on all surfaces and in all openings and crevices.

3.05 SUPPORTS AND BASES

- A. General
 - 1. Provide all bases and supports not part of the building structure, of the required size, type, and strength, all equipment and materials furnished by the Contractor for the work of this section. **All support steel furnished for this purpose shall be 316 stainless.** All equipment, bases and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

3.06 DEMOLITION

- A. Odor Control Blower and Ductwork
 - 1. Demolish and remove existing Odor Control Blower, including fan, casing, motor, fan and motor supports, vibration isolators and power wiring back to power panel.

2. Demolish and remove existing Blower enclosure, including roof, front panel, back panel, side panel, and ventilator. Existing concrete slab to remain and be reused.
3. Demolish and completely remove existing Odor Control ductwork inside building, including risers, hangers and attachments to structure. Demolish and remove existing Odor Control ductwork passing to outside the building and up to the attachment to the existing Odor Control Blower.

B. Overhead Radiant Heaters

1. Demolish and completely remove existing overhead gas-fired radiant heaters as shown on drawing H-1.1; including heaters, flues, hangers, and supports. Patch holes through roof and walls for flue and combustion air. Remove power wiring back to panel and control wiring in its entirety.
2. Demolish and remove fuel gas branch supply pipe from the connection to each radiant heater back to the gas main. Plug branch connection with a malleable iron fitting.

C. MAU branch ductwork to Control Room

1. Demolish and completely remove portions of the supply and return ductwork from the MAU. Extent includes the duct portions in the Control Room back to the duct mains as indicated on the plans. GC to patch wall openings.

D. Window AC Unit in Control Room

1. Remove Window AC unit. GC to patch window opening with compatible material.

3.07 EQUIPMENT INSTALLATION – SPECIAL DETAILS

- A. None.

3.08 DUCTWORK:

- A. Duct installation shall comply with the SMACNA FRP THERMOSET DUCT CONSTRUCTION MANUAL, latest edition unless otherwise indicated.
1. Duct supports for sheet metal ductwork shall be according to SMACNA ACCEPTED INDUSTRY PRACTICE FOR INDUSTRIAL DUCT CONSTRUCTION, latest edition unless otherwise specified. Friction beam clamps indicated in SMACNA ACCEPTED INDUSTRY PRACTICE FOR INDUSTRIAL DUCT CONSTRUCTION, latest edition unless otherwise indicated shall not be used. Supports shall be attached only to structural framing members. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

2. Waterproofing: Seal duct seams with hard cast and tape to make water tight. Sealants shall be equal to Carlisle.
3. Dust Control: To prevent the accumulation of dust, debris and foreign material during construction, temporary dust control protection shall be provided. The ducts shall be protected with temporary seal-offs at all inlets and outlets at the end of each day's Work. Temporary protection shall remain in place until system is ready for startup.

3.09 PLACING IN SERVICE

- A. At the completion of performance tests and following approval of test result, recheck all equipment to see that each item is adequately lubricated and functioning correctly.

3.10 AIR SYSTEMS BALANCING:

- A. Balance airflows in accordance with the protocols of the NEBB, AABC or SMACNA. Perform all specified balancing with doors in each area closed during testing and balancing operations. Air systems shall be complete and operable with registers, ducting, diffusers, returns, and control components in place. Fans shall be operational. Air motion and distribution from air terminals shall be as shown. All data including deficiencies encountered and corrective action taken shall be recorded. If a system cannot be adjusted to meet the design requirements, promptly notify the Engineer in writing. At the conclusion balancing activities, furnish a report documenting the results for review and acceptance by the Engineer.

B. Air Systems

1. ODOR CONTROL SYSTEM:

- a. Pressure test exhaust ductwork to – 5” w.g. and record leakage. Pressure test supply ductwork to +5” w.g. and record leakage.
- b. Record exhaust airflows in each duct drop to equipment and open branch with WMS. Adjust exhaust airflow to +10%/ -0% Document airflows, and also document total discharge airflow and static pressure reading from blower to exhaust main.

C. General Balancing Methods

- a. Air flow adjustments – if necessary - shall be made by first adjusting the fan speed to meet the design flow conditions. MAU totals shall be recorded at the main supply duct. MCC Room airflows shall be measured at the supply, return, relief and exhaust ductwork as applicable. Exhaust flows shall be checked at all exhaust outlets. All flows shall be recorded before and after each adjustment and a balance report shall be furnished to the Engineer for review and approval.

3.11 CLEANING AND ADJUSTING

- A. During the progress of the Work, clean up and remove all oil, grease, and other debris caused by the Work performed under this section.

- B. At the conclusion of the Project, clean and repair all areas and finishes as installed or affected by this installation of Work under this section.
- C. Equipment: Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension.

3.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. All operating equipment installed under this section shall be placed in operation and shall function continuously in an operating test for a period of one hour without shutdown due to mechanical failure or necessity of adjustment. Prior to scheduling the Project Final Inspection and after completion of all installation and running adjustments, perform all work required to place the equipment in complete operating condition to meet all requirements under the Specifications.
- B. During this running test period, deliver to the designated representative of the Owner, through the Engineer, 3 complete sets of operating, service and replacement data for all equipment which will require operating maintenance or replacement and one copy of this literature shall be available during the instruction of the operating personnel while the other is checked for completeness by the Engineer.

END OF SECTION

DIVISION 16

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SECTION 16000

BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes all labor, materials, tools, equipment, and accessory items and performing all operations necessary to furnish and install the complete electrical work in accordance with this section of these specifications, the drawings and the standards of the applicable codes listed herein.
- B. The work shall include, but not be limited to, furnishing and installation of equipment and items listed below and installation only of items furnished under other sections of these specifications.
 - 1. Complete electrical building service as hereinafter specified.
 - 2. Conduit, wire and electrical connections are required on certain items specified in sections of these specifications other than the electrical section. This Contractor shall examine all sections of these specifications to determine the complete scope of the electrical work.
 - 3. Raceways and fittings
 - 4. Wires and cables
 - 5. Variable Frequency Drives
 - 6. Miscellaneous equipment
 - 7. Panelboards
 - 8. Lighting systems
 - 9. Generator
 - 10. Grounding systems
 - 11. Underground system
 - 12. Fire Alarm system
 - 13. Demolition of existing electrical systems.
- C. Mount and wire operator's stations, power conversion equipment, and motor control systems furnished under other Divisions of these Specifications.
- D. Install and make all field connections to variable frequency drives, process instrument panels and other control panels furnished under other Divisions of these Specifications.

- E. Mount and wire process instruments and control cabinets furnished under other Divisions of these Specifications. Furnish and install all conduit, wire and interconnections between process instrumentation primary elements, transmitters, local indicators and receivers. Mount and wire all lightning and surge protection equipment at process instrumentation transmitters and receivers.
- F. Mount and make field connections to “packaged” equipment furnished under other Divisions of these Specifications.
- G. Provide conduit and power/control wiring for all HVAC (Heating, Ventilation and Air Conditioning) furnished under other Divisions of these Specifications.
- H. Install and wire all thermostats, controllers and other devices furnished under other Divisions of these specifications which directly control HVAC equipment.
- I. Documents Applicable to the Work of this Section:
 - 1. Division 0 of the Contract Documents (Contract Forms and Requirements).
 - 2. Division 1 of the Technical Specifications.
 - 3. Technical Specifications: Section 16000 - Basic Electrical Requirements, and the following sub-sections:
 - a. Section 16060 – GROUNDING SYSTEM
 - c. Section 16080 – UNDERGROUND SYSTEMS
 - b. Section 16085 – MISCELLANEOUS EQUIPMENT
 - c. Section 16120 – WIRE AND CABLES
 - d. Section 16130 – RACEWAYS AND FITTINGS
 - e. Section 16442 – PANELBOARDS
 - f. Section 16495 – VARIABLE FREQUENCY DRIVES
 - g. Section 16500 – LIGHTING SYSTEM
 - i. Section 16612 – ENGINE GENERATOR
 - j. Section 16721 – FIRE ALARM SYSTEMS

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Circuit breakers
 - 2. Variable Frequency Drives
 - 3. Panelboards
 - 4. Generator
 - 5. Automatic transfer switch
 - 6. Lighting fixtures
 - 7. Disconnect switches
 - 8. Control stations
 - 9. Miscellaneous equipment
 - 10. Fire Alarm System

- B. The manufacturer's data sheets with product designation or catalog numbers shall be submitted for the following material:
 - 1. Wire
 - 2. Conduit
 - 3. Receptacles
 - 4. Boxes and fittings
- C. Submit all other data as specified herein.
- D. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this Section 16000.
- E. No material shall be ordered or shop work started until the Engineer's approval of shop drawings has been given.
- F. Prior to submitting shop drawings for lighting fixtures, verify the type of ceiling suspension systems being installed. Notify Engineer of any discrepancies between fixture type specified and suspension system. Additional cost rising from failure to notify the Engineer will be the responsibility of the Contractor.
- G. Operation and Maintenance Manuals - Prepare manuals in accordance with Section 01730.
- H. Record Drawings - Prepare as specified in Part 1 of this Section.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 and as specified herein.
- B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If stored for more than two weeks, the equipment shall receive all maintenance considerations required by the manufacturer for the proper storage of equipment. Proper storage in this context shall include the provision of heaters and dehumidifiers to keep the equipment dry at all times. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the Owner. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, or shall be replaced at no additional cost to the Owner.

1.04 DESIGN CRITERIA

- A. Service Characteristics
 - 1. Primary Utility Voltage: 13.8KV
 - 2. Secondary Building Voltage - 120/208V

3. All equipment and wiring shall be suitable for the applied voltage.

B. Service and Metering

1. The power company serving this project is the National Grid.
2. The existing service pole riser shall be replaced with a new service pole riser that will be obtained at 120/208 Volts, 3-phase, 4-wire from utility transformers mounted on an existing utility pole.
3. Furnish and install the secondary service conduit, wire and connectors.
4. The power company will provide the pole mounted transformers and meter, the contractor shall provide the meter socket and install all the metering equipment in accordance to the utility company requirements.
5. All work and material for the electrical service shall be in accordance with the requirements of the utility company.
6. Make all arrangements with the power utility company for obtaining the service, pay all charges and furnish all labor and material for the services. The utility company's charges shall be identified in the bid as an Allowance. An invoice from the utility company shall be submitted to the Contractor. There shall be no additional changes for overhead profit, insurance, or incidental expenses.

C. Requirements of the Regulatory Agencies

1. The final, complete installation shall comply with all state and local statutory requirements having jurisdiction. The Contractor shall arrange for all necessary permits, pay all fees and arrange for all required inspections by local authorities. In general, all work shall comply with the requirements of the National Electrical Code, all state codes and the codes and ordinances of the city or town in which the work is to be done.

D. Tests and Settings

1. Test all systems furnished under DIVISION 16 - ELECTRICAL and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of the system.
2. Make all circuit breaker and motor circuit protector settings based on the connected equipment manufacture's recommendations.
3. The following minimum tests and checks shall be made prior to the energizing of electrical equipment. A certified test report shall be submitted stating that the equipment meets and operates in accordance with manufacturer's and job specifications, and that equipment and installation conforms to all applicable standards and specifications.

- a. Testing of protective relays, static devices, transfer switches, circuit breakers and motor circuit protectors for calibration and proper operation and settings.
 - b. Over potential, high potential, insulation resistance and shield continuity tests for cables.
 - c. Mechanical inspection of switches, transfer switches and circuit breakers.
4. The Engineer shall be immediately notified of any unfavorable test results or indication of faulty equipment. No piece of equipment shall be energized until the test data is evaluated and the equipment is proven acceptable.
 5. If the test and inspection data submitted should indicate deficiencies in the operation of the electrical apparatus or in the manufacturer thereof, the Contractor shall promptly implement the necessary adjustments, corrections, modifications and/or replacements necessary to be made to meet the specified requirements.

1.05 RELATED WORK NOT INCLUDED

- A. Excavation and backfilling, including gravel or sand bedding for underground electrical work is included under DIVISION 2 - SITE WORK of these Specifications.
- B. Concrete work, including concrete electrical duct encasement, is included under DIVISION 3 - CONCRETE of these Specifications.

1.06 SLEEVES AND FORMS FOR OPENINGS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions etc. When located in formed concrete walls locate all necessary slots for electrical work and form before concrete is poured.
- B. Provide waterproof sealing for the penetrations through exterior walls, etc.
- C. Provide fireproof sealing for penetrations through fireproof walls, etc.
- D. Foam type fire and water proofing is not allowed.

1.07 CORING

- A. Provide all coring for conduits penetrating floors, walls, partitions etc.
- B. Provide waterproof sealing for the penetrations through exterior walls, etc.
- C. Provide fireproof sealing for penetrations through fireproof walls, etc.
- D. Foam type fire and water proofing is not allowed.

1.08 SUPPLEMENTARY SUPPORTING STEEL

- A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.
- B. Steelwork shall be firmly connected to building construction as required.
- C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.
- D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
- E. All manufactured steel parts and fittings shall be galvanized steel for NEMA 12 Areas and stainless steel for NEMA 4X and NEMA 7 areas.

1.09 ELECTRICAL HAZZARDOUS CLASSIFCATION AND NEMA RATINGS FOR ELECTRICAL INSTALATION AND ENCLOSURES

- A. Unclassified, NEMA Type 1 for within the Electrical Enclosure.
- B. Unclassified, NEMA Type 12 for Operations Building Basement, 1st Floor, and 2nd Floor.
- C. Unclassified, NEMA Type 12 for Pump Gallery Upper and Lower Levels.
- D. Unclassified, NEMA Type 12 for within Oakdale Pump Station Building.
- E. Unclassified, NEMA Type 4 for Operations Building Sub-Basement.
- F. Unclassified, NEMA Type 4X for Building exterior.
- G. Class 1, Division I, NEMA Type 7 for the Wet Well and the Headworks.

1.10 INTERPRETATION OF DRAWINGS

- A. The Drawings are not intended to show exact routing of conduit runs or terminations. Contractor shall determine exact location of conduit terminations by examinations of approved shop drawings. The Contractor shall not reduce the size or number of conduit runs indicated on the drawings.
- B. The final routing of raceways shall be determined by structural conditions, interferences with other trades and by terminal locations on apparatus. The Engineer reserves the right of a reasonable amount of shifting at no extra cost up until time of roughing in the work.
- C. Locate pull boxes, panelboards, control pushbuttons, terminal cabinets, safety switches and such other apparatus as may require periodic maintenance, operation, or inspection, so that they are easily accessible. If such items are shown on the drawings in locations which are found to be inaccessible, advise the Engineer of the situation before work is advanced to the point where extra costs will be involved.

- D. Each three-phase circuit shall be run in a separate conduit unless otherwise shown on the drawings.
- E. Unless otherwise approved by the Engineer conduits shown exposed shall be installed exposed; conduits shown concealed shall be installed concealed.
- F. Where circuits are shown as “home-runs” all necessary fittings and boxes shall be provided for a complete raceway installation.
- G. In general, wiring and raceway systems for lighting, receptacles, fire alarm, telephone and intercommunications systems are not indicated on the drawings but shall be furnished and installed under this section.
- H. Each branch circuit shall have its own neutral, dedicated to that circuit. A common neutral for more than one single phase circuit is not allowed.
- I. Verify with the Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
- J. Any work installed contrary to drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
- K. The locations of equipment, fixtures, outlets, and similar devices shown on the drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- L. Circuits on three phase panelboards shall be field connected to result in evenly balanced loads on each phase.
- M. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.
- N. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical system shown. Additional circuits shall be wherever needed to conform to the specific requirements of the equipment.
- O. All connections to equipment shall be made as required, and in accordance with the approved shop and setting drawings.
- P. Schematic diagrams shown on the drawings indicate the required functions only. Standard circuits of the particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic drawings shown. Additional wiring or conduit required for such deviations shall be furnished at Contractor's expense. Contractor must ensure that all components necessary to accomplish the required function are provided.

1.11 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the structure.
- B. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitable, to insure that the tilting does not impair the functional integrity of the equipment.

1.12 WORK IN EXISTING STRUCTURES

- A. Each bidder or his authorized representatives shall, before preparing his proposal, visit all areas of the existing structures in which work under this bid is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that he or his representative has visited the buildings and structures and noted the locations and conditions under which the work will be performed and that he takes full responsibility for a complete knowledge of all factors governing his work.
- B. In general, any or all existing electrical equipment and services are to remain in operation and shall not be disturbed unless otherwise noted in these Specifications and/or on the drawings or as required for the proper execution of the work.
- C. In each area of the work, disconnect and carefully remove the existing electrical equipment and devices so noted. With the exception of items indicated as having to be re-used, all such existing equipment and device shall be turned over to the Owner. If not required by the Owner, remove them from the premises and site. All existing electrical equipment and devices indicated as not removed or abandoned are to be maintained in operation and any circuits disturbed by the construction shall be restored.
- D. Maintain existing electrical services and systems to and in the buildings throughout the project and all "down-time" shall be scheduled at least three weeks in advance with the permission of the Owner and such scheduling shall be rigidly adhered to.

1.13 TEMPORARY POWER AND LIGHTING

- A. The Electrical Subcontractor shall furnish and install feeders of sufficient size from the facility existing power system for the electric light and power requirements for the project while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot in the building. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all rooms, space, and stairwells. Minimum sized lamp used shall be 1500 lumens. Where higher lighting intensities are required by Federal or State Standards of Laws or otherwise specified, the above specified lumens shall be increased to provide these increased intensities.

- B. All necessary transformers, meters, cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.
- C. The Electrical Subcontractor shall provide and maintain in each area of the building and the building exterior, a feeder or feeders of sufficient capacity for the requirements of the entire floor and he shall provide a sufficient number of outlets, located at convenient points, so that extension cords of not over 50 ft. in length will reach all work requiring temporary light or power.
- D. The Electrical Subcontractor shall install and maintain the wiring and accessories for the portable trailer office of the General Contractor.
- E. All temporary electrical work shall meet the requirements of the National Electrical Code Article 305 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.
- F. All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.
- G. The General Contractor will pay for the cost of electric energy consumed by himself and by all of his Subcontractors, unless otherwise indicated.
- H. Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten hours per day shall include manning the temporary power and lighting 2 hour before and 2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time, materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.
- H. The existing 200 Amp feeder circuit breaker for the Influent Pump Control located in MCC-1A can be utilized for powering bypass pumping equipment via temporary wiring.

1.14 RECORD DRAWINGS

- A. Record drawings shall be provided under this Section in accordance with Section 01780 and as specified herein.
- B. As work progresses and for the duration of the Contract, maintain a complete and separate set of prints of Contract Drawings at the job site at all times. On a daily basis, record work completed and all changes from original Contract Drawings clearly and accurately, including work installed as a modification or addition to the original design such as change orders, instructions issued by the Engineer, or conditions encountered in the field.

- C. Drawings shall show record condition of details, sections, and riser diagrams, and control changes. Schedules shall show actual manufacturer and make and model numbers of final equipment installation. Remove all superceded data to show the completed work. Accurately indicate the location, size, type, and elevation of new utilities and their relationship to other utilities.
- D. The Record Drawings will be used as a guide for determining the progress of the Work installed. They shall be inspected on a regular basis and shall be corrected immediately if found inaccurate or incomplete. Requisitions for payment will not be approved until the Drawings are accurate and up-to-date.
- E. At completion of Work prepare a complete set of Record Drawings showing all systems as actually installed. The Contract Drawing electronic CAD files will be made available for this Contractor's copying, at his expense, into reproducibles to serve as backgrounds for the Record Drawings. Provide all drawings necessary to show the required as-built information. Submit three sets of prints to the Engineer for comments as to compliance with this Section. Make all modifications so noted by the Engineer.
- F. Certify the accuracy of the record drawings. Record Drawings shall become the property of the Owner.
- G. When required by jurisdiction, submit the record set for approval by the Authority Having Jurisdiction in a form acceptable to the jurisdiction.

1.15 COMPONENT INTERCONNECTIONS

- A. Components of equipment furnished under this Specification will not be furnished as integrated systems.
- B. Analyze all systems components and their shop drawings; identify all terminals and prepare drawings or wiring tables necessary for component interconnection.
- C. Furnish and install all component interconnections.

1.16 MANUFACTURER'S SERVICES

- A. Provide manufacturer's services for testing, training and start-up of the following equipment:
 - 1. Generator.
 - 2. Automatic Transfer Switch.
 - 3. Variable Frequency Drives.
 - 4. Fire Alarm system
 - 5. The time required for each system shall be as hereinafter specified. The time specified shall be used as directed by the Engineer and shall not be used by the manufacturer or Contractor for field adjustments due to manufacturing or shipping defects.

1.17 MATERIALS

- A. Materials and equipment used shall be Underwriters Laboratories, Inc. listed wherever standards have been established by that agency. Written approval by the Engineer and local inspecting authority is required wherever UL Listed approval is not available.
- B. Manufacturer of Principal Equipment
 - 1. All lighting and power panelboards shall be made by one manufacturer.
 - 2. All conduit of a given type shall be made by one manufacturer.
 - 3. All wire and cables of a given type shall be made by one manufacturer.

1.18 WARRANTY

- A. Provide warranty and guarantee on all equipment furnished and work performed for a period of one (1) year from the date of substantial completion.

PART 2 (NOT USED)

PART 3 (NOT USED)

- END OF SECTION -

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SECTION 16060
GROUNDING SYSTEMS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes the furnishing and installing of a complete grounding system in strict accordance with Article 250 of the National Electrical Code and as specified herein and as shown on the drawings.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Ground rods
 - 2. Ground bus bars

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

PART 2 – PRODUCTS

2.01 GROUND RODS

- A. Ground rods shall be copper clad steel 3/4 inch in diameter and 10 feet in length unless otherwise shown on the drawings. Rods shall one 10 foot length rod. Ground rods shall be Copperweld, equal by A.B. Chance Co., or equal.

2.02 GROUNDING BUS BARS

- A. Provide a grounding bus bar next to or below the main distribution board or main disconnect, ground bus bar to be approximately 8” above finished floor.
- B. Grounding bus bars shall be copper, not less than ¼ inch by 2 inch by 12 inch.
- C. All lugs, bolts and nuts shall be silicon bronze.
- D. Buses shall be mounted to the room wall with standoff isolators, standoff brackets, and mounting bolts.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Grounding electrode conductors shall be run in rigid steel conduits. Protecting conduits shall be bonded to the grounding electrode conductors at both ends.
- B. Grounding conductors shall be run with feeders where shown on the drawings or hereinafter specified.
- C. Liquid tight flexible metal conduit in sizes 1 inch and larger shall have bonding jumpers. Bonding jumpers shall be external, run parallel (not spiraled) and fastened with plastic tie wraps. Tie wraps shall be installed 12 inches apart and not more than 6 inches from ends.
- D. Connect the following equipment by separate wire or cable directly to the grounding grid system:
 - 1. Service entrance circuit breaker
 - 2. Ground buses
 - 3. Metal Fencing
 - 4. Generator Enclosure
 - 5. Door frames and railings.
- E. Connect the following equipment by separate wire or cable to the ground bus in the distribution equipment servicing the equipment:
 - 1. Switchboard
 - 2. Panelboards
 - 3. Motors
 - 4. Control panels
 - 5. All feeders and branch circuits
 - 6. Receptacle circuits
- F. The following equipment shall be grounded through the metallic raceway systems with permanent and effective ground connections:
 - 1. All metal cases and support frames
 - 2. Lighting system
- G. Bond the following N.E.C. approved electrodes together to form a ground grid system:
 - 1. Building steel frame
 - 2. Grounding rods and buses
 - 3. Buried bare copper conductors
- H. Grounding electrodes shall be driven where shown on the drawings.

- I. All grounding connections shall be made by means of approved bronze clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A, or equal.
- J. All buried connections shall be made by a thermic welding process equal to Cadweld. Molds used for the welding process shall be new having no prior usage. Molds shall be the specific type for the connection to be made.
- K. Light fixture bases shall be furnished with a grounding point.
- L. All buried conductors shall be laid slack in trenches. The earth surrounding the cables shall be void of sharp objects which may injure the cables. Backfill material shall be natural earth. Where cables are exposed to mechanical injury they shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard. Connections shall be made as hereinbefore specified.
- M. Do not allow water main connection to be painted. If the connections are painted, they shall be disassembled and remade with new fittings.

3.02 TESTING

- A. The grounding system shall be tested under this section.
- B. The equipment grounding shall be checked to insure continuity of the ground return path.
- C. The ground grid systems shall be tested using the three terminal fall in potential method. A minimum of eight test points for each ground grid system shall be submitted for review by the Engineer. The test points shall be made along a straight line from the grid system to the reference terminal. The distance between the grid system and the reference terminal shall be consistent with normal practices for ground testing.
- D. All test equipment shall be furnished hereunder and shall be similar to Biddle Earth Tester No. 250220 or equal.
- E. These tests shall be performed during the dry season. Tests shall be performed before loaming and seeding or paving work has been performed.
- F. The Contractor shall notify the Engineer immediately if the ground grid system exceeds 5 ohms.

3.03 CLOSEOUT ACTIVITIES

- A. Provide in accordance with Section 01700.

- END OF SECTION -

SECTION 16080

UNDERGROUND SYSTEMS

1.00 PART 1 – GENERAL

1.01 SCOPE

- A. The work of this section includes furnishing and installing of a complete underground system of raceways, handholes, and frames and covers as specified herein and as shown on the drawings.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Raceways
 - 2. Warning Tape

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

2.00 PART 2 – PRODUCTS

2.01 RACEWAYS

- A. Raceways shall be PVC schedule 40 conduit. Raceway materials shall be in accordance with Section 16130 (Raceways and Fittings).

2.02 POLYETHYLENE WARNING TAPE

- A. Warning tape shall be red polyethylene film, 6 inch minimum width, Type XB-720 by W.H. Brady Co., or equal.

3.00 PART 3 – EXECUTION

3.01 INSTALLATION

- A. Raceways shall be installed to drain away from buildings. Raceways between handholes shall drain toward the handholes and wet wells. Raceway slopes shall not be less than 3 inches per one hundred feet.
- B. Raceway banks shall be encased in 3,000 psi concrete. Concrete shall be reinforced with #5 ASTM A615 Grade 60 steel rebar rods.

- C. Plastic spacers shall be used to hold raceways in place. Spacers shall provide not less than two inch clearance between raceways.
- D. The minimum cover for raceway banks shall be 30 inches unless otherwise permitted by the Engineer.
- E. Where bends in raceways are required, long radius elbows, sweeps and offsets shall be used. Sweeps at riser pole shall be rigid steel encased in concrete.
- F. All raceways shall be swabbed clean before cable installation.
- G. Spare raceways shall be plugged and sealed watertight at all buildings and structures.
- H. Raceways in use shall be sealed watertight at all buildings and structures.
- I. Rigid steel conduit shall be used for risers at the service pole and other locations shown on the drawings. Conduit sweep at pole base shall be rigid steel conduit.
- J. Raceway terminations at manholes shall be with end bells.
- K. All underground metallic conduit run underground in direct contact with earth shall be coated with asphaltum or bitumastic varnish or similar corrosion protection the entire length of the run.
- L. All underground raceways/ductbanks shall be marked with warning tape located approximately 12 inches below grade above the raceway/ductbank.

- END OF SECTION -

SECTION 16085

MISCELLANEOUS EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes the furnishing and installing of all miscellaneous equipment as specified herein and as shown on the drawings.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Automatic transfer switch
 - 2. Motor Control Center Units
 - 3. Surge Suppression Devices
 - 4. Disconnect switches
 - 5. Motor starters
 - 6. Circuit breakers
 - 7. Enclosure types
 - 8. Wireway
 - 9. Relays
 - 10. Nameplates
 - 11. Meter Socket
 - 12. External Alarm Beacon
- B. Operation and Maintenance Manuals - Prepare manuals in accordance with Section 01730.
- C. Record Drawings - Prepare as specified in Section 16000.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. All circuit breakers, magnetic motor starters, and fuses furnished under this section shall be of the same manufacturer for each type of equipment.

PART 2 – PRODUCTS

2.01 AUTOMATIC TRANSFER SWITCH

- A. The automatic transfer switch shall be true 3-pole, solid neutral type, microprocessor based control designed for an emergency and normal source of 480 Volts, 3 Phase, 4 Wire, 60 Hertz. Current ratings shall be as indicated on the drawings.
- B. The complete switch assembly including accessories shall be listed under UL-1008 for use on emergency systems.
- C. The complete transfer switch assembly shall be factory tested to ensure proper operation and compliance with the specification requirements. A copy of the factory test report shall be available upon request.
- D. System Operation
 - 1. When the voltage on any phase of the normal source drops below 80% or increases to 120%, or frequency drops below 90%, or increase to 110%, or 20% voltage differential between phases occurs, after a programmable time delay period of 0-9999 seconds factory set at 3 seconds to allow for momentary dips, the engine starting contacts shall close to start the generating plant.
 - 2. The transfer switch shall transfer to emergency when the emergency source has reached specified voltage and frequency on all phases.
 - 3. After restoration of normal power on all phases to a preset value of at least 90% to 110% of rated voltage, and at least 95% to 105% of rated frequency, and voltage differential is below 20%, an adjustable time delay period of 0-9999 seconds (factory set at 300 seconds) shall delay retransfer to allow stabilization of normal power. If the emergency power source should fail during this time delay period, the switch shall automatically return to the normal source.
 - 4. After retransfer to normal, the engine generator shall be allowed to operate at no load for a programmable period of 0-9999 seconds, factory set at 300 seconds.
- E. Construction
 - 1. The transfer switch shall be double throw, actuated by two electric operators momentarily energized, and connected to the transfer mechanism by a simple over center type linkage. Dual circuit breaker or movable beam construction is not acceptable. Minimum transfer time shall be 400 milliseconds.
 - 2. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in both the normal and emergency positions without the use of hooks, latches, magnets, or springs, and shall be silver-tungsten alloy. Separate arcing contacts with magnetic blowouts shall be provided on all transfer switches. Interlocked, molded case circuit breakers or contactors are not acceptable.

3. The transfer switch shall be equipped with a safe manual operator, designed to prevent injury to operating personnel. The manual operator shall provide the same contact to contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.
4. Transfer switch shall be adequately constructed to carry its full rated current on a continuous 24 hour basis in all approved enclosures and shall not show excessive heating or be subject to de-rating.
5. The minimum withstand and close-in current rating in symmetrical amperes shall be equal to or greater than the interrupting rating of the normal power source circuit breaker. In no case shall this rating be less than 20 times the transfer switch full load current rating. The switch contacts shall not weld or be damaged in any way as a result of a fault of up to the withstand and close-in rating.
6. The main contacts shall be visible for inspection without any major disassembly of the transfer switch.
7. A fully rated solid neutral bus bar with required AL-CU neutral lugs shall be provided.
8. Control components and wiring shall be front accessible. All control wires shall be multiconductor 18 gauge 600-volt SIS switchboard type point to point harness. All control wire terminations shall be identified with tubular sleeve-type markers.
9. The switch shall be equipped with 90 degrees C rated copper/aluminum solderless mechanical type lugs.

F. Controls

1. The transfer switch shall be equipped with a microprocessor based control system, to provide all the operational functions of the automatic transfer switch. The controller shall have two asynchronous serial ports. The controller shall have a real time clock with NiCad battery back up.
2. The CPU shall be equipped with self diagnostics which perform periodic checks of the memory I/O and communication circuits, with a watchdog/power fail circuit
3. A door mounted controller with a 20 character, LCD display, with a keypad, which allows access to the system shall be provided. The controller shall have password protection required to limit access to qualified and authorized personnel.

4. The controller shall include three-phase over/under voltage, over/under frequency, phase sequence detection and phase differential monitoring on both normal and emergency sources.
5. The controller shall be capable of storing the following records in memory for access either locally or remotely:
 - a. Number of hours transfer switch is in the emergency position (total since record reset).
 - b. Number of hours emergency power is available (total since record reset).
 - c. Total transfer in either direction (total since record reset).
 - d. Date, time, and description of the last four source failures.
 - e. Date of the last exercise period.
 - f. Date of record reset.

G. Accessories

1. Programmable three phase sensing of the normal source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage. Programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases, set at 20%, and phase sequence monitoring.
2. Programmable three phase sensing of the emergency source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases set at 20%, and phase sequence monitoring.
3. Time delay for override of momentary normal source power outages (delays engine start signal and transfer switch operation). Programmable 0-9999 seconds. Factory set at 3 seconds, if not otherwise specified.
4. Time delay to control contact transition time on transfer to either source. Programmable 0-9999 seconds, factory set at 3 seconds.
5. Time delay on retransfer to normal, programmable 0-9999 seconds, factory set at 300 seconds if not otherwise specified, with overrun to provide programmable 0-9999 second time delay, factory set at 300 seconds, unloaded engine operation after retransfer to normal.

6. Time delay on transfer to emergency, programmable 0-9999 seconds, factory set at 3 seconds.
7. A maintained type load test switch shall be included to simulate a normal power failure, keypad initiated.
8. A remote type load test switch shall be included to simulate a normal power failure, remote switch initiated.
9. A time delay bypass on retransfer to normal shall be included. Keypad initiated.
10. Dry contact, rated 10 Amps 120 volts AC, to close on failure of normal source to initiate engine starting.
11. Dry contact, rated 10 Amps 120 volts AC, to open on failure of normal source for customer functions.
12. Light emitting diodes shall be mounted on the microprocessor panel to indicate: switch is in normal position, switch is in emergency position and controller is running.
13. An exerciser shall be provided with (10) 7-day events, programmable for any day of the week and (24) calendar events, programmable for any month/day, to automatically exercise generating plant programmable in one-minute increments. Also include selection of either "no load" (switch will not transfer) or "load" (switch will transfer) exercise period. Keypad initiated.
14. Provision to select either "no commit" or "commit" to transfer operation in the event of a normal power failure shall be included. In the "no commit position," the load will transfer to the emergency position unless normal power returns before the emergency source has reach 90% of it's rated values (switch will remain in normal). In the "commit position" the load will transfer to the emergency position after any normal power failure. Keypad initiated.
15. Two auxiliary contacts rated 10 Amp, 120 volts AC , shall be mounted on the main shaft, one closed on normal, the other closed on emergency. Both contacts will be wired to a terminal strip..
16. A three phase digital LCD voltage readout, with 1% accuracy shall display all three separate phase to phase voltages simultaneously, for both the normal and emergency source.
17. A digital LCD frequency readout with 1% accuracy shall display frequency for both normal and emergency source.
18. An LCD readout shall display normal source and emergency source availability.

19. Include (2) time delay contacts that open simultaneously just (milliseconds) prior to transfer in either direction. These contacts close after a time delay upon transfer. Programmable 0-9999 seconds after transfer.

2.02 MOTOR CONTROL CENTER UNITS

- A. All units shall be either new or factory refurbished, UL listed and compatible for installation in the existing 7700 Line type motor control center manufactured by General Electric.
- B. A handle operator must be provided on each unit. With the unit stabs engaged onto the vertical phase bus and the unit door closed, the handle mechanism shall allow complete ON/OFF control of the unit circuit breaker with clear indication of the breaker status. All circuit breaker operators shall include a separate TRIPPED position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door.
- C. A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the ON position. Another mechanical interlock shall prevent the operator from placing the disconnect in the ON position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.
- D. A non-defeatable interlock shall be provided between the handle operator and the cam lever to prevent installing or removing a plug-on unit unless the disconnect is in the OFF position.
- E. The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.
- F. Provisions shall be provided for locking all disconnects in the OFF position with up to three padlocks.
- G. Unit construction shall combine with the vertical wireway isolation barrier to provide fully compartmentalized design.
- H. Circuit Breakers
 1. Circuit Breakers shall be molded case, three pole unless otherwise noted, with voltage rating as required. Ampere rating shall be as shown on the drawings.
 2. Circuit breakers interrupting capacity shall be not less than 65,000 Amperes, RMS symmetrical at 480V AC.

2.03 SURGE PROTECTION DEVICE (SPD)

- A. Electrical Service SPD
 1. Certify unit listed to UL 1449, 3rd Edition and UL 1283.

2. SPD shall be UL labeled as Type 1, intended for use without need for external or supplemental overcurrent devices. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over-temperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
3. SPD to be enclosed, surfaced mount and to include surge counter, audible alarm and dry contact for remote status.
4. Minimum surge current capability (single pulse rated) per phase shall be 200kA
5. Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G
208Y/120	700V	700V	1000V	600V
480Y/277	1200V	1200V	2000V	1200V
6. Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V
7. SPD shall be installed per manufacturer's installation instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.

2.04 DISCONNECT SWITCHES (VISIBLE BLADE TYPE)

- A. Visible blade type disconnect switches shall be heavy-duty, quick-make, quick-break, visible blades, 600 Volt, 3 pole with full cover interlock.
- B. Enclosure shall meet the area NEMA designation for which they are located.
- C. NEMA Type 12, 4, 4X and 7 enclosures shall be as specified herein.
- D. Provide service entrance rated disconnect switches for all feeders originating from an outdoor generator source.
- E. Disconnect switches shall be as manufactured by Eaton Co., Square D, or General Electric Co.

2.05 DISCONNECT SWITCHES (TOGGLE TYPE)

- A. Toggle type disconnect switches shall be quick-make, quick-break with handle guard and lock-off feature.

- B. Switches shall be provided for resistance, non-motor type loads only. Switches shall not be installed where full load current of utilization equipment exceeds 18 Amperes.
- C. Switches shall be rated 20 Amperes at 600 Volts and 30 Amperes at 250 Volts, 60 Hertz, 2 or 3 pole.
- D. Enclosure shall meet the area NEMA designation for which they are located.
- E. NEMA Type 12, 4, 4X and 7 enclosures shall be as specified herein.
- F. Disconnect switches shall be provided by Eaton Co., Square D., or General Electric Company.

2.06 MANUAL MOTOR STARTERS

- A. Manual starters shall be non-reversing, reversing or two speed type as shown on the drawings. Built-in control stations shall be provided where shown on the drawings.
- B. Enclosure shall meet the area NEMA designation for which they are located.
- C. NEMA Type 12, 4, 4X and 7 enclosures shall be as specified herein.
- D. Provide handle guard kit with padlock provisions.
- E. Manual motor starters shall be as manufactured by the Eaton Co., Square D, or General Electric Co.

2.07 ENCLOSED CIRCUIT BREAKERS

- A. Circuit breakers shall be molded case, three pole unless otherwise noted, with voltage rating as required. Ampere rating shall be as shown on the drawings. Provide with service entrance rating where required.
- B. Main breaker shall be solid state with digital trip and adjustable trip setting with LED on face of breaker providing amps per phase. Provide auxiliary contacts for trip status to remote alarm.
- C. The interrupting capacity shall be not less than 65,000 Amperes, RMS symmetrical at 480V AC.
- D. All circuit breakers with 225 Ampere frames and larger shall have interchangeable trips.
- E. Enclosure shall meet the area NEMA designation for which they are located.
- F. NEMA Type 12, 4, 4X and 7 enclosures shall be as specified herein.

2.08 ENCLOSURE TYPE

- A. NEMA Type 12 enclosure shall be general purpose sheet steel.

- B. NEMA Type 4 and 4X enclosures shall be cast iron or stainless steel.
- C. NEMA Type 7 shall be cast iron.
- D. All metal enclosures shall be finish painted over a rust inhibiting primer.

2.09 WIREWAY

- A. Wireway shall be steel.
- B. Wireway shall be manufactured by General Electric Co., or equal by Siemens Corp or Hoffman Enclosures.

2.10 RELAYS

- A. Control relays shall be heavy duty machine tool type, with 10 Ampere, 300 Volt convertible contacts. Time delay relays shall be pneumatic, adjustable 0.2 to 180 seconds. Relays shall be Catalog No. 1CR122A as manufactured by the General Electric Co., equal by Eaton Company, or Allen Bradley Co.

2.11 NAMEPLATES

- A. Nameplates shall be provided for all special purpose tumbler switches, disconnect switches, remote control stations, motor starters, time clocks, panelboards, terminal cabinet, etc. to designate the equipment controlled and function.
- B. Nameplates shall be black and white laminated, phenolic material having engraved letters approximately 1/4 inch high, extending through the black face into the white layer.
- C. Nameplates shall be attached to the panel by self-tapping stainless steel screws or rivets.

2.12 METER SOCKET

- A. Provide a utility meter socket in a NEMA 3R enclosure with HASP cover provision of the type approved by the utility company.
- B. Meter Socket shall be 7 terminal, 320 Amp continuous rated, self-contained ringless type meter socket with a manual single handled bypass with locking jaw and safety arc shield.

2.13 EXTERNAL ALARM BEACON

- A. Provide a 120-volt AC alarm beacon in a weather proof, vapor-tight fixture with red thermoplastic vandal resistant lens, conduit box, and mounting accessories. Alarm beacon and mounting accessories shall be designed to permit mounting in such a manner that rain water cannot stand or collect in the gasketed area of the fixture, between the base and globe. Alarm beacon shall be installed on the exterior of the pump station building and shall be controlled and powered by the pump control panel.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All field mounted devices shall be mounted four feet-six inches above the finished floor or grade. Devices shall be adequately supported on walls, columns or other supports. The Contractor shall furnish and install channel iron imbedded in the ground or floor to support devices where necessary.
- B. All control equipment shall be identified as to the equipment it controls. Provide lamacoid nameplates at all equipment.

3.02 TESTS AND CHECKS

- A. The following minimum tests and checks shall be made before energizing the automatic transfer switch.
 - 1. Perform insulation resistance tests phase-to-phase and phase-to-ground with switch in both source positions. The Insulation resistance test voltages and minimum values to be in accordance with manufacturer's published data.
 - 2. Measure contact resistance in normal and alternate source position.
 - 3. Determine contact resistance in micro-ohms. Investigate any value exceeding 500 micro-ohms or any values which deviate from adjacent poles by more than fifty percent (50%).

- END OF SECTION -

SECTION 16120

WIRES AND CABLES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes the furnishing, installing and testing of all wire, cable and appurtenances as specified herein and as shown on the drawings. All wiring of a given type shall be the product of one manufacturer.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Wire
 - 2. Cable
 - 3. Terminations
 - 4. Lugs
 - 5. Wire and Cable Markers

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. Wire for single phase circuits shall be Type XHHW or THWN-THHN.
- B. Wire for three phase circuits shall be Type XHHW.
- C. Single conductor wire for control, indication and metering shall be Type THWN/THHN No. 12 or 14 AWG, stranded.
- D. Multi-conductor control cable shall be used for the underground system and shall be No. 12 or 14 AWG, stranded with an overall jacket.
- E. Wire for process instrumentation shall be twisted shielded pairs No. 16 AWG, stranded.
- F. Ground wires shall be Type THW, green. Bare ground wires shall be soft drawn copper, 98 percent conductivity.

1.05 MINIMUM SIZES

- A. Except for control and signal wiring, no wire smaller than number 12 AWG shall be used.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Wires and cables shall be of annealed, 98 percent conductivity, soft drawn copper.
- B. All conductors No. 8 AWG and larger sizes shall be stranded.

2.02 600 VOLT WIRE

- A. Type XHHW shall be cross-linked polyethylene, as manufactured by Prysmian Cable Corp., Collyer Insulated Wire Co., The Okonite Co. or equal.
- B. Type THWN/THHN shall be as manufactured by Prysmian Cable Corp., Collyer Insulated Wire Co., The Okonite Co. or equal.
- C. Multi-conductor control cable shall be stranded, 600 Volt, cross-linked polyethylene insulated, neoprene jacketed, as manufactured by Allied Wire and Cable, or equal.

2.03 INSTRUMENTATION CABLE

- A. Process instrumentation wire shall be twisted pair, 600 Volts, polyethylene insulated, aluminum tape, tinned copper braid shielded, polyvinyl chloride jacketed, as manufactured by Okonite Co., Belden Corp., or equal.

2.04 CAT 6 CABLE

- A. Cable shall be CAT 6 type having four each individually twisted pair, 22 AWG conductors with a blue PVC jacket.

2.05 FIBER OPTIC CABLE

- A. 50uM Multi Mode OM3 Type, ANSI/ICEA S-104-696 listed, Loose Tube, Gel-Free Plenum Cable, 6-Strand (OM3).
- B. Provide all end connectors and test complete cable end to end, all terminations and testing shall be by a certified fiber optic technician.

2.06 CONNECTORS AND TERMINAL LUGS

- A. Splices for No. 10 or No. 12 A.W.G. solid wires, such as for lighting branch circuits, shall be made with insulated wire connectors.
- B. Connectors and terminal lugs on wires No. 8 A.W.G. and larger shall be of the mechanical or clamp type.

2.07 WIRE AND CABLE MARKERS

- A. Wire and cable markers shall be “Omni-Grip” as manufactured by W.H. Brady Co., or equal.
- B. Wire and cables with diameters exceeding the capacity of the “Omni-Grip” shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by W.H. Brady Co., T&B Fasteners Inc., or equal.
- C. The "to" and "from" destinations shall be clearly identified on each cable at each termination and within manholes, pull boxes and junction boxes.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All conductors shall be carefully handled to avoid kinks or damage to insulation.
- B. All wires, cables and each conductor of multi-conductor cables (except lighting and receptacle wiring) shall be uniquely identified at each end with wire and cable markers.
 - 1. Where wiring originates from a motor control center or process control panel the wire identification number shall incorporate the terminal numbers used in the control center or panel and a number to identify the motor control center or panel.
 - 2. Wires shall be identified at both ends and at intermediate junction boxes, terminal cabinets, etc. Wire identification numbers shall be unique.
 - 3. A typed list of the numbers used at each motor control center and control cabinet shall be submitted with the as built drawings.
- C. Lubrications shall be used to facilitate wire pulling. Lubricants shall be U.L. approved for use with the insulation specified.
- D. Shielded instrumentation wire shall be installed from terminal to terminal with no splicing at any intermediate point.
- E. Shielded instrumentation wire shall be installed in rigid steel conduit and pull boxes that contain only shielded instrumentation wire.
- F. Shielding on instrumentation wire shall be grounded at the transmitter end only.
- G. Each branch circuit shall have a dedicated neutral.
- H. Cables penetrating fire rated floors, walls, etc. shall be fireproofed. Fireproofing material shall be U.L. classified for three hour fire rating. Fire-proofing system shall be as manufactured by 3M Co., Thomas & Betts, or equal.

- I. Power conductors (other than lighting & receptacle) shall be run continuous and splicing should be kept to a minimum. The Engineer should be informed of where splices will occur.

3.02 TESTS

- A. All 600 Volt wire insulation shall be tested with a megohm meter after installation. Tests shall be made at not less than 500 Volts. Submit a written test report of the results to the Engineer.

- END OF SECTION -

SECTION 16130

RACEWAYS AND FITTINGS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes the furnishing and installing of complete raceway systems as specified herein and as shown on the drawings.
- B. All raceway systems shall be complete with fittings, boxes or cabinets, and necessary connections to result in a complete system.
- C. Aluminum materials shall not be used.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Raceways.
 - 2. Boxes and Fittings.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. Except where otherwise shown on the drawings, or hereinafter specified, all raceways installed exposed shall be rigid heavy wall galvanized steel conduit.
- B. Unless otherwise specified or shown on the drawings, raceways installed within the Operations Building 1st and 2nd floors shall be electrical metallic tubing.
- C. PVC coated galvanized rigid steel conduit shall be used within the Headworks and wet wells.
- D. PVC Schedule 40 conduit shall be used underground.

- E. When routing signal cables in raceways, maintain 12” spacing from power raceways and only cross at a 90 degree angle. All VFD power feeds to motors shall be routed in rigid steel material, NO EXCEPTION.
- F. Unless otherwise specified or shown on the drawings, all boxes shall be metal.
- G. Unless otherwise specified or shown on the drawings, exposed switch, outlet and control station boxes and fittings shall be cast or malleable iron.
- H. Switch, outlet and control station boxes in dry-wall finished areas of the Operations Building shall be pressed steel.
- I. Terminal boxes, cabinets, junction boxes, pull boxes and wireways used in areas designated as NEMA 4 and NEMA 4X shall be stainless steel 316, gasketed.
- J. Combination expansion-deflection fittings shall be used where conduits cross structure expansion joints. Refer to Structural drawings for expansion joint locations.
- K. Conduit wall seals shall be used where conduits penetrate walls and floors or at other locations shown on the drawings.
- L. Fire stops shall be used where cables or conduits penetrate through fire resistant rated walls, floors, ceilings or partitions, including the wall, floor and ceiling openings of the electrical room.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Rigid Conduit
 - 1. Rigid heavy wall steel conduit shall be hot-dipped galvanized as manufactured by the Youngstown Sheet and Tube Co., Allied Tube and Conduit Corp., Wheeling-Pittsburgh Steel Corp., or equal.
 - 2. PVC conduit used underground shall be rigid polyvinyl chloride Schedule 40 as manufactured by Carlon, Phillips Petroleum Co., Triangle Pipe & Tube Co., Inc., or equal.
 - 3. PVC coated rigid steel conduit shall have a 0.040 inch thick, polyvinyl chloride coating permanently bonded to hot-dipped galvanized steel conduit, as manufactured by Calbond, Ocal, Robroy Industries, or equal.
- B. Electrical metallic tubing shall be hot-dipped galvanized steel as manufactured by Youngstown Sheet and Tube Co., Allied Tube and Conduit Corp., Wheatland Tube Co., or equal.
- C. Liquidtight, Flexible Metal Conduit, Couplings and Fittings.

1. Liquidtight, flexible metal conduit shall be Sealtite, Type UA, as manufactured by Anaconda American Brass Co., or equal by American Flexible Conduit Co., Inc., or equal.
 2. Fittings used with flexible conduit shall be of the screw-in type as manufactured by Thomas and Betts Co., Crouse-Hinds Co., O.Z. Manufacturing Co., or equal.
- D. Flexible couplings shall be as manufactured by Crouse-Hinds Co., Appleton Electric Co., O.Z. Manufacturing Co., or equal.
- E. Boxes and Fittings
1. Pressed steel switch and outlet boxes shall be hot-dipped galvanized as manufactured by Raco Manufacturing Co., Adalet Co., O.Z. Manufacturing Co., or equal.
 2. All boxes including, but not limited to, terminal boxes, junction boxes and pull boxes shall be sheet steel unless otherwise shown on the drawings. Boxes shall be galvanized and have continuously welded seams. Welds shall be ground smooth and galvanized. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel screws. Boxes shall be as manufactured by Hoffman Engineering Co. or equal.
 3. All boxes and fittings used with PVC coated conduit shall be furnished with a PVC coating bonded to the metal. The tensile strength of the bond shall be not less than 2,000 pounds.
 4. All boxes and fittings used with PVC coated conduit shall be furnished with a PVC coating bonded to the metal, the same thickness as used on the coated steel conduit.
 5. Cast or malleable iron boxes and fittings shall be galvanized with cast galvanized covers and corrosion-proof screws as manufactured by the Crouse-Hinds Co., Appleton Electric Co., O.Z. Manufacturing Co., or equal.
 6. PVC fittings shall be as manufactured by Carlon, An Indian Head Co., O.Z. Manufacturing Co., or equal.
 7. Steel elbows and couplings shall be hot-dipped galvanized. Elbows and couplings used with PVC coated conduit shall be furnished with a PVC coating bonded to the steel, the same thickness as used on the coated steel conduit.
 8. Conduit hubs shall be as manufactured by Myers Electric Products, Inc., Raco Div., O.Z. Manufacturing Co., or equal.

9. Conduit wall seals shall be Type WSK as manufactured by O.Z. Manufacturing, Co., or equal by Link Seal Co.
10. Combination expansion-deflection fittings shall be Type XD as manufactured by Crouse-Hinds Co., or equal by Appleton Electric Co., O.Z. Manufacturing Co.
11. Conduit seal bushings shall be Type CSB as manufactured by O.Z. Manufacturing Co., or equal by Crouse-Hinds Co.
12. Fire stops shall be Type CFSF as manufactured by O.Z. Manufacturing Co., or equal by Crouse-Hinds Co., Appleton Electric Co.
13. Explosion proof conduit seals shall be Type EYS as manufactured by O.Z. Manufacturing Co., or equal by Crouse-Hinds Co. and Appleton Electric Co.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. No conduit smaller than 3/4 inch electrical trade size shall be used, nor shall any have more than three 90 degree bends in any one run. Approved factory elbows shall be used when sharper bends are necessary. Pull boxes shall be provided as required or directed.
- B. No wire shall be pulled until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the conduit system has been completed in every detail.
- C. The ends of all conduits shall be tightly plugged to exclude dust and moisture while the buildings are under construction.
- D. Conduit supports shall be spaced at intervals of eight feet or less, as required to obtain rigid construction.
- E. Single conduits shall be supported by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the surface. Plastic "CLIC" system supports are not acceptable. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8 inch diameter. Wire hangers will not be accepted.
- F. Conduit hangers shall be attached to structural steel by means of beam or channel clamps. Where attached to concrete surfaces, concrete inserts of the spot type shall be provided.
- G. All conduits on exposed work and concealed above hung ceilings shall be run at right angles to or parallel with surrounding wall and shall conform to the form of the ceiling. Diagonal runs will not be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run perfectly straight and true.

- H. Conduit terminating in pressed steel boxes shall have double locknuts and insulated bushings.
- I. PVC conduits shall be installed using a fusing cement process. Conduits shall be water tight.
- J. Conduit terminating in gasketed enclosures shall be terminated with conduit hubs.
- K. Metallic heavy wall conduits shall be installed using threaded fittings. Threadless fittings may be used in isolated instances when approved by the Engineer.
- L. Liquidtight flexible metal conduit shall be used for all motor terminations and other equipment where vibration is present.
- M. PVC coated rigid steel conduits shall extend a minimum of 12 inches above finished slabs. Conduits penetrating walls shall be caulked gas tight on both sides.
- N. When a conduit has to be cut in the field, it shall be cut square using a hand or power hacksaw cutter, or an approved pipe cutter using knives. The use of pipe cutter wheels will not be permitted. The cut ends of the field cut conduit shall be reamed to remove burrs and sharp edges. Where threads have to be cut on conduit, the threads shall have the same effective length and shall have the same thread dimensions and taper as specified for factory cut threads on conduits. Field cut threads shall be protected by a field applied cold galvanizing compound.
- O. Conduits entering buildings below grade shall be furnished with a conduit seal bushing.
- P. Where ducts terminate at panelboards, terminal cabinets, etc. panel of sufficient width and depth shall be provided to maintain the 2 inch spacing between ducts or wireways shall be provided below panels, cabinets, etc.
- Q. A ground wire shall be run in all runs of electric metallic tubing and PVC conduit.
- R. All bends in PVC conduit shall be made using a hotbox and bending guide tool.
- S. Conduits run underground below the highest known ground water level shall not enter buildings below this groundwater level without first being run through a drain manhole, handhole, or exterior pull box.

- END OF SECTION -

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SECTION 16442

PANELBOARDS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes the furnishing and installing of all panelboards as specified herein and as shown on the drawings. All panelboards shall be provided with the applicable NEMA enclosure in accordance with the Electrical Specifications.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Panelboards, including construction details and enclosures
 - 2. Terminals and lugs
 - 3. Trim
 - 4. Buses
 - 5. Circuit Breakers
 - 6. Groundfault Circuit Interrupter
 - 7. Metering

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. Panelboard ratings shall be as shown on the drawings. All panelboards shall be rated for the intended voltage.
- B. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. “Standard for Panelboards” and “Standard for Cabinets and Boxes” and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

PART 2 – PRODUCTS

2.01 PANELBOARD CONSTRUCTION

- A. Interiors
 - 1. All interiors shall be completely factory assembled with circuit breakers, wire connectors, and buses. All wire connectors, except screw terminals, shall be of

the anti-turn solderless type and all shall be suitable for copper wire of the sizes indicated.

2. Interiors shall be designed such that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be such that circuits may be changed without machining, drilling or tapping.
3. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.
4. A factory provided label shall be provided listing panel type, number of circuit breakers and ratings.
5. The main breaker shall be at the top or bottom of the bus construction and not a branch breaker.

B. Buses

1. Main bus shall be copper. Full size neutral bars shall be included. Phase bussing shall be full height without reduction. Cross connectors shall be copper. All buses shall be tinned.
2. Main bus shall be distribution phase sequence type configuration to allow installation of two or three pole circuit breakers at any location.
3. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
4. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.
5. Solderless main lugs or main circuit breakers shall be furnished as shown on the drawings.
6. Bus bracing to be at least equal to the interrupting rating of lowest rated circuit breaker installed in panel. Series rated breakers and panels shall not be acceptable.

C. Boxes

1. Boxes shall be made from galvanized code gauge steel having multiple knockouts unless otherwise noted. Surface mounted boxes shall be painted to match the trim. Boxes shall be of sufficient size to provide a minimum gutter space of four inches on all sides.
2. Surface mounted boxes shall have an internal and external finish as specified herein. Surface mounted boxes shall be field punched for conduit entrances.
3. At least four interior mounting studs shall be provided.
4. Panelboards shall be "door-in-door" construction.

D. Trim

1. Hinged door-in-door construction shall enclose all circuit breaker handles and shall be included in all panel trims.
2. Doors shall have semi flush type cylinder lock and catch, except that doors over 48 inch in height shall have a vault handle and three point catch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Two keys shall be supplied for each lock. All locks shall be keyed alike. A directory frame and card having a transparent cover shall be furnished on each door.
3. Trims shall be fabricated from code gauge sheet steel.
4. All exterior and interior steel surfaces of NEMA 1, 1A, 3R and 12 panelboards shall be properly cleaned and finished with ANSI Z55.1, No. 61 light gray paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.
5. Trims for flush panels shall overlap the box by at least 3/4 inch all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.

E. Manufacturer

1. 120/208 Volt three phase, 4 wire panelboards shall be Pow-R-Line 3X type as manufactured by Eaton, or equal by Square D and General Electrical.

2.02 CIRCUIT BREAKERS

- A. Panelboards shall be equipped with circuit breakers with frame size and trip settings as shown on the drawings. Circuit breaker mounting shall not exceed 78 inches above floor.
- B. Circuit breakers shall be molded case, bolt-in type.
- C. Circuit breakers shall have an interrupting capacity as shown on the Electrical Contract Drawings.
- D. Main circuit breaker shall be attached to the main vertical bus.
- E. Main and feeder breakers with frame rating of 250 Amps and greater shall have a solid state digital trip unit with adjustable long, short, instantaneous, and ground fault trip settings. Provide auxiliary contacts for trip status to remote alarm.

2.03 GROUND FAULT CIRCUIT INTERRUPTER (GFCI)

- A. GFCI shall be provided for circuits where indicated on the drawings. GFCI units shall be molded case, bolt-on breakers, incorporating a solid state ground fault interrupter circuit insulated and isolated from the breaker mechanism. The unit shall be U.L. listed Class A

Group I device (5 milliamp sensitivity, 25 millisecond trip time), and an interrupting capacity matching the circuit breakers in the panelboards.

2.04 DIGITAL POWER METER

- A. Main Distribution panelboard shall be metered with a digital power meter.
- B. Digital Power Meter
 - 1. Digital power meter shall be true RMS type power monitor with features to data log (30 days) and communicate remotely the AC amperes on each phase, voltage, harmonic distortion, watts, volt amperes, bars, power factor, frequency, demand watts, demand volt ampere and watt hours; and capable of providing alarm status for phase loss, phase on balance, phase reversal and provides all data to remote monitoring systems.
 - 2. The power meter shall communicate using Modbus RTU via a RS-485 port and Ethernet protocol via a RJ-45 port and be able connect to any host devices.
- C. Provide small control wiring, necessary fuse blocks, suitable numbering strips and terminal blocks as required
- D. Provide current transformers for each meter. Current transformers shall be wired to shorting type terminal blocks. All transformers used for metering shall meet the requirements of IEEE C12.11 and IEEE C57.13.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Boxes for surface mounted panelboards shall be mounted so there is at least ½ inch air space between the box and the wall.
- B. Circuit directories shall be typed identifying location and nature of load served.
- C. Panelboards installed in areas with finished walls shall be installed recessed into the wall with the front of the panel flush with the finished wall.

- END OF SECTION -

SECTION 16495

VARIABLE FREQUENCY DRIVES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes furnishing all labor, materials, tools and equipment necessary to furnish and install Variable Frequency Drives (VFD) as shown on drawings, specified herein, or evidently required to complete the work.

1.02 SUBMITTALS

- A. Shop Drawings and/or brochures shall be submitted to the Engineer in accordance with Section 01300.
- B. Submittals required under this section include, but are not limited to the following:
 - 1. Shop drawings showing complete fabrication and construction details, materials, electrical components, enclosures, input line reactors, harmonic filters, weights, dimensions, clearances, anchorage locations, piping and utility requirements, and step by step sequence of controls.
 - 2. Certified Performance and Efficiency Characteristics.
 - 3. The Contractor shall provide the VFD manufacturer with copies of all motor shop drawing submittals and or nameplate data. The VFD manufacturer shall review this data and shall certify in writing that the equipment has been coordinated with the variable frequency drives and motors for complete compatibility.
 - 4. Complete master wiring diagrams, VFD layout drawings and control schematics, including required coordination with other electrical control devices operating in conjunction with each VFD and suitable outline drawings shall be furnished for each VFD being supplied for approval before proceeding with manufacture. Due to the complexity of the control functions, it is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard preprinted sheets or drawings simply marked to indicate applicability to this contract will not be acceptable.

1.03 DELIVERY, STORAGE AND HANDLING

- A. All materials and equipment shall be shipped, stored, and handled in accordance with Section 01600.
- B. The materials and components shall be stored on a flat, clean surface to prevent damage and shall be covered to prevent exposure to adverse conditions prior to installation.

- C. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. The materials and equipment covered by this specification are intended to be standard materials and equipment of demonstrated successful performance, as manufactured by reputable concerns. Equipment shall be designed and constructed in accordance with the highest standards of the industry and shall be installed in accordance with the manufacturer's recommendations and the Contract Documents. The specifications call attention to certain features but do not purport to cover all details entering into the construction of the equipment.
- B. Provide individual constant torque VFD's with LCL line filters. Each individual VFD requires all these devices to be factory mounted within its enclosure. Field mounting of drive related accessories is unacceptable.
- C. All equipment submitted shall be provided with enclosures that can be installed in the spaces shown on the drawings. Enclosures that exceed the allowable space provided shall be subject to rejection.
- D. Heat dissipation from VFD enclosures shall meet all requirements of the specifications.
- E. Each VFD unit shall be U.L. listed or labeled.

PART 2 – PRODUCTS

2.01 DRIVES

- A. This specification is intended to outline the overall physical features, performance and functional requirements of the VFD equipment required under this section, consisting of a variable speed adjustable frequency converter, by-pass contactors, filters, accessories, and enclosure. The VFD system shall be fully tested by the manufacturer before initial startup with all components compatible in function and appearance.
- B. Variable Speed Adjustable Frequency Converter. The adjustable frequency drive shall be UL Listed solid state type in a NEMA 12 filtered enclosure and blower cooled. The filter element shall be of the removable and replaceable type for each drive unit. Front access shall be provided. Top, rear and side access shall not be required. The enclosure shall be coated with an epoxy resin base and acrylic resin enamel finish. The drive shall meet applicable provisions of DIVISION 16, ELECTRICAL, the National Electric Code and NEMA. The drive shall be arranged for 480 Volts plus 10 percent to minus 5 percent, three phase, 57 to 63 Hertz input converted into adjustable frequency/Voltage output in an ambient temperature of -10 to 40 degrees C. The VFD shall be capable of sustaining operation with a line voltage dip of 15 percent of normal operating voltage on a constant torque or variable torque load. During line dip the VFD shall automatically provide a speed drop allowing maximum capable speed for the duration of the input voltage dip. Each individual drive shall be mounted in a separate enclosure. The drive efficiency shall be 97 percent or better at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads. Each individual drive and associated equipment shall be mounted in a single and individual enclosure unless otherwise

specified. The following features shall be included with each adjustable frequency drive:

1. Control. The control method shall be sinusoidal Pulse Width Modulation. Output Voltage shall be three phase, 480 Volts and output frequency shall be 0.1 to 66 Hz when shipped. Frequency shall be selectable by a digital keypad. The frequency resolution shall be 0.1 Hz and the accuracy shall be within 1.0 percent of the maximum frequency at 25 degrees plus or minus 10 degrees C. Voltage/frequency (V/f) characteristics shall be characterized by selectable patterns. Up to 82 control functions shall be programmed. The overload capacity shall be 110 percent continuous and a minimum two minute rating of 150 percent of rated current. The frequency setting signal shall be 4 to 20 mA. The VFD shall employ a full wave rectifier to prevent input line notching, DC bus choke, DC bus capacitors, and Insulated Gate Bipolar Transistors (IGBT's) as the output switching device. SCRs, GTOs and Darlingtons transistors are not acceptable.
2. Function. The adjustable parameters consisting of: accelerating time, decelerating time, upper and lower limit of output frequency, and 4 to 20 mA reference bias and reference gain shall be indicated on a digital display. Braking shall be achieved through capacitor charging and starting shall be achieved by external contact. The VFD shall be software configurable to automatically restart following power outage, overcurrent and overvoltage detection. Soft stall shall occur when motor runs continuously at overload.
3. Protection. The drive shall be protected from stalling, overcurrent, overload, short circuit, overvoltage, undervoltage, loss of one (1) phase of input power, instantaneous power failure (approximately 30 msec), overheating, fuse burnout protection and earth (ground) fault detection. The fault cause shall be displayed (flickering) for overcurrent, short circuit, overload, overvoltage, overheating and earth (ground) fault. There shall be a main capacitor charging indicator for internal circuit. Fault shall be reset by a reset push button on the printed circuit board and an external reset contact.
4. Displays. The digital display shall be a 2 line, 40 character unit with readout in plain English. Display shall be located on the door of the VFD enclosure.
5. Internally mounted set point control shall be provided to receive either a 4 to 20 mAdc or 0 to 10 vdc analog input control signal from a process panel to control the speed of the motor. An external digital display shall be provided outside of the inverter. The following control devices shall be available for external control of the inverter; frequency/speed meter, frequency setting variable resistor, knob for frequency setting variable resistor and drive switch. The drive shall be capable of receiving a dry contact input to override the analog input control signal and control the flow rate to 95%.
6. A bypass motor starter and VFD VFD/Bypass switch shall be provided to allow VFD bypass and straight in line full load motor operation. A solid state bypass soft start style motor starter shall be provided for all motors 30HP and greater. The line and load sides of the soft start motor starter shall be electrically isolated

from incoming power and motor respectively with contactors in which will not close until the bypass switch is in the bypass position.

7. A lockable main load break disconnect switch interlocked with the enclosure door with through the door handle to provide positive disconnect of incoming AC power shall be furnished for each individual drive and enclosure. The circuit breaker shall be rated at a minimum 25,000 amperes at 480 volts, RMS symmetrical.
8. Each drive shall be provided with the following accessories:
 - a. "Local-Off-Remote" keypad switch for local/remote speed control. In the "Remote" mode, the motor speed shall be adjusted in response to the related remote 4 to 20 mA pacing signal. In "Local" mode the motor speed shall be adjusted in response to keypad entry speed and the VFD shall run when the "Hand-Off-Auto" selector switch is in "HAND". . In "Off" mode the VFD shall not run.
 - b. Provide a 4-20 mA speed feedback output signal.
 - c. Provide four (4) Type C dry contacts at each VFD for remote indication of motor running status.
 - d. "Hand-Off-Auto" selector switch located on the door of the VFD enclosure. In the "Auto" position the VFD shall be started and stopped remote via an external dry contact. In the "Hand" position the VFD shall run. In "Off" mode the VFD shall not run.
 - e. Elapsed time meters located on the door of the VFD enclosure.
 - f. Provide two (2) type C contacts at each VFD for remote indication of VFD run and fault conditions.
 - g. Motor running indicating light located on the door of the VFD enclosure.
 - h. Motor off indicating light located on the door of the VFD enclosure.
 - i. Drive failure indicating light located on the door of the VFD enclosure.
 - j. Provide a bypass contractor operation indicating light located on the door of the VFD enclosure.
 - k. All indication lights shall be LED push to test type.
 - l. All time delay relays shall be true on and true off type that utilize the control signal for relay power.
 - i. Provide all controls and accessories as shown on the equipment motor wiring diagrams in the contract drawings.

PART 3 – EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Before the start of the work of this Section, verify that the project is ready for this work.
- B. Verify that field measurements are as shown on approved shop drawings and/or manufacturer's instructions.
- C. Verify that the equipment or material is in conformance with the approved shop drawings and specifications and resolve any deviations.
- D. Notify subcontractors involved or affected by this work and coordinate the work with them.

3.02 INSTALLATION

- A. All materials and equipment shall be installed in a neat, workmanlike manner.
- B. Minimum requirements of all wiring of the equipment shall be as specified under DIVISION 16 -ELECTRICAL of these specifications.
- C. Installation of the equipment shall be in accordance with written instructions provided by the manufacturer and as approved.

3.03 PAINTING

- A. Shop painting and the surface preparation is a part of the work specified herein. Enclosures shall be coated with an electrostatically-applied epoxy enamel.

3.04 CLEAN UP

- A. Prior to start-up and field testing, all foreign matter shall be removed from the equipment. Spillage of lubricants used in servicing the system shall be cleaned from all equipment and concrete surfaces.

3.05 MANUFACTURER'S FIELD SERVICES

- A. Manufacturer's Field Services shall be provided for field programming and startup for all the VFDs provided.

3.06 MANUFACTURER'S TRAINING

- A. Manufacturer's training shall be provided for training of Owner's personnel for each type of VFD provided in accordance with Section 01700.
- C. Manufacturer's Training of Owner's Personnel shall be a minimum of two (2) calendar days performed at the project site.

3.07 SPARE PARTS

- A. One set of spare parts shall be provided for each VFD size.
- B. Spare parts for each VFD Size:
 - 1. One (1) control interface.
 - 2. Three (3) fuses.
 - 3. One (1) VFD module each size provided without enclosure

3.08 WARRANTY

- A. A manufactures warranty for three years shall be provided for each VFD.

- END OF SECTION -

SECTION 16500

LIGHTING SYSTEMS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes the furnishing and installing of complete lighting systems including panelboards, transformers, lighting fixtures, receptacles, switches, contactors, clocks and all accessories and appurtenances required as specified herein and as shown on the drawings.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Light Switches
 - 2. Receptacles
 - 3. Lighting Fixtures
 - 4. Device Plates
 - 5. Emergency Lighting Inverter Unit

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. All lighting fixtures shall be in accordance with the National Electrical Code and shall be constructed in accordance with the Underwriters Laboratories “Standards for Safety, Electric Lighting Fixtures.” All lighting fixtures shall be Underwriters Laboratories labeled.

PART 2 – PRODUCTS

2.01 LIGHT SWITCHES

- A. NEMA WD 1, UL 20, Heavy-Duty, AC only general-use toggle switch.
- B. Rated 20 Amperes, 120/277 Volts for inductive and resistive loads.
- C. Motor rated up to 80 percent of ampere rating.
- D. Totally enclosed in a phenolic base and cover.

- E. Explosion-proof Switches: Provide explosion proof, 20 Ampere, 125 Volt, front operated switch in all NEMA 7 areas. Switches shall be UL listed rated for Class I, Division 1, Groups C and D hazardous areas.

2.02 RECEPTACLES

- A. NEMA WD 1, UL 498, Heavy-duty general use receptacle.
- B. GFCI Receptacle: UL 943, Convenience receptacle with integral ground fault circuit interrupter and indication light that is lighted when device is not tripped.
- C. NEMA WD 6, straight blade type for rated current and phases as indicated on drawings.
- D. Weatherproof Cover Plate: NEMA 3R, thermoplastic white use type covers by Hubbell or equal.
- E. Explosion-proof Receptacles: Provide explosion proof, 20 Ampere, 125 Volt, 3- pole, 2- wire, simplex type receptacles with hinged cover in all NEMA 7 areas. Furnish matching explosion proof plug with mechanical cable grip for every two receptacles installed (minimum of one). Receptacles and plugs shall be UL listed rated for Class I, Division 1, Groups C and D hazardous areas.

2.03 DEVICE PLATES

- A. Plates for shall be of the required number of gangs for the application involved and shall be Type 302 (18-8) high nickel stainless steel of the same manufacturer as the device.

2.04 LIGHTING FIXTURES

- A. Lighting fixture shall be LED illuminated and of type as shown on the drawings. The catalog numbers listed are given as a guide to the design and quality of fixture desired. Equivalent designs and equal quality fixtures of other manufacturers will be acceptable.
- B. The fixture shall be tested to IESNA LM-79-08 and LM-80 Testing Standards at 25° C ambient temperature
- C. The LED package shall be designed around the lumen maintenance of 87% at 60,000 hrs. and is to be expected to achieve L70 at 100,000 hrs.
- D. The Light Engine shall be a high efficacy LED light engine equipped with brand-name LEDs available in outputs of 100%, 85%, 70% and 55%.
- E. The LED Drivers shall be Electronic Class 2, high efficiency, with the following power factor correction (PFC):
 - 1. Standard Non-Dimming Driver (PFC>0.95).
 - 2. Dimming Drivers (PFC>0.90).

2.05 EMERGENCY LIGHTING INVERTER UNIT

- A. Provide UL 924 listed emergency lighting inverter unit to power emergency lighting fixtures that upon sense of circuit power loss will transfer from normal power source to battery power utilizing a no break (uninterruptible) transfer with a pulse width modulated sine wave output. Upon return of the normal AC circuit power, the unit shall return to standby mode automatically and without any interruption of power supplied to the load. The charging system shall recharge the batteries within UL requirements.
- B. The unit shall be capable of powering any combination of electronic, power factor corrected, fluorescent, LED, incandescent or HID lighting with normally on, normally off and switched output circuit.
- C. The unit shall be capable of operating normally on, normally off or switched lighting loads.
- D. The unit shall operate from 0-100% loading, and be rated to deliver the minimal specified watts as indicated in the drawings, at unity power factor, for a minimum of 90 minutes.
- E. Input voltage to the unit shall be 120 or 277, +10% to -15%, single phase, with a frequency of 60Hz. The output voltage of the unit shall be the same as the input voltage, 120 or 277 volts, +/- 5% single phase sine wave, with a frequency of 60Hz + 0.05Hz on inverter.
- F. Unit shall have multipurpose LED diagnostic indicators for unit changes or possible problems and have an audible alarm for shutdown conditions.
- G. The unit shall be housed in a NEMA 1 steel wall mounted enclosure cabinet with conduit knockouts at the top with front access and designed for floor mounting. All components must be front accessible. All unit components shall have a modular design to facilitate field service.
- H. The unit's batteries will provide sufficient power to maintain the output voltage of the unit for a period of 1.5 hours, without dropping below 87.5% of nominal battery voltage. The batteries shall be Sealed Lead Calcium VRLA type, enclosed in the unit cabinet that permits easy maintenance without requiring removal. Batteries shall require no addition of water over the life of the battery. The case and cover shall be constructed of polypropylene, contain low-pressure UL recognized safety release vents, and be non-gassing in normal use. Batteries shall have a 10-year design life expectancy at 77°F (25°C).
- I. The unit's battery charger shall be software controlled, temperature compensated, three-step float type charger. The charger shall maintain the batteries fully charged during normal standby condition. Following a power failure the charger will start in constant current mode until battery voltage reaches Equalize. Equalize voltage will then be maintained until charging current drops to .5 amps or .3% of the battery amp/hour rating; battery voltage will then be allowed to drop down to float.

- J. Provide permanent red lamacoid nameplate with white lettering to each inverter cabinet identifying inverter as part of the emergency lighting system and the inverter tag name.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Each fixture shall be a completely finished unit with all components, mounting and/or hanging devices necessary, for the proper installation of the particular fixture in its designated location and shall be completely wired ready for Connection to the branch circuit wires at the outlet. All pendant mounted fixtures shall be mounted plumb with floors and walls.
- B. When fixtures are noted to be installed flush, they shall be complete with the proper accessories for installing in the particular ceiling involved. All flush mounted fixtures shall be supported from the structure and shall not be dependent on the hung ceilings for their support.
- C. Flexible fixture hangers shall be used for all pendant mounted fixtures. Pendant mounted fixtures shall be supported from 3/4 inch galvanized rigid steel conduit.
- D. Receptacles and switches shall be mounted at 45” above finished floor.
- E. Mounting heights given are to the bottom of the fixture. When “mount up” is indicated, fixture is to be mounted the stated distance off the finished floor.

3.02 SEPARATION OF NORMAL AND EMERGENCY SYSTEMS

- A. Emergency system on the load side of the emergency lighting inverter unit shall be kept entirely independent of all other wiring, devices and equipment, and shall not enter the same raceways, boxes or cabinets with each other or other wiring.

3.03 CLEANING UP

- A. All fixtures shall be left in a clean condition, free of dirt and defects, before acceptance by the Engineer.

- END OF SECTION -

SECTION 16612

ENGINE GENERATOR

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section includes all labor, materials, tools, equipment and incidentals necessary to furnish and install, put in operation and field test a diesel engine driven generator unit with sound attenuated weatherproof enclosure and doubled wall base tank of the size and rating as specified herein and on the Drawings.

1.02 SUBMITTALS

- A. Shop Drawings and/or brochures shall be submitted to the Engineer in accordance with Section 01300.
- B. Submit all pertinent technical data including but not limited, to the following:
 - 1. Manufacturer and model of engine and generator
 - 2. Rated capacity B.H.P.
 - 3. Generator
 - 4. Generator KVA, KW and P.F. rating
 - 5. Voltage
 - 6. Class insulation
 - 7. Temperature rise above 40 degree C ambient
 - 8. Generator efficiency and fuel consumption at full load, 3/4 load and 1/2 load
 - 9. Operating weight of complete unit
 - 10. Exhaust piping
 - 11. Double walled base tank
 - 12. Battery and charger
 - 13. Auxiliary system power requirements and wiring diagrams
 - 14. Enclosure with all conduit openings for system operation identified.

- C. Manufacturer's certified test record. The test record shall show the generator performance and frequency regulation to satisfy the requirements specified herein, and shall also show fuel consumption rates at 1/2 load, 3/4 load and full rated load.
- D. Submit all other data specified in this section and as outlined in Section 01300.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. The engine generator units shall comply with the requirements of the Federal Environmental Protection Agency, State of Rhode Island Department of Environmental Management, and NFPA 70.
- B. The engine generator unit shall be arranged for automatic starting and stopping on failure of, and restoration of the normal source of power, and for automatic load transfer, but not including the automatic load transfer switch which will be furnished separately.
- C. The engine generator unit shall include, but not be limited to excitation system, controls, keep warm system, cooling system, silencer, starting batteries, charger, and all essential and desirable appurtenances whether specifically mentioned in this specification or not.
- D. The system described herein, including but not necessarily limited to the engine generator set, engine auxiliaries, batteries and engine generator control panels shall be furnished by a single supplier who is regularly engaged in the production of diesel fueled engine driven generators.
- E. The voltage regulation shall be within plus or minus two percent from no load to full rated load. On application or removal of full rated load in one step, the transient voltage dip or overshoot shall not exceed twenty percent of rated voltage. Frequency regulation shall be within 3 Hertz from no load to full load.
- F. The voltage regulator shall be insensitive to severe load induced waveshape distortion from SCR or thyrister circuits such as those used in battery charging (UPS) and motor speed control equipment. This SCR immune regulator shall not reduce the motor starting capabilities as specified herein.
- G. Engine generator units of not less than KW rating indicated on the contract drawings, 0.8 power factor capacity with 3 phase, 60 Hertz, 120/208 Volts, 4 wire alternating current generator shall be furnished.
- H. The engine generator units shall be completely prewired and piped so that only field connections to a master terminal strip for control, auxiliaries and alarms, and power connections to a molded case line circuit breaker and fuel fill and vent line connections will be required.

- I. The engine generator unit and associated auxiliaries systems and components shall be skid mounted and installed outdoors.

1.05 QUALIFICATIONS

- A. The generator units shall be the standard product, as modified by these Specifications, of one of the following manufacturer listed below. Engine generator unit shall be a standard production model of proven ability and shall be designed, constructed, and installed in accordance with the best practice and methods. In addition, the manufacturer shall maintain a permanent service organization and supply of spare parts as necessary to provide adequate service within 60 miles of the site. The design basis for the generator size including the enclosure and base tank are based on a Kohler unit with dimensions of 9.5' Length, 3.5' Width, 6.75' Height. Due to constraints on the site, units by the other manufactures must not exceed these dimension of by more than 10% which may require custom fabricated enclosures by the manufacture.
 1. Caterpillar
 2. Cummins
 3. Kohler
- B. The engine generators shall be a factory assembled unit specifically designed and fitted for operation on diesel fuel. The engine generator unit shall be free from injurious torsional or other vibration, and shall be assembled on an adequate steel subbase suitable for mounting on vibration isolation pads, on a flat concrete surface which is suitable for supporting the weight of the unit. The vibration installation material shall be furnished with the engine generator unit.
- C. The engine generator unit will be installed in Taunton, MA and rated for use at this location's elevation level. Outdoor enclosed units shall be provided with heating and cooling as required to maintain the generator set operational within the temperature limits of all devices and equipment. The engine generator unit shall be suitable for continuous operation at any temperature between 0 and 110 degree F at its full load rating and at 80 percent power factor.
- D. The engine generator unit shall be designed and built in accordance with the latest standards of IEEE, NEMA, ANSI and ASME.
- E. The engine generator unit shall be designed to minimize the danger of accidents to operating and maintenance personnel. The manufacturer shall, prior to shipment, verify that all electrical connections are tight and that circuits are isolated, that on-set piping connections are well-made, and that standard safety equipment is included and functions according to design.

1.06 ENGINE GENERATOR UNIT PERFORMANCE

- A. The engine generator unit shall maintain rated frequency from no load to full rated load.
- B. The voltage regulation shall be as specified herein and recovery to steady state operation shall be within two seconds.

- C. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus one percent of rated voltage. A rheostat shall provide a minimum of plus or minus five percent voltage adjustment from rated voltage.
- D. Frequency regulation shall be maintained within 2½ percent of rated frequency from no load to full load. The steady state frequency shall be within 0.5 percent of rated frequency.
- E. The engine shall be equipped with a electronic isochronous governor capable of maintaining the engine speed from no load to full load within plus or minus .25 percent of the synchronous speed.

1.07 PRODUCT HANDLING

- A. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.
- B. Protect material and equipment, in accordance with the manufacturers recommended storage procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

1.08 WARRANTY/SERVICE

- A. The manufacturer's and dealers Extended Service Coverage shall in no event be for a period of less than five (5) years from date of Owner/Engineer's acceptance of the system and shall include repair parts, labor, travel expense necessary for repairs at the jobsite, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of maintenance and repair. Applicable deductible costs applying only after the first year shall be specified in the manufacturer's warranty and not exceed \$500 per site visit. Submittals received without written warranties as specified will be rejected in their entirety. Warranty and maintenance shall be issued and executed by the dealer and may not be subcontracted.
- B. The generator set supplier shall have factory trained service representatives and tooling necessary to install, test maintain, and repair all provided equipment and shall be located within 150 miles of the customer's site.

PART 2 – PRODUCTS

2.01 ENGINE

- A. The engine shall be diesel fueled, four (4) cycle, water-cooled, while operating with nominal speed not exceeding 1800 RPM. The engine shall meet applicable EPA non-road mobile regulations and/or the EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State and Federal emission regulations at the time of installation/commissioning. Actual engine

emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 Emissions Cycle at specified ekW/bHP rating.

- B. The engine shall be furnished with thermostatically controlled jacket water heaters of the size recommended by the supplier. Heaters shall be rated at 1,000 Watts for operation on 120 Volts.
- C. The oil sump will be fitted with pipe nipples, a ball valve, and an extension oil drain.
- D. The engine shall be provided with a governor which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100% of rated output capacity. The governor shall be configured for safe manual adjustment of the speed/frequency during operation of the engine-generator set, without special tools, from 90 to 110% of the rated speed/frequency, over a steady state load range of 0 to 110% or rated capacity.
 - 1. Steady state speed band, +/- 0.25% of rated speed.
 - 2. Internal oil pump, relief valve and accumulator controls governor operating pressure.
 - 3. Manual speed adjustment knob at top of unit.
 - 4. Positive locking to allow manual speed adjustment.

2.02 COOLING SYSTEM

- A. The engine shall be furnished with a unit mounted radiator. The radiator shall be of sufficient size to cool the water when ambient temperature is 100 degrees F. and the engine generator unit is operating at full rated load continuously.
- B. Cooling system shall further include water cooled manifolds, pusher fans and high temperature cutout. Provide radiator duct connector complete with suitable gasket, bolts and nuts. The cooling system shall be furnished with sufficient antifreeze solution to protect the cooling system with ambient air temperature down to minus fifty degrees F.
- C. Provide an anti-freeze treatment as recommended by the manufacturer for protection against corrosion and scale formation. The anti-freeze treatment shall be compatible with the antifreeze solution. The anti-freeze will be long life environmentally friendly polypropylene glycol. The concentration will be as recommended by the manufacturer.

2.03 FUEL SYSTEM

- A. The engine shall be furnished with filter, fuel pressure gage and engine priming pump.
- B. The engine-generator unit shall be furnished with an approximate 36 inch high, double-walled fuel base-tank with leak detection and fuel capacity for 48 hours of generator operation at full load. Tank shall be constructed of heavy gauge steel; epoxy coated

interior, and Housing surfaces shall have a corrosion resistant epoxy based hardened rubberized coating.

1. Tank shall conform to NFPA 30 and NFPA 47.
2. The diesel fuel oil tank shall have tappings for fuel supply and return. It shall be equipped with a suitable vent cap. The fill pipe shall be extended to the exterior wall and easily accessible and lockable.
3. The tank shall be dual wall constructed of steel and mounted directly to the generator set skid, and shall be provided with low fuel and leak detection alarms and dry contacts. For added protection the rupture basin portion of the tank shall have a leak monitoring system utilizing a non-toxic, non-volatile liquid to determine integrity of external rupture basin wall. This shall be coordinated to operate with floats and sensors of the fuel tank.
4. An 8 gallon overflow tank shall be furnished at the generator fill. The generator shall be furnished with a 2 inch diesel vent fuel line. The diesel fuel tank shall be furnished with audible and visual alarms at the fill gauge.
5. Vent and overflow piping to be provided.
6. Fuel gauge.
7. Provide tank openings to allow manual level measurement with stick gauges.

2.04 EXHAUST SILENCER

- A. The engine generator unit shall be provided with a critical type silencer including flexible exhaust fittings. Silencers shall be mounted so that its weight is not supported by the engine. Exhaust piping shall be sized as recommended by the manufacturer. Connection between engine and silencer shall be of the stainless steel flexible type.
- B. A flexible section shall be provided at each engine and an expansion joint at each muffler. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.
- C. Horizontal sections of exhaust piping shall be sloped downward away from the engine to a drip leg for collection of condensate with drain valve and cap. Changes in direction shall be long radius. Exhaust piping, mufflers and silencers installed shall be insulated with 3 inches of calcium silicate insulation and covered with aluminum flashing to protect personnel.
- D. All portions of the exhaust system shall be insulated and covered with flashing.

2.05 STARTING SYSTEM

- A. The electric starting system shall consist of the following equipment:
 - 1. The engine shall have a two wire, direct current starter suitable for automatic starting through the load transfer switch.
 - 2. Batteries shall be of the lead-acid type. Batteries shall be guaranteed to have sufficient capacity when in a fully charged state to perform not less than five, 15 second cranks while in an ambient temperature of 0 degrees F without recharging.
 - 3. Current limiting type automatic battery charger conforming to UL 1236 shall be of the static type, magnetic amplifier control with led status lights, battery temperature compensation, and user adjustable parameters factory set to match battery charge curve. Charger to be completely automatic, charging rate to be determined by the state of the battery, and reducing to milliamp current on a fully charged battery. Charger shall be for 120 Volt, single phase, 60 Hertz A.C. input with an output of not less than 10 amperes. The charger shall be for the correct voltage for the battery, and specifically for charging a lead-acid battery and for panel mounting.

2.06 ALTERNATOR

- A. The alternator shall be single bearing, open, dripproof revolving field, four pole brushless type, permanently aligned to the engine by flexible disc coupling. Each unit shall be reconnectable type having nine leads and shall be factory connected for three phase, 4 wire, 60 Hertz. The rating of the unit shall be as indicated on the drawings.
- B. Alternators shall have Class F insulation and shall be furnished with Amortisseur windings. Alternators shall have a complete static automatic voltage regulator which will hold the voltage within plus or minus two percent from no load to full rated load. On application of rated load in one step, the transient voltage dip shall not exceed twenty percent. The generator windings shall be braced to withstand any possible short circuit stresses. Alternator shall be "Radio Interference Proof" (RIP) and "Telephone Influence Factor" (TIF) and shall be within the limits of Section 9, ANSI C50.12. Alternators shall have a rotating brushless exciter and rectifier.
- C. The alternator characteristics shall be matched to the torque characteristics of the engine in such a manner that with full load connected to the alternator terminals, the alternator will utilize all the available engine power without exceeding it at all speeds.
- D. The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300% for peak inverse voltage and forward current ratings for all operating conditions, including 110% generator output at 40 degrees C 104 degrees F ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified.

- E. Each generator shall be provided with a solid-state voltage regulator, separate from the exciter. The regulator shall maintain the voltage within a bandwidth of the rated voltage, over a steady-state load range of zero to 100% of rated output capacity. Regulator shall be configured for safe manual adjustment of the engine-generator voltage output without special tools, during operation, from 90 to 110% of the rated voltage over the steady state load range of 0 to 100% of rated output capacity. Regulation drift shall not exceed plus or minus 0.5% for an ambient temperature change of 20 degrees C. 68 degrees F.
- F. Alternators shall be furnished with 120V stator heater and controls.

2.07 CONTROLS

- A. The engine generator units shall be furnished with a shock resistant, engine mounted NFPA 110 compliant microprocessor based controller.
- B. Standard data available shall include:
 - 1. Jacket water temperature
 - 2. Lube oil temperature
 - 3. Lube oil pressure
 - 4. Battery voltage
 - 5. RPM
 - 6. A.C. Voltmeter
 - 7. A.C. Ammeter
 - 8. Frequency meter
 - 9. Elapsed time meter calibrated in hours and tenths of hours
- C. Accessories shall include:
 - 1. Current transformers.
 - 2. Fuses
 - 3. Generator voltage regulator
 - 4. Voltage adjusting rheostat.
 - 5. Fault indication lights one each for:
 - a. low oil pressure
 - b. high water temperature

- c. overspeed
 - d. overcrank (fail to start).
 - 6. Prewarn indication lights one each for:
 - a. low oil pressure
 - b. high water temperature.
 - 7. 90 DB (a) Audible alarm to sound on any fault or prewarn and an alarm silencer.
 - 8. Mode selector switch – "AUTO", "OFF", "MANUAL" with audible alarm when switch is not in "AUTO" position.
 - 9. Control power fuse.
 - 10. Fixed overcrank timer - four-10 second cranks shall be provided. After four cranks, the unit shall stop and an alarm initiated.
 - 11. Auxiliary contacts which close when engine is in operation. Contacts shall be rated 10 amperes and shall be used to interlock combustion and ventilation air dampers.
 - 12. Common failure relay
 - 13. Dry contact kit with the minimum following contact signals:
 - a. Engine Running
 - b. Engine Trouble
 - c. Battery Charger Alarm
 - 14. Engine sensors for low water temperature near low oil pressure, near high water temperature.
- D. In addition to the equipment included in the control panel described above, the unit shall include a power and control junction box mounted on the generator. This junction box shall include:
- 1. Three phase power conductors terminated with pressure type ring connectors.
 - 2. Neutral connection.
 - 3. Terminal block with marked connection points for all external control connections and for jacket heaters, etc.
 - 4. Molded case line circuit breaker with interrupting rating of 100 KA amperes RMS, electronic LSI, and ground fault relay alarm.
- E. Automatic shutdown shall be provided for each of the following conditions:

1. High jacket water temperature
 2. Low jacket water pressure
 3. Low lubricating oil pressure
 4. Engine overspeed
 5. Unit fail to start.
- F. Auxiliary normal open dry contacts shall be provided for remote transmission of unit failure.
- G. Provide remote emergency stop pushbutton operator station for mounting in locations as indicated on the drawings.

2.08 SUB-BASE

- A. The engine, generator and radiator shall be mounted on a structural steel base designed to maintain proper alignment. Vibration isolators shall be furnished of the size and type recommended by the supplier.

2.09 ENCLOSURE

- A. A sound-attenuated weather-protective housing shall be furnished. The housing shall enclose the complete unit and all related equipment (e.g. battery, battery charger, engine controls and control panel, etc). All components shall be wired and piped within the enclosure.
- B. The housing shall be constructed of 18 gauge rolled steel and shall include hinged locking access doors. Housing surfaces shall be prime painted with two coats of a rust resistant primer and finished with a dark green enamel paint.
- C. The housing shall be sound insulated, vandal proof, and padlocked. The resulting structure with engine-generator in operation shall not transmit more than 65 db at a distance of 23 feet from the generator in any direction. There shall be no Puretone. The generator set manufacturer shall choose the thickness of insulation to meet the aforementioned sound criteria.
- D. The housing shall be furnished with weather-protective fixed louvers, and weather-protective flanged door openings to insure weather-resistant construction.
- E. Stainless steel flexible exhaust sections shall be provided. Exhaust outlet shall be terminated with a "shanty cap" designed so to prevent entrance of rain into exhaust outlet. All handles, sheet metal screws, bolts, nuts, hinges, and other exterior hardware shall be stainless steel.

- F. Provide factory wired instruction detection style doors switches for each of the enclosure entry doors that shall be wired in series to one another and terminated at a junction box within the generator enclosure.

PART 3 – EXECUTION

3.01 MANUFACTURER'S SERVICES

- A. A minimum of one, eight-hour day shall be provided to supervise the installation and testing of the equipment furnished, to assist in start-up and train Owners maintenance personnel.
- B. A minimum of one, four hour day, not including travel time to and from the site, shall be used by a fully qualified field service engineer to make necessary adjustments and to provide operator training on the equipment furnished. This work shall occur after the equipment has been in operation and at the request of the owner, but not to exceed one year after the acceptance of the facility.

3.02 TESTS

- A. At least 48 hours prior to the load test, the manufacturer shall perform a pretest. The pretest shall be conducted in the presence of the Engineer. The pretest shall determine that the unit is ready for load testing and that all components are functioning correctly. All adjustment for tuning the unit shall be made during the pretest. If remedial work is required, the work shall be performed before the load test is conducted.
- B. Upon completion of the installation, the manufacturer of the equipment shall test the complete unit, at full load, using load banks, for four continuous hours. During the test, the following data shall be taken at 15 minute intervals:
 - 1. Outside air temperature
 - 2. Generator room temperature
 - 3. Oil pressure
 - 4. Oil temperature
 - 5. Jacket water temperature
 - 6. Battery charge rate
 - 7. Fuel pressure
 - 8. A.C. Volts
 - 9. A.C. Amps
 - 10. Frequency
 - 11. Kilowatts.
- C. Following the test, three successive simulated power outages shall be conducted using all connected building load.
- D. The equipment shall be left in good operating order and the settings of all alarm and shutdown devices verified.

- E. The diesel fuel required for testing shall be supplied by the electrical contractor, upon engineer acceptance of the tests results the electrical contractor shall fill the generator's base tank and make the unit completely ready for full operation.

3.03 OPERATION AND MAINTENANCE MANUALS

- A. Furnish Operation and Maintenance Manuals as specified in Section 01730.
- B. Maintenance instructions shall be furnished for batteries, to include simple and clear procedures for addition of liquids, maintaining cleanliness, proper ventilation, proper electrical connections.
- C. Maintenance instruction shall be furnished for engines, including recommended lubricants, coolants, etc., recommended maintenance intervals, and recommended ventilation requirements.
- D. The Operating manual shall be a simple starting and stopping procedure, with reference to shop drawings information for more complicated procedures.

- END OF SECTION -

SECTION 16721

FIRE ALARM SYSTEMS

1.00 PART 1 – GENERAL

1.01 SCOPE

- A. The work of this subsection includes the furnishing and installing of complete addressable fire alarm systems for the Operations Building and Pump Gallery as specified herein and as shown on the drawings. Each system shall be capable of standalone operation and being networked via fiber optics with existing fire alarm panels at the facility and act as one overall plant fire alarm system. The system shall be electrically supervised, connected, tested and left in first class operating condition.
- B. The fire alarm systems provided shall be Edward EST3X to match the existing fiber optic networked fire alarm control panels in the Operations Building and Chemical Building at the plant, no exceptions. Existing conventional devices in the Operations Building and Pump Gallery are connected to, controlled by, and monitored by an existing conventional zone fire alarm control panel located in the Operations Building's lobby. The Operations Building's EST3X fire alarm control panel monitors the conventional system and is connected to an existing 16 zone radio master box. The conventional system including all device, conduit, and wire shall be completely removed after the new system control panels and devise are installed, tested, and accepted by the local fire department.
- C. The systems shall consist of, but shall not be limited to, fire alarm control panels and associated data highway, fire and smoke detection devices, manual pull stations, audible/visual alarms, alarm annunciator, fiber optic networking equipment, conduit, fittings, outlet boxes and wire, operating instructions and maintenance instructions.
- D. The General Contractor and Electrical Contractor shall meet with the local fire department prior to submitting any shop drawings for this project

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. The system riser diagram shall indicate every alarm control panel, terminal panel, actuating device, annunciator panel and the required interconnecting wiring with wire type, quantity and raceways sizes.
 - 2. Description of system operation, of each panel and device.
 - 3. Original copies of catalog cuts of all devices, modules, batteries, battery chargers, etc. Copies of internet based data shall not be acceptable.
 - 4. Battery load calculations for each panel.
 - 5. Operating instructions and maintenance procedures. Operating instructions shall be furnished separate from manufacturers standard catalog literature and shall

include recommended customer troubleshooting procedures. Maintenance procedures shall be furnished separate from manufacturer's standard catalog literature and shall include battery maintenance, lamp and fuse replacement, detector periodic checking and reset procedures, and other applicable procedures.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.04 DESIGN CRITERIA

- A. The equipment, wiring and completed installation shall be in compliance with local and national codes, Rhode Island Fire Safety Code, authorities having jurisdiction, the local Fire Department, and in accordance with applicable sections of the latest edition of NFPA 72 for Fire Alarm Systems.
- B. All equipment shall be listed by National Fire Protection Association, Underwriters Laboratories and/or the Factory Mutual System.
- C. The equipment manufacturer shall have a local branch office within 75 miles staffed with trained, full time employees who are capable of performing testing, inspecting, repair and maintenance services for the life of the fire alarm system.
- D. All components of the system shall have been tested for compatibility with each other to ensure the system performs all intended functions.
- E. System Operation
 - 1. The operation of a manual station or activation of any automatic alarm initiating device (system smoke, heat) shall automatically:
 - a. Initiate the transmission of the alarm via an existing radio masterbox.
 - b. Sound a code 3 temporal evacuation signal over all audio circuits.
 - c. Flash all visual signals throughout the building in a synchronized manner.
 - d. Flash an alarm LED and sound an audible signal at the Fire Alarm Control Panel (FACP). Upon Acknowledgment, the alarm LED shall light steadily and the audible shall silence. Subsequent alarms shall re-initiate this sequence.
 - e. Visually indicate the alarm initiating device type and location via the LCD display located at the FACP.

- f. Automatically shut down or control HVAC equipment. Manual override controls and programmable relay interface shall serve as an interface to the HVAC equipment.
 - g. Activate the exterior weatherproof beacon.
2. The operation of a carbon monoxide detector shall automatically:
- a. Sound a code 4 temporal evacuation signal over the detector's sounder base.
 - b. Illuminate the red alarm LED on the detector.
 - c. Flash an alarm LED and sound an audible signal at the FACP and remote annunciator. Upon Acknowledgment, the alarm LED shall light steadily and the audible shall silence. Subsequent alarms shall re-initiate this sequence.
 - d. Visually indicate the alarm initiating device type and location via the LCD display located at the FACP.
3. The control panels shall perform auxiliary control functions on a common or zoned basis as required.
4. All alarm initiating circuits, alarm indicating circuits and annunciator circuits shall be supervised against the occurrence of a break or a ground fault condition in the field wiring. These conditions shall cause a trouble buzzer to sound in the control panel until manually silenced by the buzzer silencing switch.
5. Tripping of the smoke detection supply circuit breaker or a burned out zone lamp will also energize the trouble circuit.
6. The trouble circuit shall be arranged for ringback operation to prevent switch disarrangement during normal supervisory conditions.
7. The system shall also have the capability of indicating the specific alarm initiating device in the trouble condition.

C. System Wiring

- 1. The system shall be wired, connected, and left in first class operating condition. Wiring shall be provided and installed in accordance with NFPA 72, Rhode Island Fire Safety Code and manufacturers drawings. The contract drawings indicate the devices required for each building, the types of devices to be installed, and the general method for connecting the system devices together. The actual number of wires to be installed in each raceway and the size of each raceway shall be in accordance with the manufacturer's drawings.
- 2. Initiating circuits shall be addressable type.

3. Addressable loop wiring shall support all devices shown and allow for a minimum of 25% spare capacity and be wired in a Class X style.
 4. As a minimum, power supplies and notification appliance circuits shall operate all devices shown plus 25% spare capacity, and be wired in a Class A style.
- D. Fiber Optic networking cable shall be per manufacture recommendations.
- E. System shall be addressable microprocessor based and shall provide the following features:
1. Sufficient memory to perform as specified and as shown for addressable system.
 2. Individual identity of each addressable device for the following conditions: alarm; trouble; open; short; and appliances missing/failed remote detector - sensitivity adjustment from the panel for smoke detectors.
 3. Capability of each addressable device being individually disabled or enabled from the panel.

1.05 SPARE PARTS

- A. Provide one detector and one audio/visual device of each type to the town at the conclusion of all work.

2.00 PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. The basis of design is based on the Notifier NFS-320 fire alarm system similar networking type systems by Gamewell and Faraday are acceptable. Systems by Siemens and Simplex are not allowed.

2.02 FIRE ALARM CONTROL PANEL

- A. Provide and install Fire Alarm Control Panels (FACP). The system shall support analog/addressable devices, expandable in a true peer-to-peer network (multi-panel) configuration.
1. Monitor all initiating devices, report to each network node, annunciate the alarmed device and its' location, capture elevators, conduct smoke control functions, and initiate the audio/visual evacuation signaling and control sequences as described herein.
 2. Conduct municipal notification as described herein.
 3. Initiating devices shall respond with their condition. Control relays shall be individually addressable by the system to respond automatically in the event of an alarm of related sensors. Manual override of control relays shall be individually addressable by the operator.

- B. Control Configuration: All fire alarm control portions of the system shall be housed in red locking, semi-flush mounted enclosures. All panel initiating and control status indicators shall be visible through a clear Lexan window. Access to the control panel shall be by keys issued to the Fire Department and authorized personnel. Each panel shall incorporate an operator interface, CPU, addressable loop interface cards, audio control/microphone, amplifiers, power supply and batteries to perform the system operation as described herein.
- C. Primary Operator Control: The FACP shall provide an operator interface module consisting of a backlit LCD display to display all system alarm, trouble and supervisory conditions, and shall provide common control switches for system status scrolling, alarm acknowledge, trouble acknowledge, reset, and system drill. The unit shall have LED indicators for Normal Power Status, Alarm, Supervisory, Trouble and Test/Program.
- D. Addressable Loop Interface: Provide an addressable loop interface card for each addressable signaling line circuit. Each circuit shall support digital communications with addressable field devices. The addressable loop interface shall support the following features and functions:
1. Provide full digital communications with analog field devices.
 2. An integral alarm relay which will support alarm operation in the event of a failure of addressable loop data communications.
 3. The interface card shall support the retrieval of the following information from each individual analog system device:
 - a. Device serial number
 - b. Device address
 - c. Device type and personality code
 - d. Date of manufacture
 - e. Hours in use
 - f. Number of alarms and troubles
 - g. Time and date of last alarm
 - h. Amount of environmental compensation left/used
 - i. Last maintenance date
 - j. Current detector sensitivity values
 - k. Diagnostic information (trouble codes)
- E. Auxiliary Control / Annunciation: Provide auxiliary annunciator switch and LED modules for simple LED annunciation, zone disconnect, HVAC override, or other related monitoring and control functions. These are intended for use by the Fire Department during an event, or by authorized personnel during testing periods. Keypad entered commands for these functions shall not be an acceptable substitute. Alarm LEDs and zone disconnect switches shall be provided by type of device on a per floor/zone basis. Provide a minimum of 64 discreet programmable alarm LEDs, and 32 discreet programmable 2-position control switches with corresponding LED indicators.

- F. System Power Supplies: Integral system power supplies shall provide 12amps of 24VDC operating and emergency power to each panel. Each supply shall contain brownout, low battery detection, system ground fault, and LED indicators for loss of AC or CPU failure.

2.03 INTELLIGENT SYSTEM DEVICES

- A. Provide intelligent analog devices where shown and required. Each device shall retain operating characteristics in non-volatile memory and conduct algorithms to distinguish real fire conditions from unwanted nuisance alarms. All analog devices shall provide dual LED indicators, a green LED shall flash to denote active communication, and a red LED shall flash to denote an alarm condition. Devices shall be interchangeable with twist-lock bases which may include a supervised remote LED output, fault isolation circuitry, or an auxiliary relay contact. In the event of an addressable loop communications failure, devices shall remain capable of initiating an alarm sequence.
- B. Multi-sensing Smoke Detector: Provide multi sensing analog smoke detectors where shown on contract drawings and required. Each detector shall employ photoelectric and thermal sensing principles.
- C. Heat Detectors: Provide fixed temperature 135 degrees F vapor-tight industrial grade units connected to monitor modules.
- D. Explosion Proof Heat Detectors: Provide fixed temperature 135 degrees F explosion proof units connect to monitor modules in all NEMA 7 areas. Units shall be rated for Class I, Division 1, Groups C and D hazardous areas.
- E. Carbon Monoxide Detector: Provide analog carbon monoxide detectors where shown and required. Each detector shall employ an electrochemical sensing cell. The detector shall have an red LED alarm notification and audio sounder base.
- F. Intelligent Manual Pull Stations: Provide intelligent addressable manual stations where shown on contract drawings and required. The station shall be double action type with screw terminals, toggle switch, and integral addressable electronics. The station shall be constructed of red Lexan with white raised letters and a key reset switch. The station shall be keyed alike to the FACP.
- G. Explosion Proof Manual Pull Stations: Provide double action type explosion proof units connect to monitor modules in all NEMA 7 areas. Units shall be rated for Class I, Division 1, Groups C and D hazardous areas and be constructed of a red colored copper-free cast aluminum alloy with either white lettering or red lettering in a white background.
- H. Monitor Module: Provide addressable input monitor modules to monitor related systems or integrate conventional initiating devices onto the addressable loop.
- I. Control Module: Provide addressable output control modules to supervise and control conventional devices (indicating circuits, AHUs, door holders, electric door locks etc.) over the addressable loop. Control modules shall provide a supervised output rated for 1, 2 or 5 amps @ 24VDC and 120VAC, as required by the conventional device.

- J. Isolation Modules: Provide Isolator Modules to protect circuit integrity in the event of a wiring fault. Provide a minimum of one module per floor/zone, or one for every 25 devices; whichever is greater.

2.04 PRIMARY NOTIFICATION APPLIANCES

- A. Primary Notification Appliances: Flush mounted combination Audio/Visual Horn/Strobe type signaling appliances. Stand alone devices may be used to augment combination units when necessary. Specific audible and visual characteristics shall be as follows:
 - 1. Visual Signals shall be self-synchronizing xenon strobes in compliance with NFPA 72. Strobes shall have an effective intensity rating of 15 candela in corridors and other areas up to 20' x 20', 30 candela in areas up to 30' x 30' and 110 candela in areas up to 50' x 50'.
 - 2. Audible Signals shall be horns in compliance with NFPA 72, 24 Volt dc polarized type with a minimum sound output shall be 90 db at 10 feet
- B. Explosion Proof Horn & Strobe: Provide explosion proof units consisting of a separate horn with and strobe device in all NEMA 7 areas. Units shall be rated for Class I, Division 1, Groups C and D hazardous areas and conform to the candela and db ratings listed paragraph 2.04.A.
- C. Exterior Strobe: Provide a flashing weatherproof strobe with a minimum 150,000 candlepower output where shown. The strobe shall be properly installed on a weatherproof backbox.

2.05 SYSTEM ACCESSORIES

- A. Terminal Cabinets: Provide fire alarm terminal cabinets where necessary. The cabinets, which shall have a removable hinged cover with key lock and red finish are intended to house analog/addressable modules and facilitate field wiring junctions.
- B. Auxiliary Power Supplies: Where the power requirements exceed that which is supplied by the FACP, auxiliary power supplies may be used. Each auxiliary power supply shall be supervised for loss of AC power and Battery Fail, and each notification circuit served shall be individually supervised.

3.00 PART 3 – EXECUTION

3.01 INSTALLATION

- A. Installation shall be supervised and tested by the system supplier. The work shall be performed by skilled technicians under the direction of experienced engineers, all of whom are properly trained and qualified.
- B. All wiring for the system shall be in accordance with Articles 760, 725, and 800 of the National Electrical Code and local electrical codes.

- C. Wiring shall be No. 14AWG Type XHHW copper type. All wiring shall be color coded. All wiring shall be tagged at each junction point. Proper connectors shall be installed at terminations to accept the No. 14 AWG wiring.
- D. Provide complete wiring and conduit between all equipment. All devices shall be mounted upon and splices made in UL listed boxes. Wiring splices and transposing or changing of colors will not be permitted. All wiring shall be installed in raceway as specified in SECTION 16130, RACEWAYS AND FITTINGS
- E. No conduit smaller than ¾ inch shall be installed.
- F. All fire alarm raceway system including junction boxes shall be painted red.
- G. Conduit sizes and wire quantities shall be suitable for the equipment furnished. The Electrical Subcontractor shall review the proper installation of each type of device with the equipment supplier.
- H. Fire Alarm control systems and equipment shall be connected to separate dedicated branch circuits, sized as required for proper service. Circuits shall be labeled 'FIRE ALARM'.

3.02 FINAL TESTS / WARRANTY

- A. The system shall be fully tested by a UL certified testing company, in accordance with UL guidelines and NFPA standards. Each and every device shall be tested.
- B. A copy of the final test report and UL certificate shall be submitted indicating proper functioning of the system and conformance to the specifications. The test shall be performed by UL certified and factory-trained qualified technicians. Each and every device shall be tested, and standalone operation of remote panels shall be verified. Final testing [and UL certification] shall be performed by the same company that will hold and execute the Test and Inspection contract.
- C. The manufacturer shall guarantee all system equipment for a period of three (3) years from the date of final acceptance.
- D. The contractor shall guarantee all raceways and wiring to be free from inherent mechanical or electrical defects for one (1) year from the date of final acceptance of the system.

3.03 FIRE ALARM TEST AND INSPECTION CONTRACT

- A. Each contractor shall include as part of their base bid the cost of a one-year test and inspection contract. This contract shall provide for quarterly tests according to UL, NFPA and local requirements. Upon its' expiration, the contract shall be renewable by the town.

3.04 TRAINING

- A. The contractor shall provide the services of the manufacturer's representative for a period of 4 hours, during normal business hours, to instruct the owner's designated personnel and fire department response teams on the operation of the system.

- END OF SECTION -

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