City of Dover

March 16, 2018

To Whom It May Concern:

The City of Dover will receive sealed bids on April 17, 2018 at 2:30 p.m. local time for the **SILVER LAKE PUMP STATION REPLACEMENT PROJECT, BID NO. 18-0026PW.** The bid must be submitted in three paper copies and one electronic copy in PDF format on either a flash drive or a CD/DVD. The electronic copy must be included in the submission package. Prices must be firm for at least 90 days. If prices are not bid as firm, the bid *may* be considered non-responsive.

Late Bids – A bid received after the closing date and time for receipt of the bids is late and shall not be considered. It is the responsibility of the bidder to ensure that the bid is received prior to the closing date and time.

All vendors must complete the Invitation to Bid notice and return it to doverwhse@dover.de.us or fax it to (302) 736-7178 if they intend to bid. Any vendor not returning the form may not receive published addenda.

Your proposal is not revocable for ninety (90) days following the response deadline indicated above.

If you have questions concerning this Invitation to Bid, they must be made in writing and addressed to the Purchasing Manager, 710 William Street, Dover, DE 19904 or emailed to doverwhse@dover.de.us. **All questions must be submitted no later than March 28, 2018**. All changes or corrections to this ITB will be handled by addenda issued by the Purchasing Manager. The receipt of all Addenda must be acknowledged in the proposal submission.

All copies of any bids/proposals submitted in response to this request shall be considered the property of the City of Dover and shall not be returned to the bidder.

Conflict of Interest Clause:
Pursuant to Dover Code, Chapter 30, Section 30-33, No city employee or official may participate on behalf of the city in the review or disposition of any matter pending before the city in which he has a personal or private interest. No city employee or official shall benefit from any contract with the city, nor solicit any contract, and shall not enter into any contract with the city (other than an employment contract). No person who has served as a city employee or official shall represent or otherwise assist any private enterprise on any matter involving the city, for a period of two years after termination of his employment or elected or appointed status with the city, if he gave an opinion, conducted an investigation or otherwise was directly and materially responsible for such matter in the course of his official duties as a city employee or official. All parties hereto declare and affirm that no officer, member, or employee of the City, and no member of its governing body, and no other public official of the City who exercises any functions or responsibilities in the review or approval of the undertaking described in this contract, or the performing of services pursuant to this contract, shall participate in any decision relating to this contract which affects his or her personal interest, or any corporation, partnership, or association in which he or she is directly or indirectly interested; nor shall any employee

of the City, nor any member of its governing body, have any interest, direct or indirect, in this contract or the proceeds thereof.

Bids will be opened publicly at the time and place designated in this letter. The main purpose of the bid opening is to reveal the name(s) of the bidder(s), not to serve as a forum for determining the low bidder(s).

The contract shall be awarded within 90 days of the closing date to the bidder who is determined in writing to be most advantageous to the City. All prices must be held firm for a minimum of 90 days from the date of the bid opening. The bids, summaries, and tabulations shall not be open for public inspection until after receipt of a fully executed contract.

The City of Dover reserves the right to waive technicalities, to reject any or all bids, or any portion thereof, to advertise for new proposals, to proceed to do the work otherwise, or to abandon the work, if in the best interest of the City.

Minority, women, veteran, service disabled veteran, and individuals with disabilities owned vendor preference shall be three percent (3%) of the value of the award. **The vendor must identify qualification and claim to the preference on the submitted proposal documents. The vendor must provide authoritative proof of minority ownership such as identification in the certification directory maintained by the State of Delaware Office of Supplier Diversity to qualify for this preference.** This preference is to be considered as a stand-alone and cannot be added to any other preference that may be allowed. This preference shall not apply to subcontractors.

Local vendor preference shall be considered for materials, equipment, construction contracts, and utility contracts. Local vendor preference shall be three percent (3%) of the value of the award. The term local vendor is defined as a gradually increasing range with preference assigned as follows:
Rule 1: Vendor located within the city limits of the City of Dover.
Rule 2: Vendor located within Kent County, Delaware (applicable only if no vendor qualifies under rule 1)
Rule 3: Vendor located within the State of Delaware (applicable only if no vendor qualifies under rules 1 & 2)

In the event that no vendor qualifies under rules 1, 2, or 3, no local vendor preference will be awarded. **The vendor must identify qualification and claim to the preference on the submitted documents.** This preference is to be considered as stand-alone and cannot be added to any other preference that may be allowed.

All bids are to be received by the Procurement Office, 710 William Street, Dover, DE, 19904 no later than the 2:30 p.m. bid opening. All bids will be opened in the presence of the Procurement Manager or his/her designee. All bids shall become public record and shall be available for public inspection after it has been determined that there is no proprietary information contained within the bids. Any and all proprietary information contained within the bid must be clearly marked. The cover must indicate that the bid contains such information. **Copies** of the bids will not be provided to competing vendors.

A bid bond or certified check in the amount equivalent to ten percent (10%) of the proposal amount shall be required with each proposal. Acceptable bid security shall be limited to a bid bond in a form satisfactory to the City underwritten by a company licensed to issue bid bonds in this state or a bank certified check. If a bid does not comply with security requirements, it shall be rejected as being non-responsive. The check or bid bond of the bidder to whom the contract is awarded will be forfeited to the City of Dover as liquidated damages in case the contract and performance bond are not executed within fifteen days after receiving official notification of award.

A performance bond shall be required from the successful bidder for a construction contract. Such a bond shall be for the full amount of the contract. If the contractor fails to provide such a bond or a binder within fifteen days of the award of the contract, the award of the contract or the contract shall be void. The bond shall be released by the City of Dover upon successful completion of the contract and upon a detailed inspection of the contracted work.

In the event the contractor does not fulfill its obligations under the terms and conditions of this contract, the City of Dover may contract for an equivalent product on the open market. Any difference in cost between the contract prices herein and the price of open market product shall be the responsibility of the contractor. Under no circumstances shall monies be due the contractor in the event open market products can be obtained below contract cost. Any monies charged to the contractor may be deducted from an open invoice.

Neither the contractor nor the City of Dover shall be held liable for non-performance under the terms and conditions of this contract due, but not limited to, government restriction, strike, flood, fire, or unforeseen catastrophe beyond either party's control. Each party shall notify the other in writing of any situation that may prevent performance under the terms and conditions of this contract.

Vendors must provide references to the City of Dover upon request. Vendor references may be checked to verify their ability to perform the contract requirements, the quality of work and the ability to meet obligations.

ENVELOPES MUST BE MARKED "SILVER LAKE PUMP STATION REPLACEMENT PROJECT, BID NO. 18-0026PW, BID OPENING APRIL 17, 2018, 2:30 P.M." No faxed or electronic bids will be accepted.

The City of Dover shall have the right to reject any or all bids if deemed to be in the best interest of the City, such as but not limited to local vendor preference and minority vendor preference while awarding bids.

Sincerely,

Barry Wolfgang
Acting Contract and Procurement Manager
City of Dover
(302) 736-7795
Fax (302) 736-7178
bwolfgang@dover.de.us
www.cityofdover.com

City of Dover

INVITATION TO BID NOTICE

Bid Number: 18-0026PW Bid Opening: April 17, 2018, 2:30 p.m.

Description: Silver Lake Pump Station Replacement

If you are interested in the invitation to bid described above, you can download the instructions in Adobe PDF format from our web site http://www.cityofdover.com/bid-procurement. Any amendments of other additional information related to this solicitation will be posted with the original document on the web site.

If you do not have internet access and want to receive this request for proposal, all subsequent amendments, or additional information on the bid package, please provide the requested information to:

The City of Dover
Purchasing Office
710 William Street
Dover, DE 19904
Fax: (302) 736-7178, attention Barry Wolfgang
Phone: (302) 736-7795
e-mail: bwolfgang@dover.de.us

Please complete the following and return this form to the Procurement Office:

Company:		Vendor Response /Request
Address		____ No bid at this time, please retain on bid list
		____ Please send complete Bid/RFP package
Contact:		____ I will download the Bid/RFP package
Phone		____ I intend to bid
Fax		____ I do not intend to bid
e-mail for ITB/RFP		____ Other:

CITY OF DOVER, DELAWARE

INVITATION TO BID

FOR

SILVER LAKE PUMP STATION REPLACEMENT

March 2018

BID NUMBER
18-0026PW

Issued By:
City of Dover
Procurement Office
710 William Street
Dover, Delaware 19904
(302) 736-7795
Fax (302) 736-7178

Prepared By:

Engineering A Brighter Future

121 Continental Drive, Suite 208
Newark, DE 19713
(302) 266-9600

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ADVERTISEMENT FOR BIDS

Sealed bids will be received on behalf of the City of Dover, (herein called the "Owner") at the City of Dover, City of Dover Procurement Office, 710 William Street, Dover, DE 19904 no later than 2:30 p.m. EST on Tuesday April 17, 2018. Bids will then be publicly opened and read aloud immediately thereafter for the following:

Silver Lake Pump Station Replacement
Bid No.: 18-0026PW
Contract Duration 180 Days

This work is detailed in the **Silver Lake Pump Station Replacement, Bid No.: 18-0026PW**. The work includes the replacement of the existing skid mounted vacuum primed pump station complete with new pump control panel, valving, piping, site work and electrical improvements.

- Drawings and Specifications, including the bid forms, may be obtained on CD, in PDF format, for $50.00 from the City of Dover Department of Public Works, 15 Loockerman Plaza, Dover, DE 19901. Drawings and Specifications Fees are **NON-REFUNDABLE**. If picking up CD at the DPW office, **please contact 302-736-7025 to provide 48 hours' notice before pickup so that the CD will be ready upon arrival.**
-
- Specifications, including the bid forms, will be available on the City of Dover's procurement website (http://www.cityofdover.com/Bid-Procurement/). The Contractor is responsible for all printing costs if so desired.
- A copy of the Drawings and Specifications will be held at the City of Dover Department of Public Works, 15 Loockerman Plaza, Dover, DE 19901 for review.

Local vendor preference shall be considered for materials, equipment, construction contracts, and utility contracts. Local vendor preference shall be three percent (3%) of the annual value of the award. The term local vendor is defined as a gradually increasing range with preference assigned as follows:

- Rule 1: Vendor located within the city limits of the City of Dover.
- Rule 2: Vendor located within Kent County, Delaware (applicable only if no vendor qualifies under Rule 1).
- Rule 3: Vendor located within the State of Delaware (applicable only if no vendor qualifies under Rule 1 or 2)

If in the event no vendor qualifies under Rules 1, 2 or 3 no local vendor preference will be awarded. **The vendor must identify qualification and claim to the preference on the submitted bid documents.** The preference is considered as standalone and cannot be added to any other preferences that may be allowed.

Minority owned vendor preference shall be three percent (3%) of the value of the award. **The vendor must identify qualifications and claim to the preference on the submitted bid documents. The vendor**

must provide authoritative proof of minority ownership such as identification in the certification directory maintained by the State of Delaware, Department of Administrative Services, Office of Minority and Women Business Enterprises to qualify for this preference. The preference is considered as standalone and cannot be added to any other preferences that may be allowed. This preference shall not apply to subcontractors.

Each BID must be accompanied by a BID BOND payable to the Owner for ten (10) percent of the total amount of the BID. No Bidder may withdraw his bid within ninety (90) days after the actual date of the opening thereof.

The right is reserved, as the interests of the City of Dover may appear, to reject any and all bids, to waive any information in bids received, and to accept or reject any items of any bid.

City of Dover, Delaware

By Barry Wolfgang
Acting Contract and Procurement Manager
City of Dover

SECTION ITB

INVITATION TO BIDDERS

BID NUMBER: 18-0026PW

Sealed Bids, three (3) paper copies and one (1) electronic copy, will be received by the City of Dover, City of Dover Procurement Office, 710 William Street, Dover, DE 19904 no later than **2:30 P.M.** on **Tuesday, April 17, 2018** for the general construction of the **Silver Lake Pump Station Replacement** project, at which time the bids will be opened publicly and read aloud.

I. NAME OF SOLICITING GOVERNMENT

City of Dover, Delaware
City Hall – The Plaza
P.O. Box 475
Dover, Delaware 19903-0475

II. PURPOSE OF REQUEST

A. The work under this project includes bypass pumping the site during the entirety of the work, demolition of an existing pumping station, installation of a new bypass piping connection with shutoff valves, connection to an existing force main, installation of a new vacuum primed pumping skid complete with two (2) Smith and Loveless 4B2X centrifugal pumps, one (1) pump control panel complete with circuit breaker, motor starters - Variable Frequency Drives (VFD's), level control system consisting of a level transducer and backup floats, wet well access ladder, new electrical equipment rack and pad, new electric meter socket, new main disconnect, manual transfer switch, generator receptacle, branch circuit panel board, disconnect switches, replacement of the existing SCADA RTU with a HighTide SCADA RTU, coordination with City's SCADA integrator for interconnection of new pump control panel to proposed HighTide SCADA RTU, new site lighting and site restoration. It is anticipated that this project will be completed within one hundred eighty (180) calendar days.

B. The Contractor shall and will furnish and deliver to the City all labor, materials and equipment to successfully complete the work of this Contract, of which all construction documents are a part, and which is generally described as the replacement and relocation of a vacuum prime pumping skid, installation of a new bypass piping connection, rehabilitation of the existing wet well, electrical work, sediment and erosion control, traffic control, surface restoration and all other appurtenances and incidental items of the work complete and in place.

C. The City of Dover (the City) invites written bids from qualified contractors that are interested in providing services, as outlined below.

III. SCOPE OF WORK

A. The work to be done is covered in the Construction Documents (Drawings) titled Silver Lake Pump Station Replacement and in the project technical specifications titled Silver Lake Pump Station Replacement, Section 01 10 00- Summary

B. All implements, machinery, tools, maintenance of traffic (traffic control), erosion and sediment control, equipment, and material, shall be provided by the contractor, including the labor necessary for the removal of the existing pumping station and the installation of the new pumping station and shall furnish and do everything necessary to make the work perfect, complete, neat and finished. The Contractor shall leave all the work to be done under this Contract in this condition at the time the work is finally inspected.

IV. STATEMENT OF QUALIFICATIONS (SOQ)

A. All contractors submitting bids shall include the following: an acceptable experience record, an acceptable equipment schedule and any other documents deemed necessary by the City of Dover. Below is a detailed list of the items that must be submitted to the City of Dover on the date of the bid opening.

1. Business name and contact person, together with the address, telephone number, facsimile number and email address, of the office from which the services will be provided.

2. Proof of insurance, complying with the **Instructions to Bidders** Section, including the following documentation:

    - Certificate of Insurance
    - Declaration Page
    - Insurance policy documents

3. A financial statement prepared by an independent certified public accountant or an independent public accountant holding a valid permit issued by an appropriate State licensing agency and shall have been so prepared as to reflect the financial status of the submitting company. This statement must be current and not more than one (1) year old. In the case that the bid date falls within the time that a new statement is being prepared, the previous statement shall be updated by proper verification.

4. Identify the personnel who will manage and supervise this project, as well as the staff responsible for jobsite safety, quality control and other specialties. Provide each person's title and project-specific responsibilities, and resume. Lack of detailed information on the resumes may result in a less favorable evaluation. Provide an organization chart diagram if necessary to clearly explain the lines of authority, duties & responsibilities.

5. The bidder shall provide documentation showing satisfactory performance as the prime contractor (General Contractor) responsible for the complete construction of five (5) similar projects within the past five (5) years. Projects considered "similar" are defined as those with two or more of the following characteristics:

    - Experience in construction of similar sized pump station projects
    - Experience in construction of any sized pump station projects
    - Experience with pump station construction in the State of Delaware
    - Bidders past performance and experience working with proposed subcontractors
    - Contractor's understanding of the project's intent, goals and objectives

6. Documentation that the business is licensed, insured and authorized to do work in the State of Delaware and the City of Dover

7. A minimum of three (3) references must be provided. Governmental references preferred. For each reference listed, the information provided should consist of the following:

   (1) **Name and mailing address of the owner/business**

   (2) **Name and telephone number of your contact person within said business**

   Provide a list of references the City may contact in order to assist in the evaluation of your past performance. Please limit these references to owners of projects that involved the installation of pump stations.

8. The City's plan is to complete the proposed work by the end of December 2018. Provide documentation stating that your business has the available equipment, manpower resources and ability to meet the proposed schedule.

9. Provide documentation that shows that your business has a current safety plan and or policy in place and conducts periodic safety training.

10. Information on the nature and magnitude of any litigation or proceeding whereby, during the past three (3) years, a court or any administrative agency has ruled against the bidder in any matter related to the professional activities of the bidder. Similar information shall be provided for any current or pending litigation or proceeding.

11. A statement to the effect that the selection of the bidder shall not result in a conflict of interest with any other party which may be affected by the work to be undertaken. Should any potential or existing conflict be known by a bidder, said bidder must specify the party with which the conflict exists or might arise, the nature of the conflict, and whether or not the proposer would step aside or resign from the engagement or representation creating the conflict. (The City reserves the right to select more than one firm to perform the required services to avoid conflict of interest and other similar occurrences.)

12. Any additional information that you feel will be beneficial to the City in evaluating your qualifications to perform the proposed scope of work.

V. COMPENSATION

A. The bid should clearly state the fee to be charged for the proposed work and should be provided on the attached Bid Form three (3) copies.

END OF SECTION ITB

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SECTION IB

INSTRUCTIONS TO BIDDERS

I. BID SUBMISSION

A. All bids should be delivered to:

Barry Wolfgang
Acting Contract and Procurement Manager
City of Dover Procurement Office
710 William Street
Dover, Delaware 19904

B. Questions regarding scope of services or bid process:

1. To ensure fair consideration for all bidders, communication to or with any department or departmental staff during the submission process, will be prohibited except as provided in the third paragraph below. Any communication between proposer and the City will be initiated by the appropriate staff member in order to obtain information or clarification needed to develop a proper, accurate evaluation of the bid. Such communications initiated by a bidder may be grounds for disqualifying the offending bidder from consideration for award of the bid and/or any future bid.
2. Any questions relative to interpretation of the scope of services or the bid process, shall be addressed as indicated below, in ample time before the period set for the receipt and opening of bids.
3. Questions or comments should be directed **in writing** to:

Barry Wolfgang
Acting Contract and Procurement Manager
City of Dover Procurement Office
710 William Street
Dover, Delaware 19904
Facsimile Number: (302) 736-7178
E-mail address: bwolfgang@dover.de.us

C. In order to be acceptable, **three (3) paper copies and one (1) electronic copy of the bid must be submitted in a sealed envelope on the outside of which shall be plainly marked "Sealed Bid: Silver Lake Pump Station Replacement ITB Opening April 17, 2018, 2:30 P.M. Bid No.: 18-0026PW",** together with the name, address, and license number, if applicable, of the company submitting the bid. Bids will be received until **2:30 P.M.** or hand delivered no later than **2:30 P.M.** on April 17, 2018, at which time they will be publicly opened in the **City of Dover Procurement Office, 710 William Street, Dover, Delaware 19904**.

D. Bidders are fully responsible for the timely delivery of bids. Late bids will not be accepted and will be returned to the proposer unopened. Telegraph, telephone, facsimile machine, and electronic mail proposals will not be accepted under any circumstances.

E. In the event that personal interviews are deemed necessary, and your business is included among those selected for interview, you will be contacted in order to schedule a mutually agreeable date and time for the interview.

F. It is anticipated that a final decision on the business to be selected will be made within 30 days or upon approval by City Council, whichever occurs earlier. All bidders will subsequently be contacted and advised of the Department's decision.

II. TERMS AND CONDITIONS

A. The City reserves the right to reject any or all bids, with or without cause, to waive technicalities, or to accept the bid which in its judgment best serves the interests of the City. The City further reserves the right to award the contract to the next most qualified bidder if the successful bidder does not execute a contract within thirty (30) days after being notified of the award of the bid.

B. The City reserves the right to request clarification of information submitted and to request additional information from one or more bidders. All costs associated with the presentation of the proposal and any supplemental information shall be borne solely by the bidder, and shall not be passed on to the City under any circumstances.

C. Any bid may be withdrawn until the date and time stated above for the opening of the bids. Any bids not so withdrawn shall constitute an irrevocable offer to sell to the City the services indicated for a period of ninety (90) days, or until one or more of the bids have been accepted by the Department, whichever occurs earlier.

D. Any written agreement or contract resulting from the acceptance of a bid shall be prepared on forms either supplied by or approved by the City, and shall contain, at a minimum, applicable provisions of this request for proposals. The City reserves the right to reject any agreement that does not conform to the request for proposals or any other City requirements for agreements and contracts. The following are representative of the provisions to be included within the contract documents:

1. Termination - If through any cause, the firm selected shall fail to fulfill the obligations agreed to in a timely and efficient manner, the City shall have the right to terminate the contract by specifying the date of termination in a written notice to the firm at least thirty (30) days before the termination date. In this event, the firm shall be entitled to just and equitable compensation for the work satisfactorily completed.

2. Assignment - The bidder shall not assign any interest in the contract, and shall not transfer any interest in the same without the prior written consent of the City.

3. Non-discrimination - The successful proposer must specify in the contract that the firm will not discriminate under the contract, against any person as provided in any federal, state, or local government laws and regulations.

4. Certificate of Insurance - The contractor selected must present proof of insurance coverage of a nature and amount deemed adequate by the City, and be willing to execute a hold harmless indemnification for the City.

5. Publication of Information - No reports, information, or data given to or prepared by the firm under the contract shall be made available to any individual or organization by the firm without the prior written approval of the City. This provision shall only apply insofar as it does not conflict with the provisions of the Freedom of Information Act.

E. The successful Bidder shall be required to enter into a contract with the City of Dover which shall reflect the services requested in the Invitation to Bid, within 10 days from the notice of award of contract.

III. INSURANCE REQUIREMENTS

A. Policies Required. At all times during the term of this Project Bid No. 18-0026PW, the Contractor shall keep in force and affect all insurance policies as described below:

- Worker's Compensation and Employers' Liability Insurance. Statutory worker's compensation benefits and employers' liability insurance with a limit of liability no less than that required by Delaware law at the time of the application of this provision for each accident. This policy shall be endorsed to include a waiver of subrogation in favor of the City of Dover. The Contractor shall require subcontractors and others not protected under its insurance to obtain and maintain such insurance.

- Commercial General Liability Insurance. Policy will be written to provide coverage for, but not limited to, the following: premises and operations, products and completed operations, personal injury, blanket contractual coverage, broad form property damage, independent contractor's coverage with Limits of liability not less than $1,000,000 general aggregate, $1,000,000 products/completed operations aggregate, $1,000,000 personal injury, $2,000,000 each occurrence.

- Automobile Liability Insurance. Business automobile policy covering all owned, hired and non-owned private passenger autos and commercial vehicles. Limits of liability not less than $1,000,000 each occurrence, $1,000,000 aggregate.

- Qualification; Priority; Contractors' Coverage. The insurer must be authorized to do business under the laws of the State of Delaware. Such insurance will be primary. All contractors and all of their subcontractors who perform work on behalf of Contractor shall be responsible for carrying, in full force and effect, worker's compensation and employer's liability, and automobile liability insurance coverage.

- Certificate of Insurance; Other Requirements. At the execution of this Agreement and prior to each insurance policy expiration date during the term of this Agreement, Contractor will furnish the City of Dover with a Certificate of Insurance with the CITY named as an additional insured. The Certificate shall reference this Agreement and worker's compensation and property insurance waivers of subrogation required by this Agreement. City of Dover shall be given thirty (30) calendar days advance notice of cancellation or nonrenewal of insurance during the term of this Agreement.

- Limits. The limits of liability set out in this Agreement may be increased by mutual consent of the parties, which consent will not be unreasonably withheld by either party, in the event of any factors or occurrences, including substantial increases in the level of jury verdicts or judgments or the passage of state, federal or other governmental compensation plans, or laws which would materially increase the City of Dover's exposure to risk.

- Deductible/Self-insurance Retention Amounts. Contractor shall be fully responsible for any deductible or self-insured retention amounts contained in its insurance program or for any deficiencies in the amounts of insurance maintained.

V. BID PROCESS SCHEDULE

A. The City will use the following tentative timetable in the selection process:

Date	Event
March 16 &23, 2018	Publicly Advertise ITB #18-0026PW.
March 28, 2018	Deadline for submitting questions
April 10, 2018	Addendum issued/answers to bidder questions published.
April 17, 2018	**BID OPENING Deadline to submit final bids (Bid Opening). (3 original copies by 2:30 pm)**
April 27, 2018	City Completes Evaluation of Bids
May 30, 2018	City Issues Notice of Award
July 2, 2018	Notice to Proceed

END OF SECTION IB

SECTION IFB

INFORMATION FOR BIDDERS

Bids will be received by the City of Dover (herein called the "OWNER") at the City of Dover, City of Dover Procurement Office, 710 William Street, Dover, Delaware 19904, at the date and time stated in the Invitation to Bidders.

Each bid must be submitted in a sealed envelope, addressed to the City of Dover, Attn: Mr. Barry Wolfgang, City of Dover Procurement Office, 710 William Street, Dover, Delaware 19904. Each sealed envelope containing a BID must be plainly marked "Sealed Bid: Silver Lake Pump Station Replacement ITB Opening Tuesday, April 17, 2018 2:30 P.M. Bid No.: 18-0026PW" and the envelope should bear on the outside the name of the BIDDER, his address, his license number, if applicable, and the name of the project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at the City of Dover, 710 William Street, Dover, Delaware 19904.

All BIDS must be made on the required Bid form. All blank spaces for bid prices must be filled in, in ink or typewritten, and the Bid form must be fully completed and executed when submitted. Three (3) hard copies of the Bid form and one electronic copy on flash drive or CD/DVD are required.

A. The OWNER may waive any informalities or minor defects or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No BIDDER may withdraw a bid within ninety (90) days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period; the time may be extended by mutual agreement between the OWNER and the BIDDER.

B. BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID Schedule by examination of the site and review of the drawings and specifications including ADDENDA.

C. Products or equipment of manufactures not named in the specifications may be bid as an "or equal" by using the Add/Deduct Items Section of the Bid Form and stating the name of the substitute manufacturer and the amount to be added to or deducted from the total bid. The evaluation of the bids will be based on using only the named manufacturers unless costs exceed available funds. BIDDER shall list manufacturers of major products and equipment in conformance with specified equipment.

D. After bids have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

E. The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

F. The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any of the conditions of the contract.

G. Each bid must be accompanied by a BID BOND payable to the OWNER in the amount of ten (10%) percent of the total amount of the BID. When the Agreement is executed the BID BONDS of the unsuccessful BIDDERS will be returned. A certified check may be used in lieu of a BID BOND.

H. A PERFORMANCE BOND in the amount of one hundred (100%) percent of the CONTRACT PRICE, with a corporate surety approval by the OWNER, will be required for the faithful performance of the contract.

I. Attorneys-in-fact who sign BID BOND and/or PERFORMANCE BOND must file with each BOND a certified and effective dated copy of their power of attorney.

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

K. The OWNER shall, within ten (10) days of receipt of acceptable PERFORMANCE BOND, and Agreement signed by the party to whom the Agreement was awarded, sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the BIDDER may by WRITTEN NOTICE withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

L. The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and the CONTRACTOR.

M. The OWNER may take such investigations as he deems necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the WORK contemplated therein.

N. To demonstrate qualifications for performing the WORK identified within the CONTRACT DOCUMENTS, BIDDERS have been requested to submit written evidence of financial position, previous experience, current commitments, and license to perform work in the State of Delaware as stated in the Invitation to Bidders. Failure to submit the requested information will be deemed sufficient to disqualify the BIDDER.

O. A conditional or qualified BID will not be accepted. Award will be made to the lowest responsible BIDDER.

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

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

R. The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when requested to do so by the OWNER.

S. The ENGINEER is Johnson, Mirmiran & Thompson, Attn: Mr. Robert A. Koechert, P.E., 121 Continental Drive, Suite 208, Newark, Delaware 19713, Phone: 302-533-3973.

END OF SECTION IFB

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SILVER LAKE PUMP STATION REPLACEMENT
BID NO.: 18-0026PW
CITY OF DOVER, DELAWARE
BID FORM

Date: _____

Bid of_____(hereinafter called "BIDDER"), organized and existing under the laws of the State of Delaware doing business as _____*. To the City of Dover (hereinafter called "OWNER").

In compliance with the Invitation to Bidders, BIDDER hereby proposes to perform all WORK for the Silver Lake Pump Station Replacement project, Bid No. 18-0026PW, in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below. The BIDDER has examined the Drawings and Specifications with related documents and the site of the proposed work, being familiar with all of the conditions surrounding the construction of the proposed project including materials and supplies, and to construct the project in accordance with the CONTRACT DOCUMENTS at the price stated below. The price is to cover all expenses incurred in performing the work required under the Contract Documents of which this Bid is a part.

The BIDDER declares that the attached Specifications and the Drawings therein referred to have been carefully examined and are understood. It is proposed and agreed if the Bid is accepted to contract with the City of Dover the required work in the manner set forth in the Specifications and shown by the Drawings.

*Corporation, Partnership, or Individual as applicable.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within One Hundred Eighty (180) calendar days thereafter. Liquidated damages of $500 per day will be in effect with this PROJECT, refer to Section 00 73 00, paragraph 1.03.

BIDDER acknowledges receipt of the following ADDENDUM (if applicable):

_____ _____
_____ _____
_____ _____
_____ _____

The BIDDER declares that the only person, firm or corporation, or persons, firms or corporations, that has or have any interest in this bid or in the Contract or Contracts proposed to be taken is or are the undersigned; that this bid is made without any connection or collusion with any person, firm or corporation, making a bid for the same work.

Items to be included with Bid: _____Completed Bid Form (3 Hard Copies & 1 Electronic Copy)
_____Bidders Statement of Qualifications
_____Bid Bond (10% of the total amount of the BID)

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, bidder will execute the formal contract attached within 10 days and deliver.

The names and addresses of all members of a firm or the names, addresses, and titles of every officer of a corporation as the case may be, must be given here by the member if the firm or by the officer or agent of the corporation who signs the Bid.

Respectfully submitted:

_____	_____
Signature	Company Name
_____	_____
Title	Address
_____	_____
Date	
_____	_____
License Number (if applicable)	Telephone No.

SEAL – (If BID is by a corporation)

If a Partnership, state names and addresses of Partners here:

_____	_____
_____	_____
_____	_____

SILVER LAKE PUMP STATION REPLACEMENT
BID NO.: 18-0026PW
CITY OF DOVER, DELAWARE

BID FORM

BIDDER agrees to perform the work described in the CONTRACT DOCUMENTS for the following prices:

SCHEDULE OF UNIT PRICES

ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL
1	Bonds and Insurance	Lump Sum	1		$_____
2	Mobilization/Demobilization	Lump Sum	1		$_____
3	Installation, Maintenance, and Removal of Erosion and Sediment Controls	Lump Sum	1		$_____
4	Bypass Sanitary Sewer Flow	Lump Sum	1		$_____
5	Maintenance of Traffic	Lump Sum	1		$_____
6	Unclassified Excavation and Backfill Below Subgrade	C.Y.	100	$_____	$_____
7	Miscellaneous Unclassified Excavation and Backfill	C.Y.	100	$_____	$_____
8	Furnish and Install Monitoring System (HighTide)	Each	1		$_____
9	Pump Station Demolition and Disposal	Lump Sum	1		$_____
10	Reconnection to Ex. Force Main	Lump Sum	1		$_____
11	Macadam Within Pump Station Fence	S.F.	820	$_____	$_____
12	6" DIP CL52 Force Main	L.F.	40	$_____	$_____
13	4” CIP Suction Piping	L.F.	40	$_____	$_____
14	4” Sch. 80 PVC	L.F.	10	$_____	$_____
15	Wet Well Lining	Lump Sum	1		$_____
16	Emergency Bypass Connection	Lump Sum	1		$_____
17	Pump Station and Meter Vault, Complete	Lump Sum	1		$_____

ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL
18	Precast Concrete Manhole	Each	1		$_____
19	Chain Link Fence and Gate, Complete	Lump Sum	1		$_____
20	Davit Arm Base	Each	1		$_____
21	Site Restoration (Topsoil, Seed and Mulch Disturbed Areas)	Lump Sum	1		$_____
22	Pavement Restoration	S.F.	50	$_____	$_____
23	Electrical Work, Complete	Lump Sum	1		$_____

TOTAL STIPULATED SUM $_____

ALTERNATES (None)

_____

Contractor's Name

_____

Signature Title Date

Note:

Contractor shall supply documentation to answer all requirements in the statement of Qualification section, located in Section ITB.

Local Vendor Preference

Circle One: Rule 1 Rule 2 Rule 3 None

Minority Vendor Preference

Circle One: Yes No

END OF SECTION BF

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the Undersigned

_____as

Principal, and _____as Surety, are

Hereby held and firmly bound unto the City of Dover, as OWNER, the penal sum of

_____ ($_____)

for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves,

successors and assigns. Signed, this _____ day of _____2018.

The Condition of the above obligation is such that whereas the Principal has submitted to the City of Dover a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the Installation of the **Silver Lake Pump Station Replacement, Bid No.: 18-0026PW**.

NOW, THEREFORE,

a) If said BID shall be rejected, or

b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attachment hereto (properly completed in accordance with said BID) and shall furnish a BOND for faithful performance of said contract, and for the payment of all persons performing labor and furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the owner may accept such BID; and said Surety does hereby waive notice of any extension.

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, the day and year first set forth above. Surety executing Bonds shall be a licensed agent in the State of Delaware.

_____(L.S.)
Principal

_____ By: _____
Surety

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.

END OF SECTION BB

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AGREEMENT FOR PROFESSIONAL SERVICES

THIS AGREEMENT is made as of the _____ day of _____ in the year 2018, between The City of Dover, a Delaware Municipal Corporation, whose address is 15 Loockerman Plaza, Dover, Delaware 19901 (hereinafter referred to as the CITY), and _____ (COMPANY NAME), whose address is, _____ (hereinafter referred to as the CONTRACTOR).

NOW, THEREFORE, in consideration of the mutual benefits accruing to the parties to this Agreement, and for other good and valuable considerations, the parties agree as follows:

1. SERVICES

The CONTRACTOR shall perform the following services as identified in the: **SEE INVITATION TO BID FOR SILVER LAKE PUMP STATION REPLACEMENT, BID NO.: 18-0026PW AND THE SUBMITTED BID FORM.**

Nothing herein shall limit the CITY's right to obtain proposals or services from other professionals for similar projects at any time the City so chooses.

2. INDEMNIFICATION

The Contractor, and any agent or subcontractor, shall defend, indemnify and hold harmless the City of Dover and its officials, officers, board members, council members, commissioners, representatives, employees, agents, and contractors, against any and all liability, costs, damages, fines, taxes, special charges by others, penalties, payments (including payments made under any Workers' Compensation Laws or under any plan for employees' disability and death benefits), and expenses (including reasonable attorney fees of the City of Dover and all other costs and expenses of litigation). Claims arising in any way, including any act, omission, failure, negligence or willful misconduct, in connection with the work, construction, maintenance, repair, presence, use, or operation by Contractor, or Contractors officers, directors, employees, agents, and sub-contractors, shall be responsible for Claims. Such Claims include, but are not limited to, the following:

A. Intellectual property infringement, libel and slander, trespass, unauthorized use of television or radio broadcast programs and other program material, and infringement of patents;

B. Cost of work performed by City of Dover that was necessitated by Contractors failure, or the failure of Contractors officers, directors, employees, agents, or sub-contractors, to perform work, or maintain City of Dover facilities in accordance with the requirements and specifications of this Agreement, or from any other work authorized under this Agreement;

C. Damage to property, injury to or death of any person arising out of the performance or nonperformance of any work or obligation undertaken by Contractor, or Contractors officers, directors, employees, agents, and sub-contractors, pursuant to this Agreement;

3. PROCEDURE FOR INDEMNIFICATION

A. City of Dover shall give notice promptly to Contractor of any claim or threatened claim, specifying the factual basis for such claim and the amount of the claim. If the claim relates to an action, suit or proceeding filed by a third party against City of Dover, the notice shall be given to Contractor by City of Dover no later than ten (10) calendar days after written notice of the action, suit or proceeding was received by City of Dover.

B. Failure to timely give the required notice will not relieve the Contractor from its obligation to indemnify the City of Dover unless the City of Dover is materially prejudiced by such failure.

C. The City of Dover will have the right at any time, by notice to the Contractor, to participate in or assume control of the defense of the claim with counsel of its choice, which counsel must be reasonably acceptable to the Contractor. The Contractor agrees to cooperate fully with the City of Dover. If the City of Dover so assumes control of the defense of any third-party claim, the Contractor shall have the right to participate in the defense at its own expense. If the Contractor does not so assume control or otherwise participate in the defense of any third-party claim, it shall be bound by the results obtained by the City of Dover with respect to the claim.

D. If the City of Dover assumes the defense of a third-party claim as described above, then in no event will the City of Dover admit any liability with respect to, or settle, compromise or discharge, any third party claim without the Contractors prior written consent, and the Contractor will agree to any settlement, compromise or discharge of any third-party claim which the City of Dover may recommend which releases the City of Dover completely from such claim.

E. Municipal Liability Limits. No provision of this Agreement is intended, or shall be construed, to be a waiver for any purpose by either Utility of any applicable State limits on municipal liability.

F. Disclaimer. The City of Dover makes no express or implied warranties with regard to its structures, fixtures, materials, or other equipment, all of which are hereby disclaimed. The City of Dover makes no other express or implied warranties, except to the extent expressly set forth in this Agreement. The City of Dover expressly disclaims any implied warranties of merchantability or fitness for a particular purpose.

G. Duty to Competent Supervision and Performance. The Contractor shall ensure that its employees, servants, agents, and subcontractors have the necessary qualifications, skill, knowledge, training, and experience to protect themselves, their fellow employees, employees of the Utility, and the general public, from harm or injury while performing work permitted pursuant to this Agreement. In addition, the Contractor shall furnish its employees, servants, agents, and subcontractors with competent supervision and sufficient and adequate tools and equipment for their work to be performed in a safe manner.

H. Duty to Inform. The Contractor further warrants that it understands the imminent dangers (INCLUDING SERIOUS BODILY INJURY OR DEATH FROM FALLING) inherent in the work necessary to perform the work expected under this agreement by Contractors employees, servants, agents, contractors or subcontractors, and accepts as its duty and sole responsibility to notify and inform Contractors employees, servants, agents, contractors or subcontractors of such dangers, and to keep them informed regarding same.

4. INSURANCE

A. Policies Required. At all times during the term of this Agreement, the Contractor shall keep in force and affect all insurance policies as described below:

B. Worker's Compensation and Employers' Liability Insurance. Statutory worker's compensation benefits and employers' liability insurance with a limit of liability no less than that required by Delaware law at the time of the application of this provision for each accident. This policy shall be endorsed to include a waiver of subrogation in favor of the City of Dover. The Contractor shall require subcontractors and others not protected under its insurance to obtain and maintain such insurance.

C. Commercial General Liability Insurance. Policy will be written to provide coverage for, but not limited to, the following: premises and operations, products and completed operations, personal injury, blanket contractual coverage, broad form property damage, independent contractor's coverage with Limits of liability not less than $1,000,000 general aggregate, $1,000,000 products/completed operations aggregate, $1,000,000 personal injury, $2,000,000 each occurrence.

D. Automobile Liability Insurance. Business automobile policy covering all owned, hired and non-owned private passenger autos and commercial vehicles. Limits of liability not less than $1,000,000 each occurrence, $1,000,000 aggregate.

E. Qualification; Priority; Contractors' Coverage. The insurer must be authorized to do business under the laws of the State of Delaware. Such insurance will be primary. All contractors and all of their subcontractors who perform work on behalf of Contractor shall be responsible for carrying, in full force and effect, worker's compensation and employer's liability, and automobile liability insurance coverage.

F. Certificate of Insurance; Other Requirements. At the execution of this Agreement and prior to each insurance policy expiration date during the term of this Agreement, Contractor will furnish the City of Dover with a Certificate of Insurance with the CITY named as an additional insured. The Certificate shall reference this Agreement and worker's compensation and property insurance waivers of subrogation required by this Agreement. City of Dover shall be given thirty (30) calendar days advance notice of cancellation or nonrenewal of insurance during the term of this Agreement.

G. Limits. The limits of liability set out in this Agreement may be increased by mutual consent of the parties, which consent will not be unreasonably withheld by either party, in the event of any factors or occurrences, including substantial increases in the level of

jury verdicts or judgments or the passage of state, federal or other governmental compensation plans, or laws which would materially increase the City of Dover's exposure to risk.

H. Deductible/Self-insurance Retention Amounts. Contractor shall be fully responsible for any deductible or self-insured retention amounts contained in its insurance program or for any deficiencies in the amounts of insurance maintained.

5. CODES, LAWS, AND REGULATIONS

The CONTRACTOR will comply with all applicable codes, laws, regulations, standards, and ordinances in force during the term of this Agreement.

6. PERMITS, LICENSES, AND FEES

The CONTRACTOR will obtain and pay for all permits and licenses required by law that are associated with the CONTRACTOR performance of the Scope of Services.

7. ACCESS TO RECORDS

The CONTRACTOR will maintain accounting records, in accordance with generally accepted accounting principles and practices, to substantiate all invoiced amounts. Said records will be available for examination by the CITY during the CONTRACTOR's normal business hours. Said records will be maintained for a period of three (3) years after the date of the invoice.

8. CONTINGENT FEES PROHIBITED

The CONTRACTOR warrants that he or she has not employed or retained any company or person, other than a bona fide employee working solely for the CONTRACTOR, to solicit or secure this Agreement and that he or she has not paid or agreed to pay any person, company, corporation, individual, or firm, other than a bona fide employee working solely for the CONTRACTOR any fee, commission, percentage, gift, or other consideration contingent upon or resulting from the award or making of this Agreement. In the event of a breach of this provision, the CITY shall have the right to terminate this Agreement without further liability and at its discretion, deduct from the contract price, or otherwise recover, the full amount of any such fee, commission, percentage, gift or consideration paid in breach of this Agreement.

9. PAYMENT

It is understood and agreed by and between the parties hereto that this Contract is in the amount of _____ _____and _____ Dollars [$_____.___] as per the Bid submitted by the Contractor on _____, 2018, and accepted by the City. The Contractor shall submit an invoice on or about the 15th of each month in which the Contract is in effect for the work completed and verified to date. The City shall pay the Contractor's invoice, less 10% retainage, within thirty (30) days of receipt. The application for payment shall include a description and verification of work completed by the Contractor. All requests for payment shall be submitted

on the AIA Document G702 (Application Certificate for Payment) and be accompanied by supporting documentation which will include the percent complete on the bid items identified in the Bid Form. Dates of testing and start-up should be provided to the City as required supporting documentation. Any reimbursement for expenses shall include receipts or copies of the invoices. No other costs or services shall be billed to the CITY.

10. INDEPENDENT CONTRACTOR

The CONTRACTOR is an independent contractor and as such will be responsible for paying his own Federal income tax and self-employment tax, or any other taxes applicable to the compensation paid under this agreement.

11. ASSIGNMENT

Neither party shall have the power to assign any of the duties or rights or any claim arising out of or related to the Agreement, whether arising in tort, contract, or otherwise, without the written consent of the other party. These conditions and the entire Agreement are binding on the heirs, successors, and assigns of the parties hereto.

12. NO THIRD PARTY BENEFICIARIES

This Agreement gives no rights or benefits to anyone other than the CONTRACTOR and the CITY.

13. JURISDICTION

The laws of the State of Delaware shall govern the validity of this Agreement, its interpretation and performance, and any other claims related to it. In the event of any litigation arising under or construing this Agreement, venue shall lie only in Kent County, Delaware.

14. TERM AND TERMINATION

All services to be rendered by the CONTRACTOR within the Scope of Work within the Invitation to Bidders section of the **Invitation to Bid** shall be completed within one hundred eighty (180) calendar days from the date of the Notice to Proceed. All or part of this Agreement may be terminated by the CITY for its convenience on thirty (30) days written notice to the CONTACTOR. In such event, the CONTRACTOR will be entitled to compensation for services competently performed up to the date of termination. In the event of termination not the fault of the CONTRACTOR, the CONTRACTOR shall be compensated for with Reimbursable Expenses then due and all Termination Expenses.

15. CONTACT PERSON

The primary contact person under this Agreement for the CONTRACTOR shall be

Name:_____, Phone No.:_____,

Address:_____.

The primary contact person under this Agreement for the CITY shall be Paul Thompson, Construction Manager, P.O. Box 475, Dover Delaware, 19903. P: 302-736-7029, Public Works Department.

16. APPROVAL OF SERVICE PERSONNEL

The CITY reserves the right to approve the contact person and the persons actually performing the services on behalf of the CONTRACTOR pursuant to this Agreement. If the CITY, in its sole discretion, is dissatisfied with the contact person or the person or persons actually performing the services on behalf of the CONTRACTOR pursuant to this Agreement, the CITY may require the CONTRACTOR assign a different person or persons be designated to be the contact person or to perform the services hereunder.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the respective dates under each signature.

(CONTRACTOR)	CITY OF DOVER
By: _____	By: Sharon J. Duca, P.E
Title: _____	Title: Public Works Director/City Engineer
Signature: _____	Signature: _____
Date: _____	Date: _____

ATTACHMENT A

BASIS FOR PAYMENT

END OF SECTION A

NOTICE OF AWARD

TO: _____

_____

_____

PROJECT Description: Wastewater Utility Construction for the **Silver Lake Pump Station Replacement Project Bid No.: 18-0026PW.**

The OWNER has considered the BID submitted by you for the above described WORK in response to its Invitation to Bidders and Information for Bidders.

You are hereby notified that your base BID has been accepted for the amount of: _____($_____).

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____ 2018.

The City of Dover, Owner

Signature:_____

Printed:_____

Title:_____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

Firm Name:_____

this the _____ day of _____, 2018

Signature:_____ Printed:_____

Title:_____

END OF SECTION NOA

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NOTICE TO PROCEED

TO: _____ Date: _____

_____

_____ Project: **Silver Lake Pump Station Replacement, Bid No. 18-0026PW**

_____

_____

You are hereby notified to commence WORK in accordance with the Agreement dated _____ _____, 2018 on or before _____, 2018 and you are to complete the WORK within _____ consecutive calendar days thereafter. The date of completion of all work is therefore anticipated by _____, 2018.

The City of Dover
Owner

By:_____

Title:_____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged

by_____

this the _____ day of _____, 2018

By:_____Title:_____

Employer Identification Number: _____ _____

END OF SECTION NTP

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PERFORMANCE BOND

KNOWN ALL PERSONS BY THESE PRESENTS: That

_____

(Name of Contractor)

_____

(Address of Contractor)

a _____ hereinafter

(Corporation, Partnership or Individual)

called Principal, and _____

(Name of Surety)

_____

(Address of Surety)

hereinafter call Surety, are held and firmly bound unto the City of Dover, 15 Loockerman Plaza, Dover, Delaware 19901 hereinafter called OWNER, in the total aggregate penal sum of _____

_____

($_____) in lawful money of the United States, for the payment of which sum well and truly to be make, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 2018, a copy of which is hereto attached and made a part hereof for the construction of: **Silver Lake Pump Station Replacement, Bid No.: 18-0026PW**

NOW THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the SURETY and during the one year guaranty period and if the PRINCIPAL shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said SURETY, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder of the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that it is expressly agreed that the BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more that 20 percent, so as to bind the PRINCIPAL and SURETY to the full and faithful performance of the CONTRACT as so amended. The term "Amendment", wherever used in this BOND, and whether referring to this BOND, the Contract or the Loan Documents shall include any alteration, addition, extension, or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the OWNER and the PRINCIPAL shall abridge the right of the other beneficiary hereunder, whose claim may be unsatisfied. The OWNER is the only beneficiary hereunder.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be

deemed an original, this the _____ day of _____, 2018.

ATTEST:

(SEAL)

_____	_____
Secretary	Principal
_____	BY:_____(s)
Witness as to Principal	
_____	_____
Address	Address
_____	_____
_____	_____

ATTEST:

(SEAL)

_____	_____
Secretary	Surety
_____	BY:_____(s)
Witness as to Surety	Attorney-in-Fact
_____	_____
Address	Address
_____	_____
_____	_____

NOTES:

Date of BOND must not be prior to date of Contract.

IF CONTRACTOR is partnership, all partners should execute BOND.

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.

END OF SECTION PERB

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MAINTENANCE BOND

KNOWN ALL PERSONS BY THESE PRESENTS: That

_____

(Name of Contractor)

_____

(Address of Contractor)

a _____hereinafter called

(Corporation, Partnership or Individual)

Principal, and _____

(Name of Surety)

_____

(Address of Surety)

hereinafter call Surety, are held and firmly bound unto the City of Dover, 15 Loockerman Plaza, Dover, Delaware 19901 hereinafter called OWNER, in the total aggregate penal sum of _____

_____ Dollars, ($ _____) in lawful money of the United States, for the payment of which sum, well and truly to be make, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that,

WHEREAS: The Principal entered into a certain contract with the OWNER, dated the _____ day of_____, 2017 and

WHEREAS: the Contract provides for the construction of:_____

_____

_____

_____ _____

which Contract is by reference incorporated herein, and made a part hereof, and is referred to as the Contract.

WHEREAS: said Contract provides that the Principal shall furnish a maintenance bond, and

WHEREAS: said Contract has been substantially completed, and a Certificate of Substantial Completion was issued on_____.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the Principal shall remedy any defects due to faulty materials or workmanship, and pay for any damages to other work resulting

therefrom, which shall appear within a period of _____ year(s) from the date of the Certificate of Substantial Completion as stated herein, then this obligation to be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that the OWNER shall give Principal and Surety notice of defects with reasonable promptness.

SIGNED and sealed this the _____ day of _____, 2017.

ATTEST:

(SEAL)

_____	_____
Secretary	Principal
	BY:_____(s)
_____	
Witness as to Principal	
_____	_____
Address	Address
_____	_____
_____	_____

ATTEST:

(SEAL)

_____	_____
Secretary	Surety
	BY:_____(s)
_____	
Witness as to Surety	Attorney-in-Fact
_____	_____
Address	Address
_____	_____
_____	_____

NOTES:

Date of BOND must not be prior to date of Contract.
IF CONTRACTOR is partnership, all partners should execute BOND.
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.

END OF SECTION MAB

SECTION 00 72 00

GENERAL CONDITIONS

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Wherever in these General Conditions or in other contract documents the following terms or abbreviations are used, and/or unless otherwise defined, the meaning shall be as follows:

1.01 ORGANIZATIONAL DEFINITIONS

A. Administration: *Administration* shall mean the Mayor and Council Members of the City of Dover and/or the City Manager.

B. Administrator: *Administrator* shall mean the City Manager of the City of Dover.

C. Engineer: *Engineer* shall mean the City of Dover's consultant engineer.

D. City: *City* shall mean the City of Dover whose administrative offices are located at, City of Dover City Clerk's Office, City Hall, 15 Loockerman Plaza, Dover, Delaware 19901.

E. Owner: *Owner* shall mean the City of Dover, Kent County, Delaware.

F. Reservation of rights: The City of Dover reserves the right to define any organizational term(s) used in the context of these general conditions and contract documents.

1.02 ABBREVIATIONS

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
AWPA	American Wood Preservers Association
AGC	Associated General Contractors of America
BOCA	Building Officials Conference of America
CRSI	Concrete Reinforcing Steel Institute
DELDOT	Delaware Department of Transportation
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration, U.S. Department of Transportation
FSS	Federal Specs. and Standards, General Services Administration
IES	Illuminating Engineers Society
MBMA	Metal Building Manufacturers' Association
MUTCD	Manual on Uniform Traffic Control Devices
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electric Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
RLMI	Reflector and Lamp Manufacturers' Institute

SAWP Society of American Wood Preservers
ULI Underwriters Laboratories, Inc.

1.03 DEFINITIONS

Bid: A statement of price, terms of sale, and description of the supplies, services, or construction offered by a vendor to the City of Dover. The response may include but is not limited to a bidder's price and terms for the proposed contract, and description of technical expertise, work experience and other information as requested in the solicitation.

Bid Bond: The security, designated in the Bid, to be furnished by the bidder as a guaranty of good faith to enter into a contract with the City, if the work of constructing the improvement is awarded to him.

Bid Form: The approved form on which the City of Dover requires bids to be set forth and submitted.

Bid Guaranty: See Bid Bond.

Bid Price: Total Bid amount.

Bidder: A person formally submitting a bid for the work contemplated, acting directly or through a duly authorized representative.

Business: A corporation, partnership, individual, sole proprietorship, joint venture, or any other legal entity through which commercial activity is conducted.

Calendar Day: Every day shown on the calendar, Saturdays, Sundays, and holidays included.

Change Order: A written order signed by the responsible person assigned by the City of Dover, directing a Contractor to make changes to the contract documents.

City: City of Dover.

Construction: The process of building, adding, altering, converting, relocating, renovating, replacing, or restoring of real property in which the City has an interest.

Contingent Item: Any item listed in the contract documents and included in the bid for the purpose of obtaining a contract price. Such bid constitutes tender of an exercisable option to incorporate such items into the work in accordance with stated terms at bid prices.

Contract: An agreement entered into by the City of Dover for the procurement of supplies, services, construction, or any other item.

Contract does not include:

- Collective bargaining agreements with employee organizations; or
- Medical, Medicare, Judicare, or similar reimbursement contracts for which user eligibility and cost are set by law or regulation.

Contract Documents: The written agreement executed between the City of Dover and the successful bidder, covering the performance of the work and furnishing of labor, equipment and materials, by which the Contractor is bound to perform the work and furnish the labor, equipment and materials, and by which the City is obligated to compensate him therefore at the mutually established and accepted rate of price. The Contract shall include the Invitation to Bidders, Instructions to Bidders, Notice of Award, Notice to Proceed, Information for Bidders, Contract Forms (Agreement) and Bonds, General Conditions, Specifications, Special Conditions, also any written Change Orders and Supplemental Agreements that are required to complete the construction of the work in an acceptable manner, including authorized extension thereof.

Contract Drawings: The official drawings issued by the City of Dover as part of the contract documents, including those incorporated in the contract documents by reference. The Drawings referred to in the Contract Documents are entitled:

Silver Lake Pump Station Replacement
City of Dover, Kent County, Delaware

These drawings consist of a total of thirteen (13) sheets.

Contract Item (Pay Item): An item of work specifically described and for which a price, either unit or lump sum, is provided. It includes the performance of all work and the furnishing of all labor, equipment, and materials, described herein or described in any Supplemental Specifications or Special Provisions.

Contract Modification: Any written alteration in the specifications, delivery point, date of delivery, contract period, price, quantity, or other provision of any existing contract, whether accomplished in accordance with a contract provision, or by mutual action of the parties to the contract. It includes change orders, extra work orders, supplemental agreements, contract amendments reinstatements, or options/renewals.

Contractor: The person or firm having a contract agreement with the City of Dover. A contractor does not include employees with labor contracts (collective bargaining agreements).

Contract Time or Completion Date: The number of working or calendar days shown in the contract indicating the time allowed for the completion of the work contemplated in the contract. In case a calendar date of completion is shown in the contract, in lieu of the number of working or calendar days, such work shall be completed by that date.

Day: Calendar day unless otherwise designated.

Easement: A grant of right of use of the property of an owner for a certain purpose at the will of the grantee.

Final Acceptance: The date as certified by the City when the construction of the project is complete and tested, all punch list items have been completed to the satisfaction of the City, and provisions of the public works or other agreements have been complied with.

Highway Standards: The official Book of Standards for Highway and Incidental Structures, edited by the Delaware Department of Transportation (DelDOT), with the latest incorporated revisions issued on or before the date of advertisement of the contract.

Information for Bidders: Any document, whether attached or incorporated by reference, used for soliciting bids under procurement by competitive sealed bidding and small procurement procedures including requests for quotations.

Invitation to Bidders (ITB): Any document, whether attached or incorporated by reference, used for soliciting bids under procurement by competitive sealed bidding and small procurement procedures including requests for quotations. The ITB includes the advertisement for Bids for all required work or materials. Such advertisement will indicate the location and magnitude of the work to be done or the character and quantity of the material to be furnished and the time and place of the opening of bids.

Laboratory: The testing laboratory which may be designated by the City of Dover.

Maintenance Bond: Security guaranteeing repairs to project defects appearing during guarantee period.

Materials: Any substances specified for use in the construction of the project and its appurtenances.

Notice of Award: The decision by the City of Dover to appoint or present a purchase agreement or contract to a vendor.

Notice to Proceed: A written notice to the Contractor of the date on or before which he shall begin the prosecution of the work to be done under the contract.

Payment Bond: A guarantee that Contractor will pay in full all bills and accounts for materials and labor used in the work, as provided by law.

Performance Bond: Security guaranteeing complete performance of the contract.

Person: Any individual, business, union, committee, club, or other organization.

Plans: See definition of “Contract Drawings”.

Proposal: The response by a bidder to a solicitation of the City for construction. As used herein the word “proposal” means “bid.”

Responsible Bidder: A person who has the capability in all respects to perform fully the contract requirements, and the integrity and reliability which will assure good faith performance.

Responsive Bid: A bid submitted in response to an Invitation for Bids that conforms in all material respects to the requirements contained in the Invitation for Bids.

Specifications: A written description of functional characteristics, or the nature of a construction item to be procured. It may include a statement of any of the user's requirements and may provide for inspection, testing, or preparation of a construction item before procurement. The definitions, descriptions, directions, provisions and requirements, contained herein, and all written supplements thereto, made or to be made, pertaining to the contract, and the material, equipment, and workmanship to be furnished under the contract.

Standard Specifications: A book of specifications intended to general application and repetitive use.

State: The State of Delaware acting through its authorized representative.

Subcontractor: Any person undertaking the construction of a part of the work under the terms of the contact, by virtue of an agreement with the Contractor, who prior to such undertaking, receives the (consent of the surety and the) approval of the City of Dover.

Superintendent: The executive representative of the Contractor authorized to receive and execute instructions from the City of Dover, who shall supervise and direct the construction.

Substantial Completion: That date as certified by ENGINEER when the construction of the PROJECT or a specified part thereof is sufficiently completed in accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part can be utilized for the purposes for which it is intended.

Supplemental Agreement: Any contact modification which is accomplished by the mutual action of the parties.

Supplemental Specifications: Additions and revisions to the Standard Specifications. Generally, include new or improved procedures, construction items or materials developed subsequent to the publication of Standard Specifications.

Surety: The corporate body bound with and for the Contractor, for the full and complete performance of the contract, and for the payment of all debts pertaining to the work. When applying to the Bid Bond, it refers to the corporate body which engages to be responsible in the execution by the bidder of a satisfactory contract.

Work: Work shall be understood to mean the furnishing of all labor, materials, equipment, and other incidentals necessary to the successful completion of the project and the carrying out of all the duties and obligations imposed by the contract.

1.04 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

A. The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until the insurance required of the Subcontractor has been so obtained and approved.

B. Compensation and Employer's Liability Insurance

1. The Contractor shall take out and maintain during the life of the contract the statutory Workmen's Compensation and Employer's Liability Insurance for all his employees to be engaged in work on the project under the contract and, in case any such work is sublet, the Contractor should require the subcontractor similarly to provide Workmen's Compensation and Employer's Liability Insurance for all the latter's employees to be engaged in such work.

C. Bodily Injury Liability and Property Damage Liability Insurance

1. The Contractor shall take out and maintain during the life of the contract Bodily Injury Liability and Property Damage Liability Insurance to protect him and any Subcontractor performing work covered by the contract form claims for damages for personal injury, including accidental death, as operations under the contract, whether such operations be by himself or by a Subcontractor, or by anyone directly or indirectly employed by either of them, and the amount of such insurance should not be less than:

2. Bodily Injury Liability Insurance, in an amount not less than one million dollars ($1,000,000) for injuries, including wrongful death to any one person, and subject to the same limit for each person in an amount not less than two million dollars ($2,000,000) on account of one accident.

3. Property Damage Insurance, in an amount not less than two million dollars ($2,000,000) for damages on account of any and all accidents.

D. Automobile Bodily Injury Liability Insurance

1. Automobile Bodily Injury Liability Insurance in an amount not less than five hundred thousand dollars ($500,000) for bodily injuries per person, one million dollars ($1,000,000) for bodily injuries per occurrence, and one million dollars ($1,000,000) for property damage.

E. Proof of Carriage of Insurance

1. The Contractor shall furnish the Owner with Certificates showing the type, amount, class of operations, effective dates, and date of expiration of policies. Such certificates shall contain substantially the following statement. "The insurance covered by this certification shall not be canceled or materially altered, except after thirty (30) days written notice has been received by the owner."

2. The Contractor shall furnish the Declaration Page and Insurance policy documents with the Certificate of Insurance.

1.05 PERMITS, FEES AND NOTICES

A. The Contractor shall pay taxes, royalties, and fees, and secure licenses and permits that are required, during the time of the contract, by local, county, state and federal laws, ordinances, rules, codes and regulations for the legal performance of the contract.

B. The contractor shall perform the work in accordance with notices issued by public authorities having jurisdiction over the work, including but not limited to Delaware Department of Transportation, and Delaware Board of Public Health.

C. If the Contractor performs work, knowingly or ignorantly, contrary to requirements of local, county, state and federal laws, ordinances, rules, codes and regulations, he shall assume full responsibility therefore and shall bear all costs of suits, actions and damages resulting from his illegal work performed.

1.06 INDEMNIFICATION OF THE OWNER

A. The Contractor shall indemnify and hold harmless the Owner and the Engineer, and all who represent them, from and against claims, damages, losses and expenses arising out of the Contractor's performance of the work, provided such claim damage, loss and expense are attributable to:

1. Bodily injury, sickness, disease or death, or to injury to tangible property, including the loss of use resulting therefrom, and

2. Negligence of the Contractor or his subcontractors and others directly related to the project or both.

B. Monies due the Contractor for performance of the contract may be retained by the Owner, as may be considered by the Engineer as necessary, until such suits and claims for damages shall have been settled and evidence of such settlement furnished by the engineer.

1.07 PATENTS

A. Whenever articles, materials, means, appliances, processes, compositions, combinations and things indicated by these specifications are covered by letters patent, the successful Bidder shall secure, before using or employing such articles, materials, means, appliances, processes, compositions, combinations or things, the assent, in writing of the Owner or licensee of such letters patent and file the assent with the Engineer.

B. The said assent is to cover not only the use, employment and incorporation of said articles, materials, means, appliances, processes, compositions, combinations or things in the construction and completion of the work, but also the permanent use of said articles, materials, means, appliances, processes, compositions, combination or things, thereafter by or on behalf of the Owner in the operation and maintenance of the project for the purpose for which it is intended or adapted.

C. The Contractor shall be responsible for claims made against the Owner and his agents and employees for actual or alleged infringement or patents by the use of the work, and shall save harmless and indemnify the Owner and his agents and employees from all costs, expenses, and damages, including solicitors' and attorney's fees, which the Owner may be obligated to pay by reason of any actual or alleged infringement of patents used in the construction, completion, maintenance, or operation of the works and project herein specified.

D. If the Contractor uses any patented or copyrighted articles, materials, means appliances, processes, compositions, combinations or things he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted articles, materials, means appliances, processes, compositions, combinations or thing. It is mutually agreed and understood that without exception, the Contract prices shall include all royalties or costs arising from the use design, device or materials in any way involved in the work.

1.08 SCOPE OF WORK

A. The work to be done under these specifications is to cover the completed work shown on the plans or called for in the specifications and other contract documents. The Contractor shall furnish all implements, machinery, tools, equipment, material and labor necessary to the performance of the work and shall furnish and do everything necessary to make the work perfect, complete, neat, and finished, and the Contractor shall leave all the work to be done under this Contract in this condition at the time the work is finally inspected.

1.09 DRAWINGS TO BE FOLLOWED

A. The approved plans, profiles, details and cross sections on file in the office of the Engineer will show the location, details and dimensions of the work contemplated, which shall be performed in strict accordance therewith and in accordance with the specifications. There shall be no deviation from the drawings and specifications on account of the exigencies of construction, unless approved and authorized in writing by the Engineer.

1.10 INTERPRETATION OF DRAWINGS

A. On all drawings, the figured dimensions shall govern in the case of discrepancy between the scales and figures. The Contractor shall take no advantage of any error or omission in the drawings or of any discrepancy between the drawings and specifications, and the Engineer will make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the specifications, and of the drawings as construed by him. In all cases of doubt as to the true meaning of the specifications and drawings, the decision of the Engineer will be final and conclusive.

1.11 ALTERATION OF DRAWINGS AND CHARACTER OF WORK

A. The Engineer reserves the right to make such alterations in the drawings and in the character of the work necessary or desirable, or both, from time to time to complete the construction of the work, provided such alterations do not change materially the original drawings and specifications; and such alterations shall not be considered as a waiver of conditions of the contract, nor shall they invalidate any of the provisions thereof. Should such alterations in the drawings or in the character of work, or both, cause increased or decreased cost to the Contractor, a fair and equitable sum therefore, to be agreed upon in writing by the Contractor and Engineer before such work is begun, shall be added or deducted from the contract price. No allowance will be made for anticipated profits on the work omitted.

1.12 AS-BUILT DRAWINGS

A. During the process of the work, the Contractor shall keep a careful record at the jobsite of all changes and deviations from the layouts shown on the Contract Drawings immediately. The As-Built Drawing shall indicate, in addition to any changes or deviations, the actual location referenced from at least two (2) permanently fixed surface structures of all subsurface utilities or work including valves, cleanouts, manholes, etc. installed by him. These drawings will be made available to the Engineer for inspection or checking at any time during the construction period. At the time of Conditional Acceptance of the Work the Contract Drawings with all the aforementioned as-built information clearly recorded thereon in ink.

B. The Contractor shall keep one copy of all Contract Documents, Specifications, Drawings, Errata, Addenda, Change Orders, and Shop Drawings at the site in good order and annotated to show all changes made during the construction process. These shall be available to the Engineer for inspection during the contract period.

C. No Separate payment will be made to the Contactor for As-Built Drawings as all costs in connection therewith shall be deemed to be included in the lump sum prices of the bid. If the Contractor fails to maintain up to date As-Built Drawings and records as herein required, the Engineer reserves the right to withhold monthly payments in part or in full until such time as the Contractor has compiled in all respects to these requirements.

D. Should the Contractor fail to make needed repairs and replacements promptly during the maintenance and repair period, the Owners shall be empowered to make any repairs or replacements and the costs of the required repairs or replacements shall be the financial responsibility of the Contractor.

1.13 EXTRA WORK

A. The Contractor shall perform extra work, for which there is no quantity and price included in the contract, whenever to complete fully the work contemplated it is deemed necessary or desirable, by written authority of the Engineer, and such work shall be done in accordance with the specifications therefore or in the best workmanlike manner as directed. This extra work will be paid for at a unit price or lump sum to be agreed upon previously, in writing, by the Contractor and the Engineer, or where this method of payment is impracticable, the Engineer may order the Contractor to do such work on a “Force Account” basis.

1.14 FORCE ACCOUNT WORK

A. Cost of extra work done on a “Force Account” basis will be paid in the following manner:

1. For labor and foremen in direct charge of the specific operation, the Contractor shall receive the rates of wages paid during this contract as substantiated by certified payroll slips, for each and every hour that said labor and foreman are actually engaged in such work, to which shall be added an amount equal to fifteen percentum (15%) of the sum thereof.

2. The Contractor shall receive the actual cost of materials utilized, as shown by original receipted bills, to which sum shall be added an amount equal to fifteen percentum (15%) of the sum thereof.

3. For machine-power tools and equipment, and for hauling equipment, including fuel and lubricants, which may be deemed necessary and desirable to use, the Owner shall allow the Contractor a reasonable rental price to be accepted in writing before such work is begun, for each and every hour that said tools and equipment are in use on such work, and to which sum no percentage shall be added.

4. For all work performed by subcontractors, the Contractor shall receive the rate billed to him by the subcontractor for each and every hour that said subcontractor is actually engaged in such work to which shall be added an amount equal to ten percentum (10%) of the sum.

B. The compensation as herein provided shall be received by the Contractor as payment in full for extra work done on a "force account" basis, and shall include superintendence, use of tools and equipment for which no rental is allowed, and profit. The Contractor's representative and the Resident Project Representative (R.P.R.) shall compare records of extra work on a "force account" basis at the end of each day. Copies of these records shall be made in duplicate, upon the Engineer's "force account forms" and signed by both the R.P.R. and the Contractor's representative, one copy being forwarded respectively to the engineer and to the Contractor. Claims for extra work performed on a "force account" basis shall be submitted to the Engineer, in triplicate, on certified forms properly executed, by the Contractor. Statements shall also include the value of all material used in such work, and said statements shall be filed not later than the fifteenth (15^{th}) day of the month following that in which the work was actually performed, and shall include all charges which can be verified.

C. For extra work, as defined in this paragraph, the Contractor will be reimbursed for his expenditures for Workmen's Compensation Insurance, Public Liability Insurance, Social Security taxes and Unemployment Compensation covering the workers actually engaged upon such extra work. No percentage will be added to such payments, but the Contractor shall receive only the actual amount on money expended for such Workmen's Compensation Insurance, Public Liability Insurance, Social Security taxes and Unemployment Compensation. Such payments shall be based upon the prevailing standard insurance rates supported by receipted vouchers from the insurance vendors and upon the actual amount of taxes paid for Social Security and Unemployment Compensation as evidenced by proper documents furnished by the Contractor.

1.15 UNAUTHORIZED WORK

A. Work performed without Engineer's approval of lines and grades, work performed beyond the lines and grades shown on the drawings or as given, except as herein provided, and extra work performed without written authority, will be considered as unauthorized and at the expense of the Contractor. Such work will not be measured by the Engineer, nor will payment be made by the Owner. Work so performed may be ordered, by the Engineer removed and replaced at the Contractor's expense.

1.16 EXECUTION OF WORK

A. The Contractor shall begin the work to be performed under the contract at the time stated in the Notice to Proceed, provided by the Owner to the Contractor. The place where the work is to be started will be stated either in this notice to proceed or will be designated on the ground. The work shall be executed from as many different points, in such part or parts and at such times as may be directed, and shall be conducted in such a manner and with sufficient materials, equipment and labor as is considered necessary to insure its completion with the time set forth in the contract.

B. If the work should be discontinued because of unforeseen events, the Contractor shall immediately notify the Engineer. When the Contractor shall discontinue the work because of a planned stoppage, the stoppage shall not take place until the Engineer has authorized such stoppage; and work shall not be resumed until Contractor notifies Engineer 24 hours in advance of starting work again.

1.17 COOPERATION OF CONTRACTOR AND REPRESENTATIVE

A. The Contractor shall give the work his constant attention to facilitate the progress thereof and shall cooperate with the Engineer and Owner. The Contractor shall have at all times a competent and reliable representative on the work, authorized to receive orders and act for him.

1.18 EMPLOYEES AND EQUIPMENT

A. Employees of the Contractor or persons connected with the Contractor shall be discharged upon request of the Engineer for any or all of the following reasons:

1. Directing profanity or abusive language, or both, at the Resident Project Representative and other Owner's representatives.

2. Interfering with Resident Project Representative and other Owner's representatives in performance of their work.

3. Disobeying or evading, or both, instructions of the Resident Project Representative and other Owner's representatives.

4. Careless or incompetency, or both.

5. Being objectionable to the Owner.

6. Discharged employees shall not be rehired without consent of the Engineer.

B. Contractor shall furnish, and maintain in safe working condition, equipment necessary to properly perform the work in the scheduled time.

1.19 DRAWINGS AND SPECIFICATIONS FURNISHED TO CONTRACTOR

A. The Owner will furnish Contractor two (2) copies of the drawings and specifications; Contractor shall have one (1) set available at the job site during execution of work and including copies of all sets approved by any permitting, review, or regulatory authority.

Additional copies of the drawings and specifications will be furnished to the Contractor upon receipt of payment of the amount stated in the Advertisement for each set.

1.20 LAWS TO BE OBSERVED

A. The Contractor shall observe and comply with federal, state, county, and local laws, ordinances, rules, regulations, decrees and orders that are in effect and applicable to the work during the time of construction; and he shall see that his subcontractors likewise meet this requirement. He shall indemnify, and hold harmless, the Owner and his representatives against claims and liabilities arising from Contractor and subcontractor violations of such laws, ordinances, rules, regulations, decrees, and orders whether such violations be by the Contractor or any Subcontractor, or an of their agents and/or employees.

1.21 SAFETY AND HEALTH REGUALTIONS FOR CONSTRUCTION

A. In order to protect the lives and health of his employees under the contract, the Contractor shall comply with all pertinent provisions of the Contract Work Hours and Safety Standards Act, as amended, commonly known as the Construction Safety Act as pertains to health and safety standards; and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under contract.

B. The Contractor alone shall be responsible for the safety, the adequacy of his work, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance or operation. The Contractor will comply, within the prices bid and without extra cost to the Owner, with all safety regulations or determinations issued by any agency of the Federal government including OSHA, the State of Delaware and the Engineer.

1.22 SANITARY PROVISIONS

A. The Contractor shall provide and maintain in a neat and sanitary condition such sanitary conveniences and accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the Department of Health or of other bodies or tribunals having jurisdiction thereof. He shall commit no public nuisance.

1.23 PUBLIC CONVENIENCE AND SAFETY

A. The Contractor shall conduct the work in a manner that will minimize obstruction to traffic in the area. The safety and convenience of the general public and of the residents and occupants of property along and adjacent to the work shall be provided in an adequate and satisfactory manner. Footways and portions of the highways and streams adjoining the work shall not be obstructed more than absolutely necessary. In no case shall any traveled thoroughfare be closed without permission of the Owner.

B. Fire Hydrants on or adjacent to the work shall be kept accessible to fire apparatus at all times, and no obstructions shall be placed within 15 feet of a hydrant.

C. Gutters and storm drain inlets shall be kept unobstructed at all times.

1.24 BARRICADES, DANGER, WARNING, AND DETOUR SIGNS

A. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals and signs, provide a sufficient number of watchmen and take all necessary precautions for the protection of the work and safety of the public. Highways closed to traffic shall be protected by effective barricades, on which shall be placed acceptable warning signs. The Contractor shall detour traffic and shall furnish and maintain all detour signs required to direct traffic over the entire route of the detour. Costs for maintaining traffic shall become incidental to the bid terms of this contract and will not be paid for directly. At all times, the Contractor shall use every precaution possible to warn pedestrians and the traveling public as to the construction in progress. All traffic safety devices shall be in compliance with the Delaware Manual on Uniform Traffic Control Devices.

1.25 PRESERVATION AND RESTORATION OF PROPERTY, TREES, MONUMENTS, ETC.

A. The Contractor shall not enter upon private property for any purpose without obtaining permission, and he shall be responsible for the preservation of all public and private property, trees, monuments, etc., along and adjacent to the work and shall use every precaution necessary to prevent damage and injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits and underground structures, and shall protect carefully from disturbance or damage all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed, and the cost for replacement of the same shall be borne by the Contractor. Property marker replacement shall be by a surveyor licensed in the State of Delaware. The Contractor shall not willfully or maliciously injure or destroy trees or shrubs, and he shall not remove or cut them without proper authority. He shall be responsible for all damage or injury to the property of any character, during the prosecution of the work, resulting from any act, omission or misconduct in his manner or method of executing said work or due to the non-execution thereof on the part of the Contractor. He shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury, in an acceptable manner. In case of the failure on the part of the Contractor to restore such property, or make good such damage or injury, the Owner may, upon forty-eight (48) hours notice, proceed to repair, rebuild or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from the monies due or which may become due the Contractor under his contract.

1.26 CONTRACTOR'S RESPONSIBILITY FOR WORK

A. Until the final acceptance of all work shall be indicated in writing by the Owner, the work shall be under the charge of and care of the Contractor. He shall take every precaution against destruction of, injury, or damage to the work or to any part thereof from any other cause whatsoever. The Contractor shall rebuild, repair, restore and make good, at his own expense, all deduction of, injuries, or damage to the work or any of the above causes before its final completion and acceptance shall be indicated in writing by the Engineer.

B. No inspection or supervision, no failure to inspect or supervise, nor the pressure of any employees of the Engineer during the execution of the work, and no approval or acceptance of any part of the work herein contracted for, or of the materials and equipment used therein, shall relieve the Contractor of any of his obligations to fulfill his contract, or shall prevent the rejection of said work, materials, and equipment in whole or in part, at any time thereafter should said work, materials or equipment be found by the Engineer to be defective or not in accordance with the requirements of these Contract Documents.

1.27 CERTIFICATIONS & SHOP DRAWINGS

A. Contractor shall submit shop drawings, material certifications, samples and test reports to the Engineer,

B. The Contractor shall submit to the Engineer for review:

1. Six (6) copies of certifications for all materials to be incorporated in the work.

2. Six (6) copies of certified working drawings for all fabricated or manufactured articles to be used in the work.

3. Six (6) copies of layout drawings for installation and erection of the work.

4. Such other certifications and/or drawings as may be from time to time required.

C. All shop drawings shall be submitted to the Engineer through the Contractor. Direct submittals by subcontractors shall not be accepted. The Contractor shall review, sign each copy of a shop drawing noting review and approval prior to submittal. Drawings will not be considered unless they have been stamped approved by the Contractor.

D. Drawings shall be to scale, shall be accurate and distinct, and shall give all dimensions required for the manufacturing and erection of the work, and shall also outline sectional views and details showing all working dimensions, kind of material to be used, and kind of machine work and finish to be applied.

E. Three sets of drawings will be returned to the Contractor, approved if found correct, or else showing the changes required. Where major corrections are required, six sets shall be resubmitted until final approval is given. The Engineer will review one original submittal and one resubmittal for each item requiring shop drawings without charge to the Contractor by the Engineer according to the hourly rate in effect at that time.

F. No item requiring submission of detailed drawings shall be manufactured prior to final approval of the drawings.

G. The approval of shop drawings will be general, and will not relieve the Contractor of his responsibility to construct, manufacture and erect all parts of the structure and equipment, and to furnish materials and work as required by the Contract Documents. The approval of shop drawings shall not be construed as approving any variation from the contract drawings or specifications. The Engineer will not be responsible for errors on drawings furnished by the Contract, even though drawings containing such errors are inadvertently approved.

1.28 USE OF A SECTION OF THE WORK

A. Whenever, in the opinion of the Engineer, a portion of the work is acceptable condition for the Owner's use, it may be used for its intended purpose; and such use shall not imply final acceptance of that portion of the work, nor waive any provisions of these contract documents.

1.29 TEST AND SAMPLES OF MATERIALS

A. Tests of materials shall be made at the Contractor's expense, by a certified testing laboratory, in accordance with the officially approved methods as described or designated. The Owner reserves the right to conduct verification testing at his own expense. The Contractor shall cooperate with and assist the Owner in conducting such testing and in taking samples and packing them for shipment to a laboratory.

1.30 STORAGE OF MATERIALS

A. Materials shall be stored so as to insure the preservation of their quality and fitness for the work. When considered necessary, they shall be placed on wooden platforms or other hard clean surfaces, and not on the ground, and shall be placed under cover when directed. Stored materials shall be located so as to facilitate prompt inspection. Lawns, grass plots, or other private property shall not be used for storage purposes without written permission of the owner or lessee.

1.31 QUALITY OF MATERIALS AND WORKMANSHIP

A. Materials and workmanship shall be of best possible quality and feasibility for the intended purpose, whether or not a brand name is specified. Materials shall be new and unused.

B. Representative preliminary samples of materials may be requested by the Engineer for examination or testing, or both. Materials, for which samples are submitted to the Engineer, shall not be ordered by Contractor until Engineer furnishes written approval of said samples. Materials may be further inspected by the Engineer during preparation and construction of the work; and materials found to be substandard will be rejected.

C. Contractor shall submit to Engineer samples of alternate materials that require laboratory testing. Such materials shall not be incorporated into the work until Engineer states, in writing, that materials meet requirements of the specifications.

1.32 EQUAL OR APPROVED EQUAL

A. Where an article or material is specified by proprietary name, trade name, and/or manufacturer's name, with the addition of such expressions as "or equal", or "approved equal", it is to be understood that the article named, or the equal thereof, is intended subject to the approval of the Engineer as to the equality thereof, and it is distinctly understood:

1. That the Engineer is to use his own judgment in determining from time to time whether or not any articles or thing proposed to be substituted is the equal of any article or thing so specified;

2. That the decision of the Engineer on all such questions of equality shall be final; and

3. That in the event of any adverse decision by the Engineer, no claim of any sort shall be made or allowed against the Owner or the Engineer.

B. An Offer of an article or material by the Contractor for an article or material by the contractor for an article or material specified, will raise the presumption that it is for the purpose of saving money. If, in such case the articles or material is approved, the Owner shall be given credit as follows: the difference in the net cost to the Contractor of the article or material submitted and the price at which he could have obtained the lowest priced article or material specified. For convenience in checking the credit, if any, the Contractor shall submit these figures when the offer is made, and no article or materials will be considered without figures.

1.33 WATER SUPPLY

A. The Contractor shall at his own cost provide such quantities of clean water as may be required for any and all purposes under the contract. He shall supply sufficient drinking water to all his employees.

B. Water supply shall be obtained at the filling station located at 710 William Street, Dover, DE 19904. Water cannot be obtained through use of a fire hydrant. Connection to a fire hydrant is prohibited.

1.34 AUTHORITY OF ENGINEER

A. The Engineer shall, in all cases, determine the amount or quantity, quality and acceptability of the work and materials for which payment is made under this contract. He shall decide on all questions in relation to said work and the performance thereof. He shall, in all cases, decide on questions which arise relative to the fulfillment of the contract, to the contract and to the obligations of the Contract there under.

B. To prevent disputes and litigations, the Engineer will be the referee in questions between the Contractor and the Owner concerning the contract. Engineer's determination, decision and/or estimate shall be final and conclusive upon the contractor and shall also be a condition precedent to the right of the Contractor to receive monies under the contract.

1.35 AUTHORITY AND DUTIES OF RESIDENT PROJECT REPRESENTATIVE

A. Resident Project Representatives (R.P.R.'s) employed by the Owner or Engineer shall be authorized to observe all work done and materials furnished. Such observations may extend to all or any part of this work and to the preparation or manufacture of the materials to be used. An R.P.R. may be stationed on the work to report to the Engineer as to the progress of the work and the manner in which it is being performed; also to report whenever it appears that the materials furnished and work performed by the Contractor fail to fulfill the requirements of the specifications and contract. No inspection, or any failure to inspect, at any time or place, however, shall relieve the Contractor from his obligation to perform all the work strictly in accordance with the requirements of the specifications. The R.P.R. shall perform such other duties as are assigned to him. He shall not be authorized to revoke, alter, enlarge, relax or release

any requirements of these specifications, nor to approve or accept any portion of work, nor to issue instruction contrary to the drawings and specifications. The R.P.R. shall in no case act as foreman or perform other duties for the Contractor, nor interfere with the management of the work by the latter.

1.36 INSPECTION OF MATERIALS AND WORK

A. The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether or not the work as performed is in accordance with the requirements and intent of the specifications and contract. If the Engineer requests it, the Contractor, at any time before acceptance of the work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications without additional compensation. Should the work thus exposed or examined prove unacceptable, the removing, replacing and/or making good the parts removed shall be at the Contractor's expense.

1.37 DEFECTIVE MATERIALS AND WORK

A. All materials not conforming to the requirements of these specifications shall be considered defective and all such materials whether in place or not, shall be rejected and shall be removed immediately from the work unless otherwise permitted. No materials which have been rejected, the defects of which have been corrected or removed, shall be used until approval has been given. All work which has been rejected or condemned shall be remedied, or if necessary, removed and replaced in an acceptable manner by the Contractor at his/her own expense.

1.38 FAILURE TO REMOVE AND RENEW DEFECTIVE MATERIALS AND WORK

A. Should the Contractor fail or refuse to remove and renew defective materials used or work performed previously or to make any necessary repairs in an acceptable manner, and in accordance with the requirements of these specifications, within the time indicated in writing, the Engineer shall have the authority to cause the unacceptable or defective materials or work to be removed and renewed or such repairs to be made at the Contractor's expense. Expense incurred by the Owner in making these removals, renewals, or repairs, which the Contractor has failed or refused to make, shall be paid out on any monies due or which may become due the Contractor, or may be charged against the "Performance Bond" deposited. Continued failure or refusal on the part of the Contractor to make any or necessary repairs, removals and renewals promptly fully and in an acceptable manner, shall be sufficient cause for the Owner to declare the contract forfeited, in which case the Owner, at his option, may purchase tools, materials and equipment and employ labor, as may be required to perform the work. All costs and expenses incurred thereby shall be charged against the "Performance Bond" deposited. The performance of work by the Owner and/or others as specified shall not relieve the Contractor in any way from his responsibilities under this contract.

1.39 WORKING TIME

A. The Contractor will not be permitted to work on Saturday, Sunday or holidays unless otherwise authorized by the Owner in writing.

B. In case of an emergency, which may require that work be done on Saturdays, Sundays, Holidays, the Contractor shall request permission of the Owner to do so. If, in the opinion of the Engineer, the emergency is bonafide, he will grant permission of the Contractor to work such hours as may be necessary. Also, if in the opinion of the Engineer a bonafide emergency exists, he may direct the Contractor to work such hours as may be necessary whether or not the Contractor requests permission to do so.

C. The Contractor will be allowed to work eight (8) hours per day, Monday through Friday, except for holidays. All work specified under these Contract Documents shall be performed between the hours of 7:00 A.M. and 3:30 P.M. An alternate continuous daily work period may be satisfactory; however, it is subject to approval by the City.

D. The Contractor shall pay the Owner for all costs incurred for inspection services required for work permitted during holidays, weekends, outside of city business hours, or in excess of eight (8) work hours per day.

1.40 TEMPORARY SUSPENSION OF WORK

A. The engineer shall have the authority to suspend work, wholly or in part, for such period or periods as he may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the suitable execution of the work, or for such time as is necessarily due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract. If it should become necessary to stop work for an indefinite period, the Contractor shall store all materials in such a manner that they will not obstruct or impede the traveling public unnecessarily nor become damaged in any way, and he shall take every precaution to prevent destruction, damage or deterioration of the work performed, provide suitable drainage by opening ditches, shoulder drains, etc., and erect temporary structures where necessary. The Contractor shall not suspend the work without authorization. Neither the failure of the Engineer to notify the Contractor to suspend the work on account of bad weather or other unfavorable conditions, nor permission by the Engineer to continue work during bad weather or other unfavorable conditions, shall be a cause for the acceptance of any work which does not comply in every respect with the contract and specifications.

1.41 ANNULMENT OF CONTRACT

A. Contract may be annulled if Contractor defaults in any or all of the following ways:

1. Failure to begin work at time specified

2. Failure to perform the work with sufficient number of workers.

3. Failure to provide sufficient materials to insure prompt completion of the work, except where extension of time is granted.

4. Failure to perform the work suitably.

5. Failure to remove materials of rejected work.

6. Failure to correct rejected work

7. Failure to execute the work in manner acceptable to Engineer.

8. Becoming bankrupt or insolvent, or both.

9. Allowing a final judgment against him unsatisfied for 48 hours

10. Making an assignment for the benefit of creditors.

11. Failure to pay subcontractors for labor.

12. Failure to pay for materials supplies

13. Persistently disregarding laws, rules, ordinances, regulations, and codes applicable to the work.

14. Disregarding Engineer's instructions.

15. Failure to comply, within three (3) days after Contractor's receipt (by certified mail, with return receipt requested) of Engineer's orders to properly execute the work.

16. Lapse of Contractor's Insurance.

B. Engineer may act to annul the contract, because of any or all of Contractor's defaults, in the following manner:

1. Give written notice to Contractor and/or his surety of details of Contractor's default.

2. Issue certificate to Owner describing Contractor's default.

C. Owner, upon receipt of such certificate (preceding paragraph), has full power and authority to terminate Contractor's employment and to take possession of the premises; materials, appliances and equipment of the work on the premises. Certificate shall further empower Owner to enter into an agreement for completion of said contract according to the terms and provisions thereof, or to utilize other methods shall be deemed expedient for completion of the contract in accordance with the drawings and specifications.

D. The owner shall have the right to take the following actions because of any or all of the defaults hereinbefore described:

1. Withhold without paying interest, such sums of money due Contractor until Owner's claims have been protected.

2. Deduct monies due the Contractor equal to amount required to pay Owner's expenses for Owner's completing the work of the contract.

3. Pay the defaulted Contractor an amount equal to the difference between actual cost of Owner's completing the contract and the sum which would have been paid to Contractor had he not defaulted, if the cost to complete the work is less than amount owed the defaulted Contractor.

4. Collect from the defaulted Contractor and/or surety an amount equal to the difference between actual cost of Owner's completing the contract and the sum which would have been paid to the Contractor had he not defaulted, if the cost to complete the work is more that the amount owed the defaulted contractor.

1.42 MEASUREMENT OF QUANTITIES

A. All work completed under the contract shall be measured by the Engineer of the Resident Project Representative according to United States Standard Measures.

B. In computing tonnage, certified freight weigh-bills or certified weight-slips will be utilized. Other quantities will be determined according to recognized engineering practices or as defined on drawings.

1.43 PAYMENT FOR MATERIALS WHEN PAYMENT IS NOT MADE BY CONTRACTOR

A. When persons furnishing labor or material, or both submit notice of completion and conditional acceptance, Contractor shall furnish the Engineer evidence that payment has been made for such labor and material. If such evidence is not produced, amounts of claims may be retained from monies due the Contractor until claims are satisfied or until notices are withdrawn.

B. The Owner or the Engineer may also, with the written consent of the Contractor, use monies retained or due the Contractor to pay labor and material costs for the work, provided claims have been filed in the office of the Engineer.

1.44 NO ESTOPPEL OR WAVIER OF LEGAL RIGHTS

A. The Owner or the Engineer, shall not be precluded or estoppel by any measurement, estimate or certificate, made or given by him, or by any agent or employee of the Owner, under any provision or provisions of the contract, at any time, either before or after the completion and acceptance of the work and payment therefor pursuant to any measurement, estimate, or certificate, from showing the true and correct amount and character of the work performed and materials furnished by the Contractor or from showing at any time that the measurement, estimate, or certificate is untrue or incorrectly made in any particular, or that the work or materials or any part thereof do not conform in fact to specifications and contract, and the Engineer shall have the right to reject the whole or any part of the aforesaid work or materials, should the said measurement, estimate, certificate or payment be found or be known to be inconsistent with the terms of the contract, or otherwise be improperly given, and the Owner shall not be precluded and estopped, notwithstanding any such measurement, estimate, certificate and payment in accordance therewith from demanding and recovering from the Contractor and his Surety such damages as it may be sustained by reason for his failure to comply with the terms of the specifications and contract. Neither the acceptance by the Owner, or the Engineer, or any agent or employee of the Owner nor any certificate by the Owner for payment of money, nor any payment for, nor acceptance or use of the whole or any part of the work by the Owner, or the Engineer nor any extension of time, nor any possession taken by the Owner or its employees, shall operate as a waiver of any branch of the contract be held to be a waiver of any other subsequent breach.

1.45 SUBCONTRACTORS

A. The Contractor shall give his personal attention to the faithful performance of the work, shall keep the same under his own control, and shall not assign the contract by power of attorney or otherwise, nor sublet the work or any part thereof, without the previous written consent of the Engineer. He shall state to the Engineer in writing the name of each subcontractor he intends employing, the portion of the work which he is to do or the materials which he is to furnish, his place of business and such other information as the Engineer may require, in order to know whether such subcontractors are reputable and reliable and able to perform the work or to furnish the materials as called for in the specifications. No subcontractor shall be engaged upon any branch of the work who is not thoroughly practical and reasonable and at the time of making this contract conducting business in the particular branch of trade for which he is employed.

B. The Contractor shall not, either legally or equitably, assign any of the monies payable under the contract, or his claims thereto, unless by and with the like consent of the Engineer.

C. The Contractor shall not be released from any of his liabilities or obligations under this contract should any subcontractor or subcontractors fail to perform in a satisfactory manner the work undertaken by him or them.

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

E. Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the Owner.

1.46 CLAIMS FOR EXTRA COMPENSATION

A. Should the Contractor be of the opinion, at any time or times, that he is entitled to any additional compensation whatsoever (over and above the compensation stipulated in these contract documents or for the quantities and/or amounts over and above the quantities and/or amounts allowed or approved by the Engineer for damages, losses, costs, and/or expenses alleged to have been sustained, suffered, or incurred by him in connection with the project herein contemplated, he shall, in each occurrence, within five (5) days after such alleged damages, losses, costs, and/or expenses shall have been sustained, suffered or incurred the Contractor shall file with the Engineer a written, itemized statement and/or expenses. Unless such claims and statements have been thus made and filed, in each such instance, the Contractor's claim for such additional compensation shall be held and taken to be invalidated, and he shall not be entitled to any compensation on account of such alleged damages, losses, costs and/or expenses.

B. The provisions of these General Conditions shall beheld and taken to constitute a condition precedent to the right of the Contractor to recover; they shall also apply to all claims by the Contractor in any way relating to the complete project, and even though claims and/or work involved may be regarded as "outside the Contract."

C. It is understood and agreed, however, that nothing in these General Conditions contained shall be held or taken to enlarge in any way the rights of the Contractor or the obligations of the Owner under these Contract documents.

1.47 EXTRA WORK RELATING TO CONTRACT

A. No order for extra work, nor the doing of any work, at any time or place shall in any manner or to any extent relieve the Contractor or the Surety of his bond from any of their obligations under the contract documents; all extra work orders being given and all extra work being done, under and in accordance with the contract; and to be considered a part of the same and subject, to each and every one of the terms and requirements of the contract documents, and fully covered by the bond furnished by the Contractor.

1.48 SCOPE OF PAYMENTS

A. The Contractor shall receive and accept the compensation, as provided in the Bid, in full payment for furnishing all materials, labor, tools, and equipment and for performing all work contemplated and embraced under the contract, also for all loss or damage arising out of the nature of the work, or from the action of the elements, or from any unforeseen difficulties or obstructions, which may arise or be encountered during the execution of the work, until its final acceptance by the Owner, and for all risks of every description connected with the execution of the work; also, for all expenses incurred by, or in consequence of the suspension or discontinuance of the execution of the work as herein specified, and for any actual or alleged infringement of patent, trademark or copyright and for completing the work and the whole thereof, in an acceptable manner according to the drawings and specifications. The payment of any current or final estimate, or of any retained percentage, shall in no way or in no degree prejudice or affect the obligation of the Contractor, at his own cost and expense, to renew, or replace any defects and imperfections in the construction of the work or in the strength of or quality of materials used in or about the construction of the work under contract and its appurtenances, as well as all damage due or attributable to such defects, which defects, imperfections or damages shall be discovered on or before the final inspection and acceptance of the work, and of which defects, imperfections or damages the Engineer shall be the judge, and the said Contractor shall be liable to the Owner for failure to do so.

1.49 PARTIAL PAYMENTS

A. The Contractor may make monthly estimates in the approved format, once each month, of the materials in place complete, and the amount of work performed in accordance with the contract, during the preceding month or period, and the value thereof figured at the unit price of the contract. In the case of lump sum items, the estimate will be on the basis of the schedule of values to be agreed upon, as hereinafter provided for. Partial payment requests shall be submitted in triplicate to the Engineer on an approved form. He shall respond within five (5) days and state his approval or request revisions.

B. From the total of the amounts estimated will be deducted an amount equivalent to ten (10) percent of the estimated total which will be retained by the Owner until after the completion of the entire contract, in an acceptable manner; and the balance, or a sum

equivalent to ninety (90) percent of that total, shall be paid to the Contractor by the Owner within thirty days after final approval of partial payment estimate by the Engineer.

C. A schedule of values of the various parts of the work to be done under the lump sum items shall be agreed upon by the Contractor and the Engineer. Prior to the first monthly payment requisition, the Contractor shall submit for approval, a proposed breakdown into construction categories of his lump sum bid price. This breakdown shall add up to the full 100 percent value of his lump sum price, and all parts of it shall be covered by the Performance Bond. The approved breakdown shall be used for the purpose of arriving at a basis for monthly estimates and monthly billing.

D. Mobilization and General Conditions will be proportioned according to work completed and paid as work progresses. Mobilization shall not exceed 10% of the total base bid.

E. Each request for partial payment shall contain Contractor's certification that he has paid all Subcontractors and Materialsmen in the same proportion for all work and materials supplied by them at his own receipts.

1.50 PAYMENTS MAY BE WITHHELD

A. Payments may at any time be withheld if the work is not proceeding in accordance with the contract, or if, in the judgment of the Engineer, the Contractor is not complying with the requirements of the contract documents.

1.51 CONDITIONAL ACCEPTANCE

A. Whenever, in the opinion of the Engineer, the Contractor shall have the work in an acceptable manner in accordance with the terms of the contract, the Contractor shall arrange for start-up as outlined elsewhere in these specifications and an inspection of the entire work by the Engineer, and upon completion of all repairs or renewals which may appear at the time to be necessary, in the judgment of the Engineer, he shall certify to the Owner in writing as to said completion, and as to the value thereof. The aforesaid certificate shall be held and taken to evidence the conditional acceptance of the entire work by the Owner as of the date thereof. Notwithstanding the issuance of such certificate and the entire work thereunder, the Owner shall continue to reserve and retain five (5) percent of the whole value of the work as shown by the said certificate of conditional acceptance, over and above any and all other reservations and/or deductions which the Owner is, by the terms of the contract documents or otherwise, entitled or required to make and retain, and shall hold the said five (5) percent for a period of one (1) month from and after the date of such certificate of conditional acceptance. The Owner shall be authorized to apply the whole or any part of said five (5) percent so retained, to any and all costs of repairs and renewals of the work and appurtenances which may become necessary, in the judgment of the Engineer, during such period of one (1) month on account of any failure of defects in said work and appurtenances if due to improper work done or materials furnished by the Contractor, and if the Contractor shall fail to make or initiate such repairs or renewals within twenty-four (24) hours after receiving notice from the Owner to do so.

1.52 MAINTENANCE, REPAIRS, ETC., AFTER COMPLETION

A. The Contractor, at his entire cost and expense, shall maintain all portions of the work included in this contract to meet the requirements of these specifications for and during the period one (1) month from and after the date of the conditional acceptance of the entire work by the Owner, and, in addition, shall at his entire cost and expense, make all repairs and replacements of the Engineer, at any time or times, during said one (1) month period, on account of any failures or defects in said work, equipment, controls and appurtenances due to improper work done or materials furnished by the Contractor.

1.53 FINAL ACCEPTANCE AND PAYMENT

A. Upon the expiration of the aforesaid one (1) month period from and after the date of the certificate of conditional acceptance of the work, the Engineer shall make a final inspection of the entire work witness and approved the satisfactory operation of the entire work witness and approve the satisfactory operation of all equipment and controls, and, upon completion of all repairs or renewals which may appear at that time to be necessary in the judgment of the Engineer, he shall certify to the Owner in writing as to the final acceptance of the entire project. The Owner, upon receipt and approval of said certificate, shall pay, or cause to be paid, to the said Contractor, under the contract, except such sums as may have been expended by the Owner under the provisions of the contract documents and less any other deductions the Owner may be otherwise entitled to make.

B. The last mentioned certificate issued by the Engineer shall be deemed and accepted by all of the parties thereto as evidencing the final completion and acceptance of the entire project. The payment made by the Owner to the Contractor pursuant to the issuance of said certificate of final completion and acceptance shall be deemed to be and accepted by all of the parties hereto as the final payment to be made by the Owner to the Contractor; all prior certificates or estimates upon which payments may have been made being partial estimates and subject to correction in said final payment. Prior to final payment, the Contractor shall furnish a complete release of liens from individually executed by All Subcontractors and materials Suppliers.

1.54 LAST PAYMENT TO TERMINATE LIABILITY OF THE OWNER

A. The acceptance by the Contractor of the final payment made shall operate as and be a release to the Owner and every agent thereof from all claims and liabilities to the Contractor for anything done for, furnished for, or relating to, the work, or for any act of neglect of the Owner or of any persons relating to or affecting this work.

1.55 UNLIMITED LIABILITY OF CONTRACTOR

A. It is understood and agreed that any and all of the duties, liabilities and/or obligations imposed upon or assumed by the Contractor and the Surety, or either of them, by or under the contract documents, shall be taken and constructed to be cumulative, and that the mention of any specific duty, liability or obligation imposed upon or assumed by the Contractor and/or Surety under the contract documents shall not be taken or construed as a limitation and/or obligations imposed upon or assumed by the Contractor and/or Surety by or under the contract documents.

1.56 CUMULATIVE REMEDIES

A. All remedies provided in the contract documents shall be taken and construed to be cumulative; that is, in addition to any and all other remedies provided therein and to any remedies in law or equity which the Owner would have in any case.

1.57 CONTRACTOR'S LEGAL ADDRESS

A. The address given in the bid or proposal is hereby designated as the legal address of the Contractor. Such address may be changed at any time by notice in writing delivered to the Owner. The delivering at such legal address or the depositing in any post office, in a postpaid, registered wrapper directed to the above-mentioned address of any notice, letter and other communication to the Contractor, shall be deemed to be a legal and sufficient service thereof upon the Contractor.

B. The delivering at or the mailing to the Contractor's business address (written notice of which address shall be given to the Engineer), or the delivering to the Contractor in person or to his authorized representative, of notices, letters and other communication shall also be deemed to be a legal and sufficient service thereof the Contractor.

1.58 TESTS AND INSPECTIONS

A. If the Contract Document, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction required any Work to specifically be inspected, tested, or approved by some public body, Contractor shall assume full responsibility therefore, pay all costs in connection therewith and furnish Engineer the required certificates of inspection, testing or approval.

B. Engineer and his representatives, representatives of Owner, OSHA, Kent Conservation District and State of Delaware officials will at reasonable times have access to the Work. Contractor shall provide proper and safe facilities for such access and observation of the WORK and also for any inspection or testing thereof by others.

1.59 COOPERATION WITH OTHER CONTRACTORS

A. The Contractor shall cooperate with and so conduct his operations as not to interfere with or injure the work of other contractors or workmen employed by the Owner. He shall promptly make good, at his own expense, any injury or damage which may be done by him or his employees or agents on the work.

B. The Contractor shall suspend such part of the work herein specified, or shall carry on the same in such manner, as may be ordered by the Engineer when necessary to facilitate the work of such other contractors or workmen.

1.60 GUARANTEE

A. The Contractor hereby guarantees all of the work for a period of one (1) year after the date of completion and final acceptance thereof by the owner as follows:

1. Against all faulty materials and against all imperfect, careless, and unskilled workmanship.

2. That the entire equipment and each and every part thereof shall operate (with proper care and attention) in a satisfactory and efficient manner, and in accordance with the requirements of these contract documents.

3. That all structures shall be watertight and leak proof at every point and in every particular.

4. The Contractor agrees to replace, with proper workmanship and materials, and to reconstruct, correct, or repair, without cost to the Owner, work which is improper, imperfect, does not operate in a satisfactory manner, or fails to perform as specified, or all of these.

5. The guarantee obligations assumed by the Contractor under these contract documents shall not be held or taken to be in any way impaired because of the specification errors, indication or approval by or on behalf of the Owner of articles, materials, means, combinations or things used in the construction, performance and completion of the work or any part thereof, or all of these.

6. No use acceptance by the Owner of the work or any part thereof, nor any failure to use the same, nor any repairs, adjustments, replacements or corrections made by the Owner due to the contractor's failure to comply with his obligations under the contract documents, shall impair in any way the guarantee obligations assumed by the Contractor under these contract documents.

B. It is understood and agreed that in the event the Contractor fails to correct, or repair any work under the contract which may be found to be improper or imperfect, or otherwise fails to fulfill the terms of the Guarantee, the Owner may purchase materials, tools, and equipment, and employ labor, or let a contract as required to perform the necessary corrective work covered in the Guarantee. All cost and expenses incurred thereby by the Owner shall be charged against the Guarantee (Maintenance) Bond.

1.61 LIQUIDATED DAMAGES

A. Unless otherwise specified in the contract, the sum per calendar day specified in the Special Conditions shall be deducted by Engineer from monies due the Contractor, as liquidated damages for the period that any work shall remain uncompleted after the time specified for the completion of the work covered by the contract.

B. For each and every day that the Contractor is in default in completing the Contract, he shall pay the Owner the sum of $500.00 in liquidated damages

C. A time allowance, however, may be made by the Engineer at his discretion, for delays caused by the conditions over which the Contractor has no control. The Contractor shall become liable for liquidated damages for delays commencing from the date on which the time allowance period shall expire.

1.62 FAILURE TO COMPLETE WORK ON TIME

A. Permitting the Contractor to continue and finish the work or any part of it after the time established in the contract for its completion or after the date of which the time for completion may have been extended shall not operate as a waiver by the Owner of any of its right under this contract, and shall not relieve the surety from its obligation.

1.63 EXTENSION OF TIME

A. If the Contractor finds that it will be impossible for him to complete the work on or before the completion date fixed on the contract, he shall, ten (10) days prior to said date, submit a written request to the Engineer for an extension of time for completion of the contract. He shall set forth fully therein the reasons which he believes would justify the Engineer to grant his request, and shall set forth a revised detailed progress schedule which shall provide that the remaining work shall be completed on or before the extended completion date therein requested. If the Engineer finds that the work was delayed on account of unusual conditions beyond the control of the Contractor, or that the quantities of work done or to be done are sufficiently in excess of the estimated quantities to warrant additional time, he will, with or without notice to the surety, grant an extension of time for completion to such date as appears to him to be reasonable and proper. This date shall thereafter be as binding upon the Contractor and surety as if it appeared in the contract originally.

B. If any delay is caused to the Contractor by specific orders of the Engineer to stop work or by the failure of the Engineer to provide necessary instruction for carrying on the work or the Owner to provide necessary right-of-way, such delay will entitle the Contractor to an equivalent suspension of the liquidated damage.

C. When the satisfactory execution and completion of the contract requires more work or materials in greater amounts then set forth in the contract, the Contractor shall be entitled to an extension of time. When the Contractor is delayed by conditions beyond his control, the contract time shall be extended equal to the number of calendar days he has been delayed.

1.64 EXISTING WATER AND SEWERAGE SYSTEMS

A. It is essential that the existing water and sewerage systems remain in operation throughout the construction period. Connections to existing pipes and structures shall be scheduled and coordinated with the Owner. Although some interruptions in service are impossible to avoid, the Contractor shall make every effort to keep these interruptions to a minimum.

B. Certain connections to existing systems might have to be made during weekends or nighttime hours. No additional cost for these working hours will be allowed.

1.65 OVERTIME PAYMENT FOR RESIDENT PROJECT REPRESENTATIVE

A. Ordinarily, an R.P.R. will be on the job at no cost to the Contractor. However, if the Contractor is performing overtime work and an R.P.R. is on the job, the Contractor shall pay the R.P.R. for his overtime hours.

1.66 LOCATION OF EXISTING UTILITIES

A. The Contractor’s attention is directed to the fact that the location of the existing utilities shown on the contract drawings are approximate only. It shall be the Contractor’s responsibility to locate these utilities, by test pits in the vicinity of the utilities prior to actual construction.

B. The failure to show on the contract drawings any existing utilities shall not relieve the Contractor of his/her responsibility of determining the locations of these utilities, and any damage to the utilities or interruption of services shall be repaired by the Contractor according to City or utility company specifications. The Owner shall be notified of any damage to any utilities.

1.67 ORDERING MATERIALS

A. Orders for all materials and/or equipment specified herein or shown on the drawings, or in any way affecting the work, shall be placed within ten (10) days of the signing of the contract. The Engineer shall be notified immediately if any materials or equipment are not obtainable, or promised delivery dates are such as to seriously impede the work. Substitute materials, if required, shall be subject to approval by the Engineer.

B. Contractor shall frequently check on continued validity of delivery dates and shall advise the Engineer promptly of any change of delivery promises made by the suppliers. The Contractor shall expedite deliveries of material controlling job progress.

1.68 TEST BORINGS AND/OR SUBSURFACE CONDITIONS SHOWN ON DRAWINGS

A. Where test borings and/or subsurface conditions are provided they have been provided, for the information of all parties concerned; however, the Owner assumes no responsibility for the accuracy of such information and should any bidder or Contractor rely on such information in preparing his bid or in the performance of the work, he does so at his own risk.

B. Whether or not subsurface conditions are shown the Contractor is not relieved of the responsibility of making his own investigations to determine the type of subsurface materials. Where the bid or proposal stipulates unit prices, the presence or absence particular subsurface materials, or the increase or decrease in quantities specific subsurface materials, shall not entitle the Contractor to additional compensation beyond the unit prices stipulated, wherein unclassified excavation is included as a part of the proposal items.

C. Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the plans or indicated in the specifications, he shall immediately give notice to the Engineer of such conditions before they are disturbed.

1.69 EROSION AND SEDIMENT CONTROL

A. The Contractor shall provide for safe disposal of run-off from construction areas in accordance with County erosion and sediment control requirements. Such requirements may be defined in the Contract Documents, issued by addendum or ordered during Construction by the controlling agency, owner, or engineer. The cost of erosion and sediment control measures shall be included in the appropriate unit prices bid for pipe and appurtenances.

1.70 ACCESS BY RESIDENTS AND BUSINESSES

A. The Contractor shall schedule his work so to minimize the time during which vehicular access to each dwelling along the work route is prevented. The Contractor shall provide, at all times, safe pedestrian access to all dwellings.

B. Vehicular access on side streets, in the proximity of the route of the work, shall not be encumbered by the Contractor.

C. Public access to businesses shall be provided during all periods of sewer main installation.

1.71 RECORD DRAWINGS

A. The Contractor shall keep (1) copy of the drawings at the site, in good order and provide mark-up to show all changes made during construction. These record drawings shall be available to the Engineer, and shall be delivered to him upon completion of the Contract. The Engineer will compare the contractor's mark-up to the inspector's and prepare final record drawings for the Owner. They will contain stationing on all manholes, cleanouts, laterals to each structure, etc.

1.72 TEMPORARY UTILITY SERVICES

A. The Contractor shall be responsible for securing water and power required, within the prices bid in the Proposal and without extra cost to the Owner.

B. The Contractor shall be responsible for payment of all temporary electrical services, telephone services, and water services for field offices and to all residential, commercial or industrial facilities suffering a loss of such service as a result of construction activities by the Contractor until conditional acceptance of the project facilities by the Owner.

1.73 CONTRACT CLOSEOUT

A. The items listed herein shall be compiled and prepared by the Contractor prior to completion of all work and delivered within one month of date of substantial completion to the Owner for his future use.

1. Final retainage payment to the Contractor will be withheld until all items listed herein are delivered to the Owner.

2. Submit all items specified herein to the Engineer or Architect for review prior to delivery to the Owner. Make any corrections, additions or deletions from the contents thereof as may be required.

B. As-Built Drawings

1. Submit As-Built Drawings as specified in this section, "General Conditions", paragraph 1.12.

C. Maintenance Manual

1. Submit Maintenance & Operations Manual as specified in Section 00 73 00 “Special Conditions”, paragraph 1.09.

2. Provide testing/training as specified in Section 00 73 00 “Special Conditions”, paragraph 1.09 G.

D. Warranties

1. Submit all warranties for equipment & appurtenances.

E. Asbestos Free Certification

1. The Contractor shall furnish notarized written certification to Owner that all materials installed under this contract are entirely free of asbestos.

F. Contractor’s Affidavit of Release of Liens (AIA Document G706A)

G. Clean-Up

1. The Contractor shall, at his own expense, keep the sites of his operations clean during construction and remove all rubbish as it accumulates. Daily brush cleaning of roadway sections with ongoing construction activities shall be performed. The contractor shall remove waste materials, debris and rubbish from site periodically and dispose of at legal disposal areas away from site. The contractor shall also:

   a. Clean staining or reactive materials from affected surfaces immediately during course of work. Particular care shall be taken to remove plaster, mortar, and paint from metal surfaces immediately.

   b. Clean the work as it progresses to minimize the collection of dust and debris in inaccessible spaces, color change or staining of finishes, and hardening of curing-type dirt and stains.

   c. Flush ducts of all dirt before final clean-up.

   d. Clean on a daily basis all areas used for construction traffic. Where dropping from debris carts, concrete buggies affect traffic, assign full time labor to keep public traffic moving freely under clean, unobstructed conditions.

H. The Contractor shall provide dust control by:

1. Cleaning interior spaces prior to start of finish painting and continue cleaning on an as-needed basis until painting is finished.

2. Scheduling operations so that dust and other contaminates resulting from cleaning process will not fall on wet or newly-coated surfaces.

I. The Contractor shall provide the following tasks for final cleanup:

1. Perform general cleanup of building before final inspection.

2. Glass, porcelain, tile and similar hard surfaces shall be cleaned of sticker, tags, protective paper, marks, stains, fingerprints.

3. Floor surfaces shall be vacuum cleaned and all marks or stains removed.

4. Clean ducts of dust. Replace used filters with fresh ones.

5. Clean lighting fixtures, mirrors, and both sides of window.

6. Clean the grounds of debris and paper.

7. Clean insides and outsides of sinks.

8. Vacuum control cabinets.

9. Remove debris from roof, inlet drains, and scuppers.

10. Remove dirt splash from exterior walls at grade.

11. Remove paint spots, drips, stains, marks and dirt from all surfaces including all equipment and ductwork.

12. Refer to each Technical Section of the Specifications for additional requirements

1.74 BUILDING CODES

A. The contractor shall conform to 1988 Standard Building Code and 1989 NFPA 101 Life Safety Code. If the contractor discovers questionable deviation from these code requirements, the contract is then required to notify the architect for conformation.

B. The Contractor shall conform to safety standards as set forth by the “Manual of Accident Prevention in Construction by Associated General Contractors of America, Inc.,” and OSHA.

1.75 PROJECT MEETINGS

A. The Engineer may keep minutes of project meetings and will distribute copies to all parties present at meeting or listed on a permanent list of concerned parties.

B. Except as noted below for preconstruction meeting, progress meetings will be scheduled on a regular basis by the Engineer.

C. The Engineer may call additional progress meetings at critical times in the project.

D. The Contractor shall schedule the presence of active and critical suppliers, subcontractors, and management personnel at these meetings.

E. Representatives of the Contractor's suppliers and subcontractors shall be persons familiar with the details of the work. They shall be person authorized to make commitments on matters of work progress, delivery dates, size of labor force, cost and other matters as necessary to expedite the work.

F. To the maximum extent practicable, meetings will be held at the job site.

G. A preconstruction meeting will be scheduled within ten (10) days after the Owner has issued the Notice to Proceed.

H. Contractor shall provide attendance by authorized representatives of the Contractor and all major subcontractors.

1.76 PHOTOGRAPHS

A. Each month during the construction phase of the project, the Contractor shall have taken, four (4) 5-inch by 7-inch color photographs representing four different views of significant items of work then in progress. Two prints of each photograph clearly labeled as to project title and date taken shall be delivered to the Engineer.

1.77 MATERIAL AND EQUIPMENT

A. Piled material such as sand, gravel, excavating and topsoil shall be stored in such a way that silting and staining of surroundings from rain will not occur. Cover aggregate piles in cold and wet weather.

B. Unit materials such as CMU, brick, steel, pipe, conduit, door frames and lumber shall be stored off ground, out of reach of water, mud and splashing. CMU shall be separated in piles according to grade and shall be kept dry, covered top and sides, at all times.

C. Solid materials such as insulation, tile, mechanical and electrical equipment, fittings and fixtures shall be stored under shelter, in original packages, away from dampness and other hazards. Liquid materials shall be stored in original tanks or cans, with labels protected. Protect water mixes from freezing. Keep flammables away from fire and heat. Provide sufficient open shelving for storage of all finish hardware, together with work surface for assembly.

D. Provide special storage for sensitive materials as follows and as further specified in other section.

1. Cement, lime: In an absolutely dry place.

2. Millwork, doors, casework: In heated area, after wet materials such as plaster have dried 30 days.

3. Thinners, paint rags: Isolated from paint, in well ventilated space.

4. Bottles, gases and power fasteners: Isolated from heat and fire, away from thinners and petroleum products.

E. Tools and Equipment

1. Store tools that carry dirt, or leak oil, outside.

2. When pipe threading machines or other oily machines or processes are used inside building, they shall be placed on a layer of absorptive fiber board with plastic sheet beneath so as not to stain floors.

3. Large equipment shall be stored or parked so as not to damage site or resent a fire hazard to the building.

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SECTION 00 73 00

SPECIAL CONDITIONS

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1.01 ORGANIZATIONAL DEFINITIONS

A. Engineer: City of Dover's consultant engineer is Johnson, Mirmiran & Thompson, Cristiana Executive Campus, 121 Continental Drive, Suite 208, Newark, DE 19713. The Engineer is acting for the Owner as its duly authorized agent, said agent acting severally within the scope of duties contracted for with the owner.

B. Wherever the word Owner appears in the Contract Documents, it is defined to mean the City of Dover, Delaware.

C. Key personnel involved in traffic control must be certified by DelDOT prior to commencement of construction.

1.02 DRAWINGS AND SPECIFICATIONS

A. Wherever the words "directed", "required", "ordered", "approved", "acceptable", or others of like import appear in the specifications, they shall mean as directed, required, ordered, approved or acceptable by or to the Owner and by or to the Engineer acting as the Owner's agent.

B. All reference to Federal or other standards appearing on the drawings or in the specifications shall mean the current edition. Where, in the specifications which follow, a standard is cited next to the name of a product or a test procedure, the product or test procedure shall conform to that standard.

C. Unless otherwise noted in General Conditions, two (2) sets of specifications will be furnished the Contractor without charge. Additional sets will be furnished at cost.

D. The Contractor shall maintain, at the job site, one complete set of specifications. The Contractor shall record on this set and keep current, all authorized changes and field adjustments. The set shall be kept available for inspection by representatives of the Owner and the Engineer, and shall finally be used to assist in the preparation of as-built drawings.

E. Locations of overhead and underground utilities shown on the drawings were derived from existing records and from field observations, in order to provide the Contractor with as much information as could reasonably be ascertained without actually excavating and exposing subsurface utilities. The Owner and the Engineer do not warrant or guarantee the complete accuracy of the information shown. Some utilities may not be shown, and the location of those shown may not be entirely accurate.

F. All incidental items of labor and materials not specifically delineated by the Contract Documents, but which are necessary to provide a fully operable facility, and which may reasonably be interpreted as being a part of the work shall be accomplished by the Contractor without extra charge.

1.03 CONTRACT TIME

A. The Bid Form states the number of consecutive work days allowed from date of "Notice to Proceed" to date of completion of the entire project under this Contract. For each and every day that the Contractor is in default in completing the Contract, as defined in the General Conditions and the bid, he shall pay the Owner the sum of $500.00 in liquidated damages.

B. The Owner reserves the right to take either or both of the following actions at any time, that in his judgment, it appears the scheduled completion date will not be met:

1. Require the Contractor to assign additional construction forces to the work.

2. Delete all or any portion of remaining work from this Contract and assign such work to another Contractor or accomplish same by any other method which may appear most advantageous.

3. These remedies are supplementary to all other provisions of the specifications and do not void such other provisions.

1.04 SUBCONTRACTING

A. The Contractor shall submit, prior to commencement of construction for review by the Engineer and the Owner, a final list of Subcontractors, as well as materials and equipment suppliers with whom he intends to contract. If the Owner or the Engineer objects to any proposed Subcontractor, materials or equipment supplier, the Contractor shall furnish such data as may be required to secure the Owner's and Engineer's approval. If such approval is not then forthcoming, the Owner and the Contractor will negotiate the matter to a mutually acceptable conclusion, which negotiations may include a decrease or increase in contract price.

1.05 SURVEYS AND CONSTRUCTION STAKE-OUT

A. Any bench marks or property corners destroyed through or as a direct result of the Contractor's construction operations shall be replaced and/or restored at his expense with no additional cost to the Owner by a surveyor licensed in the State of Delaware.

B. All proposed valves, meter pits, etc., shall be field located by the Contractor prior to the start of construction. Notice shall be given to the Engineer to observe the location and make any adjustments deemed necessary.

1.06 CONSTRUCTION SCHEDULE

A. The Contractor shall submit a construction schedule indicating anticipated date of beginning and completion of each work increment and indicating completion of all increments by the scheduled date. The Contractor shall assign such work forces as are necessary to accomplish all increments of the work within the times allotted on the construction schedule.

B. Once the construction schedule has been approved by the Engineer, the Contractor shall adhere to the approved construction sequence. In the event that unforeseen circumstances require the sequence to be adjusted, the Contractor shall make such request to the Engineer in writing and shall not change the sequence prior to receipt of approval.

1.07 SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

A. In order to protect the lives and health of his employees under the contract, the Contractor shall comply with all pertinent provisions of the Contract Work Hours and Safety Standards Act, as amended, commonly known as the Construction Safety Act as pertains to health and safety standards; and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work arising out of and in the course of employment on work under contract.

B. The Contractor, alone, shall be responsible for the safety, the adequacy of his work, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance or operation. The Contractor will comply, within the prices bid and without extra cost to the Owner, with all safety regulations or determinations issued by any agency of the Federal government including OSHA and the State of Delaware.

1.08 SHOP DRAWINGS

A. The Contractor shall submit to the Engineer layout drawings for installation and erection of the work, and shop drawings for all fabricated or manufactured articles to be used in the work. The Contractor shall have six (6) copies prepared for submittal to the Engineer and shall prepare whatever additional copies as may be necessary or required for his own use and/or use by individual equipment suppliers and Subcontractors.

B. All shop drawings shall be submitted to the Engineer through the Contractor. Direct submittals by the Subcontractors will not be accepted. The Contractor shall review and sign each copy of a shop drawing noting review and approval prior to submittal. Drawings will not be considered unless they have been stamped approved by the Contractor.

C. The Engineer's review of layout and shop drawings will be only to verify general compliance with Contract Documents. Figure dimensions and other detail will not be checked. Any notation made on shop drawings by the Engineer shall be for the Contractor's guidance, but shall not relieve the Contractor from his responsibility to re-check, verify and resolve items so noted. The Engineer's review of shop drawings shall not relieve the Contractor from responsibility for errors or omissions thereon, whether or not called to the attention of the Contractor by the Engineer.

1.09 OPERATING AND MAINTENANCE MANUAL

A. Compile product and related information appropriate for Owner's maintenance and operation of products furnished under the contract as specified in this section and as referenced in other pertinent sections of the Specifications.

B. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

C. Form of Submittals: Prepare data in the form of an instructional manual for use by Owner's personnel. Text shall be manufacture's printed data or neatly typewritten on 8.5 x 11 inch white pages. Drawings shall be folded as required and provided with a reinforced punched binder tab. Provide fly-leaf for each separate product or piece of equipment commercial quality three-ring binders with durable and cleanable plastic covers. Maximum ring size is three (3) inches. All

binders shall have a printed title “Operating and Maintenance Manual” and in addition, the project title and general subject matter covered within.

D. Content of Manual:

1. Neatly typewritten Table of Contents for each volume, arranged in a systematic order as follows: Contractor, name of responsible principal, address and telephone number; a list of each product required to be included, indexed to the content of the volume; list, subcontractor or installer, maintenance contractor, as appropriate, identify the area of responsibility, of each local source of supply for parts and replacement; and identify each product by product name and other identifying symbols as set forth in the Contract Documents.

2. Product Data: Include only those sheets which are pertinent to the specific product and note each sheet to clearly identify the specific product and note each sheet to clearly identify the data applicable to the installation. Delete references to inapplicable information.

3. Drawings: Supplement data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control, wiring and flow diagrams. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation. Do not use Project Record Documents as maintenance drawings.

4. Written text, as required to supplement product data for the particular installation; organize in a consistent format under separate headings for different procedures and provide a logical sequence of instructions for each procedure.

E. Manual for Materials and Finishes: Submit three (3) copies of the complete manual containing, for architectural products, manufacturer’s data, catalog number, size, composition, color, texture designation, and, information required for re-ordering special manufacturer parts for all applied materials and finishes. Also included shall be manufacture’s recommendations for care and maintenance, moisture protection and weather exposure precaution, and instructions on repair where applicable.

F. Submittal Schedule: Manuals shall be submitted and approved prior to start-up for testing of the station.

G. Instruction and Training of Owner’s Personnel: Instruction and Training shall be completed prior to acceptance for operational by the City.

1.10 CONSERVATION DISTRICT REQUIREMENTS

A. The Contractor shall comply with all provisions of the sediment and erosion control plan and all directives issued by the agency or their inspectors.

1.11 TESTS AND INSPECTIONS

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested, or approved by some

public body, the CONTRACTOR shall assume full responsibility, therefore, pay all costs in connection therewith and furnish Owner the required certificates of inspection, testing or approval.

B. ENGINEER and his representatives, representatives of OWNER, the Kent County Soil Conservation Service, OSHA, Office of Drinking Water and Department of Natural Resources and Environmental Control will at reasonable times have access to the WORK. CONTRACTOR shall provide proper and safe facilities for such access and observation of the Work and also for any inspection or testing thereof by others.

1.12 SALVAGE

A. Contractor shall coordinate with the City of Dover to verify any and all items to be salvaged from the existing pump station and force main.

1.13 JOB TRAILER FOR PROJECT R.P.R. (Not Applicable)

A. Refer to Section 01 50 00, Temporary Facilities and Controls.

1.14 UNSCHEDULED WORK ACTIVITIES

A. Sufficient time for construction has been indicated and it is intended that all work specified under these Contract Documents be performed within the normal daily working hours of 7:00 A.M. to 3:30 P.M., Monday through Friday, unless authorized by the Director of Public Works. An alternate continuous daily work period may be satisfactory, however, subject to approval of the Owner.

B. Should the Contractor extend his work beyond these specified hours, any and all cost of weekend, holiday and/or overtime inspection incurred by the Engineer or Owner will be the sole obligation of the Contractor.

1.15 PROTECTION OF PROPERTY AND STRUCTURES

A. The Contractor shall, at his own expense, sustain in their places and protect from direct or indirect injury all pipes, wires, conduits, poles, tracks, walls, buildings, and other structures or property in the vicinity of his work whether above or below the ground, or that may appear in the trench. He shall at all times have sufficient quantity of timber and plank, chains, ropes, etc., on the site and shall use them as necessary for sheeting his excavations and for sustaining or supporting any structures that are uncovered, undermined, endangered, threatened, or weakened. The Contractor shall take all risks attending the presence of proximity of pipes, wires, conduits, poles, tracks, walls, buildings or other structures and property of every kind and description in or over his trenches or in the vicinity of his work whether above or below the surface ground and he shall be responsible for all damage and assume all expense for direct or indirect injury caused by his work. To any of them or to any person or property by reason of injury to them, whether such structures are or are not shown on the drawings.

B. The Contractor shall take all necessary precautions to protect existing fences, property markers, driveways, curbing, sidewalk, etc., including the replacement of any said items damaged through or as a result of the Contractor's operations to the satisfaction of the property owner

and the Owner. The Contractor shall coordinate and pay for replacement of property monuments damaged. This work shall be performed by a surveyor licensed in the State.

C. The Contractor shall not enter upon private property for any purpose without obtaining the property owner's permission and he shall be responsible for the preservation of all public and private property, trees, shrubbery, and any and all natural or manmade objects, along and adjacent to the work and shall use every precaution necessary to prevent damage or injury to any and all property. The Contactor shall not willfully or maliciously injure or destroy trees or shrubs and shall not remove or cut them without proper written authority of the property owner. The Contractor shall be strictly responsible for any and all damage or injury of every kind and description which directly or indirectly may be done to any property or sustained by any persons during the prosecution of the work resulting from any wrong doing, misconduct, poor construction methods, or any negligence of himself or his agents and/or employees in his manner or method of executing said work or due to his non-execution of said work, even though such manner or method of said work be concurred in, permitted, or allowed by the Engineer or the Owner, its agents, and/or employees, or at any time due to defective work or material. When or where any direct or indirect damage or injury is done to public or private property, by or on account of any act, construction method, omission, neglect or misconduct in the execution of the work, or in consequence of the non-execution thereof on the part of the Contractor, he shall restore, at his own expense, such property to a condition equal to that existing before such damage or injury was done by repairing, rebuilding, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner. In case of the failure on the part of the Contractor to restore such property or make good such damage or injury, the Owner may, upon forty-eight (48) hours' notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof may be deducted from any money due or which may become due the Contractor under this Contract. No extension of the Contract time will be allowed for any work or restoration covered by these requirements.

1.16 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

A. As required under paragraph 1.04 of the General Conditions, the Contactor's Public Liability Insurance and Vehicle Liability Insurance shall be in an amount not less than $1,000,000 for injuries, including accidental death, to any one person and subject to the same limit for each person, in an amount not less than $1,000,000 on account of one accident, and Contractor's Property Damage Insurance in an amount not less than $1,000,000.

B. The Contractor shall either (1) require each of his Subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance of the type and in the same amounts as specified in the preceding paragraph, or (2) insure the activities of his Subcontractors in his own policy.

1.17 PAYMENTS TO CONTRACTOR

A. Each request for payment shall contain Contractor's certification that he has paid all Subcontractors and Materialmen in the same proportion for all work and materials supplied by them at his own receipts.

B. Prior to final payment, the Contractor shall furnish a complete release of liens individually executed by each Subcontractor and Materialmen involved in the Project.

1.18 STORED MATERIALS

A. The Contractor will be compensated monthly for only the materials in-place, complete, and will not be compensated for materials stored. In the case of lump sum items, monthly compensation will be on the basis of the schedule of values to be agreed upon prior to beginning construction.

1.19 SCHEDULES, REPORTS AND RECORDS

A. All items of work which required measurement shall be measured concurrently, upon installation and before covering or backfilling by the Owner's representative and the Contractor's Representative. All items so measured will be recorded by both parties in a format which can be kept current until completion of the work.

B. Such measurement records shall be utilized to formulate and check partial and final requests for payment. Upon completion of the work, both sets of records shall be delivered to the Engineer for his use in the preparation of as-built drawings.

C. All measurements, to the maximum extent possible, shall be referenced to base dimensions and stationing shown on the drawings.

1.20 ACCESS BY RESIDENTS

A. The Contractor shall so schedule his work so to minimize the time during which vehicular access to each dwelling along the work route is prevented. The Contractor shall provide, at all times, safe pedestrian access to all dwellings.

B. Vehicular access on side streets, in the proximity of the route of the work, shall not be encumbered by the Contractor.

C. The Contractor shall not totally bar vehicle access from more than one block of the route of the work at any given time. Access to businesses shall always be maintained.

1.21 ACCOMMODATION OF TRAFFIC

A. In carrying out the work the Contractor shall interfere as little as possible with traffic. The Contractor shall provide and maintain ingress and egress for all residences and places of business located along the construction route. So far as practical, materials shall not be stored upon the highway. When it is absolutely necessary to do so they shall be placed so as to cause as little obstruction to the traveling public as possible.

B. If, in the opinion of the Owner, it is necessary to keep the road or any portion of the road open to travel during the construction, the Contractor shall carry on his work in such a manner as to provide such means that travel will not be obstructed or endangered.

C. The Contractor shall provide and maintain, in an acceptable condition, such temporary roadways and bridges as may be necessary to accommodate the traffic using or diverted from a roadway where construction is taking place. He shall also provide and maintain, in a safe condition temporary approaches to and crossings of intersecting roadways.

D. Fire hydrants on or adjacent to the highway shall be kept accessible to fire apparatus at all times and no material or obstruction shall be placed within fifteen feet of any such hydrant. All footways, gutters, sewers, inlets, and portions of the roadway adjoining the construction shall be kept free of obstructions insofar as possible.

E. Work areas closed down for any length of time shall be left entirely accessible at all points to fire apparatus.

F. The Contractor shall not disturb the surface of an existing road further in advance of the new construction than can be completed in a reasonable length of time as determined by the Owner.

1.22 DETOURS

A. Detours are to be installed by the Contractor. Traffic will be detoured over approved routes along existing roads upon written approval of the Engineer, the Owner and the Delaware Department of Transportation (DelDOT). Cost of erection and maintenance of the detour signs, etc. is to be borne by the Contractor.

B. The Contractor shall notify DelDOT, local fire companies and the City of all proposed detours 7 days prior to implementation and permit alternate routes in case of emergency.

1.23 CONTRUCTION IN RIGHTS-OF-WAY

A. All permanent construction will be within lands of the Owner, public Rights-of-Way or Rights-of-Way through private property acquired by the Owner and the Contractor shall confine his operations strictly within the limits of the Right-of-Way and construction areas, unless he has written permission of the owner of the adjacent property to occupy additional ground. A copy of the written permission shall be placed on file with the Owner.

1.24 ELIMINATED ITEMS

A. Should any items contained in the Project be found unnecessary for the proper completion of the work contracted, the Owner may, upon written order to the Contractor, eliminate such items from the contract and such action shall in no way invalidate the contract, and no allowance will be made for the items so eliminated in making final payment to the Contractor except for such actual work as may have been done, and materials actually purchased.

1.25 QUANTITIES OF ESTIMATE

A. Whenever the estimated quantities of work to be done and materials to be furnished on a unit price basis under this contract are shown in any of the documents including the bid, they are given for use in comparing bids, and the right is expressly reserved, except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this contract, nor shall any such increase or diminution give cause for claims or liability for damages.

1.26 GUARANTEE BOND

A. Prior to final payment, the Contractor will be required to furnish the Owner with a one year Guarantee Certificate and a Guarantee Bond in the amount of 100 percent of the total bid. The bond must be effective for the one year guarantee period beginning on the date of final acceptance by the Owner.

B. It is understood and agreed that the in the event the Contractor fails to correct, or repair any work under the contract which may be found to be improper or imperfect, or otherwise fails to fulfill the terms of the Guarantee, the Owner may purchase materials, tools, and equipment, and employ labor, or let a contract as required to perform the necessary corrective work covered in the Guarantee. All cost and expenses incurred thereby by the Owner shall be charged against the Guarantee Bond. An extension of the Performance Bond for the guarantee period in lieu of the Guarantee Bond is acceptable with proper documentation from the Surety.

1.27 REFERENCED SPECIFICATION

A. Where reference is made to Delaware Department of Transportation (DelDOT) Specification it shall mean the Standard Specification for Construction and Materials, latest edition.

1.28 WAGE RATES

A. State of Delaware prevailing wage rates apply.

1.29 UTILITIES

A. The Contractor shall do all work within the lump sum price bid and without extra cost to the Owner, which is required to locate, protect, relocate, replace or repair all overhead and underground utilities shown or not shown on the drawings, as necessary for the construction of this project. He shall contact “Miss Utility (811)” at 800-282-8555 at least 48 hours prior to digging in the vicinity of existing underground utilities to have them located and marked.

B. The Contractor shall, within the unit prices bid and without extra cost to the Owner, pay all charged levied by utility companies for work performed by their forces to locate, inspect, protect, relocate, replace or repair overhead or underground utilities as necessary for the construction of this project.

1.30 EXISTING WATER AND SEWERAGE SYSTEMS

A. It is essential that the existing water and sewer systems remain in operation throughout the construction period. Connections to existing pipes and structures shall be scheduled and coordinated with the Owner. Although some interruptions in service are impossible to avoid, the Contractor shall make every effort to keep these interruptions to a minimum.

1.31 CONTRACTOR RESPONSIBILITY TO COORDINATE ALL SERVICES

A. During construction, testing, start-up and initial operation, and during the one year guarantee period, Contractor is solely responsible for coordinating the efforts of all parties responsible for work under this Contract. Should problems arise, Contractor shall promptly perform all tests

necessary to trouble shoot and identify the problems and assure repairs are made by the appropriate Subcontractors or suppliers as required to remedy any faults. Contractor shall respond to request for services from the Owner or Engineer as soon as possible, but in no case, longer than 24 hours after receiving such request whenever a problem arises which affects the proper operation of the water main. The fault or defect shall be remedied as soon as possible. The Contractor shall provide emergency substitute equipment at his expense, if necessary, to keep the system operational during troubleshooting or repairs and shall bear all costs associated with such efforts.

1.32 WATER AND POWER

A. The Contractor shall be responsible for securing water and power required, within the prices bid in the bid form and without extra cost to the Owner. Both are available from the City of Dover at cost.

B. Water supply shall be obtained at the filling station located at 710 William Street, Dover, DE 19904. Water cannot be obtained through use of a fire hydrant.

END OF SECTION 00 73 00

DELAWARE WATER POLLUTION CONTROL REVOLVING LOAN FUND

PROGRAM REQUIREMENTS
City of Dover
Silver Lake Pump Station Replacement Project

Department of Natural Resources and Environmental Control
Office of the Secretary
Environmental Finance
97 Commerce Way, Suite 106
Dover, DE 19904

Effective Date: March 2018

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SUBPART A
Delaware Prevailing Wage Regulations

A. Prevailing Wages Requirements

a. The Project or Program to which the work covered by this contract pertains to is being assisted by the State of Delaware and the US Environmental Protection Agency (EPA) therefore the prevailing wage provisions of the Clean Water State Revolving Loan Fund (CWSRF) Program are included in this Contract.

b. Loan recipients or engineering representatives are to verify with the State of Delaware Department of Labor (DE DOL) and the United States Department of Labor (US DOL) the appropriate wage determination before they go out for competitive bidding.

c. All contractors and subcontractors performing construction work covered by this contract must pay their laborers and mechanics the higher of the State of Delaware and Davis Bacon prevailing wages and fringe benefits determinations for the classifications.

d. All contractors and subcontractors performing construction work covered by this contract must conform to the State of Delaware and Davis Bacon and Related Acts (DRBA) Provisions and Procedures.

B. Prevailing Wages Requirements

a. Delaware Prevailing Wage Regulations, Worker Classifications, Current Prevailing Wage Rates and forms may be found at:
http://www.delawareworks.com/industrialaffairs/services/LaborLawEnforcementInfo.shtml#pw1

or by contacting:

State of Delaware
Department of Labor Division of Industrial Affairs
225 Corporate Blvd. Suite 104
Newark, DE 19702
Telephone No. (302) 761-8200

b. All Contractors and subcontractors must submit to Delaware DOL (at the above address) and to the loan recipient sworn certified DE DOL payroll forms on a weekly basis.

C. Davis Bacon Act Prevailing Wages

a. Davis Bacon Prevailing Wages regulations, current prevailing wage rates, forms and other information may be found at:
http://www.wdol.gov/dba.asp

b. In compliance with the Davis Bacon and Related Acts all contractors and subcontractors must submit to the loan recipient sworn certified payroll forms on a weekly basis.

SUBPART B
Equal Opportunity Clause (41 CFR 60-1.4)

A. Executive Order 11246 (Applicable to Contracts/subcontracts above $10,000).

1. During the performance of this contract the contractor and all subcontractors agree as follows:

a. 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 of 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.

b. 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.

c. 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.

d. 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.

e. The contractor will furnish all information and reports required by the 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.

f. In the event of the contractors' noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, 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.

g. 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.

SUBPARTC:
Certification of Non-Segregated Facilities (41 CFR 60-1.8)

Bidders and offerers are cautioned as follows: By signing this bid or offer, the bidder or offerers will be deemed to have signed and agreed to the provisions of the "Certification of Nonsegregated Facilities" in this solicitation. The certification provides that the bidder or offerer does not maintain or provide for his employees facilities which are segregated on a basis of race, creed, color, or national origin, whether such facilities are segregated by directive or on a de facto basis. The certification also provides that he will not maintain such segregated facilities.

SUBPART D

Civil Rights Act of 1964

The contractor and any subcontractors shall not, on the grounds of race, color, or national origin, or sex, exclude from participation in, deny the benefits of, or subject to discrimination any person under any program or activity receiving Federal financial assistance.

SUBPART E
Section 13 of PL 92-500; Under the Federal Water Pollution Control Act; Rehabilitation Act of 1973; PL 93-112; and Age Discrimination Act of 1975

The contractor and any subcontractors shall not on the ground of race, color, national origin, or sex, exclude from participation in, deny the benefits of, or subject to discrimination any person or activity funded in whole or in part with Federal funds. Any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975, or with respect to any otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973 shall also apply to any such program ofactivity.

SUBPART F
Required Provisions of 40 CFR Part 31 Subpart C

A. Contracts awarded in excess of $10,000

1. Equal Employment Opportunity Clause
    a. The contractor agrees to comply with Executive Order 11246, entitled Equal Employment Opportunity, "as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR Part 60).

B. Contracts awarded in Excess of $100,000

1. Violating Facilities Clause
    a. The contractor agrees to comply with all applicable standards, orders or requirements issued under section 306 of the Clean Air Act (42 U.S.C 1857 (h), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and EPA regulations (40 CFR Part 15) which prohibits the award of this contract to facilities included on the EPA List of Violating Facilities. The contractor shall report violations to EPA.

SUBPART G

Suspension and Debarment and Other Responsibility Matters

The Project or Program to which the work covered by this contract pertains to is being assisted by the State of Delaware and the following provision is included in this Contract pursuant to the provisions applicable to such SRF Program. Loan Recipients or engineering representatives are to refer to the "List of parties excluded from Federal Procurement and Nonprocurement Programs" to insure that the contractor or subcontracts are not on this list. A search may be made on the System for Award Management web site at https://www.sam.gov/portal/SAM/#1 or by calling (202) 606-8220 for assistance.

ACCESS TO PROJECT SITE

The Contractor shall allow representatives of U.S. EPA and the State of Delaware DNREC access to the project site.

ADDITIONAL PROGRAM REQUIREMENTS

1) AMERICAN IRON AND STEEL - Appendix A

2) DAVIS-BACON WAGE RATES - Appendix B

3) DELAWARE DRUG TESTING – Appendix C

PROJECTSIGN

The contractor shall provide and erect a sign at a prominent location at each construction site. The sign and location shall be approved by the Environmental Finance Project Engineer. The sign shall be prepared in accordance with the attached detailed instructions. It shall be the responsibility of the Contractor to maintain the sign in good condition throughout the life of the project.

The sign wording shown on Figure 1 is an example only and must be adapted to suit each project. The Contractor shall be responsible for obtaining the appropriate wording from the Engineer.

WORKING FOR YOU TO PROVIDE CLEAN WATER
FOR TODAY & TOMORROW

NAME OF PROJECT

PROJECT NO. xxxx-xx
Name of Engineering Firm

FUNDING PROVIDED BY:

DIVISION OF WATER RESOURCES

Funding Source	$xx,xxx,xxx
Funding Source	$xx,xxx,xxx
Funding Source	$xx,xxx,xxx
Total Project Costs	$xx,xxx,xxx

CONSTRUCTION SITE SIGN REQUIRKMENTS

Sign Dimensions: 1200 x 2400 x 19 mm (4' x 8' x *W')* Exterior Plywood (A-B Grade).
1st four lines are 4 inches in height; remaining lines are 2 inches in height.
DNREC Logo is to be the standard colors - decal to be provided by Environmental Finance.
Black letters on white background with 3 inch border around the perimeter in dark blue. Place bottom of sign 36 inches to 48 inches above grade to permit public viewing.
Provide adequate support for sign.

EXAMPLE
Figure 1

American Iron and Steel Requirement
P.L. 113-76, Section 436

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works.

The Act states:

Sec. 436. (a)(l) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C.1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the "Administrator") finds that-

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(l) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following guidance excerpt has been provided from EPA:

(Complete guidance may be downloaded from:

http://water.epa.gov/grants_funding/upload/AIS- final-guidance-3-20-14.pdf

Covered Iron and Steel Products

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body

and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc.). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steelin such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered.
Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example, trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or
Steel); Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and
Rectangular; Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Comer Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot,
Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction
Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;
Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash
receptacles;
Tree Grates;
Tree Guards;
Trench Grates;
and
Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange

shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system. The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If **the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?**

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in

the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Certification and Compliance

The attached "Contractor's American Iron and Steel Certification" must be executed and included in the bid package. The contractor will supply to the loan recipient manufacturers' certifications for each iron and steel item documenting/asserting that all manufacturing processes occurred in the United States. Such certifications will be submitted with shop drawings.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework is described in the guidance document found at:
http://water.epa.gov/grants_funding/upload/AIS-final-guidance-3-20-14 . pdf.
Approved and denied waivers may be reviewed at:
http://water.epa.gov/grants_funding/aisrequirement.cfm.

De Minimis Materials Waiver

The EPA has granted a nationwide waiver of the AIS requirements of the Consolidated Appropriations Act under the authority of Section 436(b)(l) (public interest waiver) for de minimis incidental components of eligible infrastructure projects. For many of these incidental components, the country of manufacture and the availability of alternatives is not always readily or reasonably identifiable prior to procurement in the normal course of business; for other incidental components, the country of manufacture may be known but the miscellaneous character in conjunction with the low cost, individually and (in total) as typically procured in bulk, mark them as properly incidental. Examples of incidental components could include small washers, screws, fasteners (i.e., nuts and bolts), miscellaneous wire, comer bead, ancillary tube, etc. Examples of items that are clearly not incidental include significant process fittings (i.e., tees, elbows, flanges, and brackets), distribution system fittings and valves, force main valves, pipes for sewer collection and/or water distribution, treatment and storage tanks, large structural support structures, etc.

Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the total materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the total materials used in and incorporated into a project. Contractors who wish to use this waiver should determine the costs of all items installed or supplied for the project. The contractor must retain relevant documentation (i.e., invoices) for each of these items in their project files, and must summarize the items in monthly draw requests to the owner: the total cost of all materials, the total cost of "incidental' materials, and the calculations by which they determined the percentage of incidental products installed or supplied for the project. None of the products specifically listed as "Covered Iron and Steel Products" are incidental. None of the products identified in detail in the technical specifications are considered incidental.

Construction Contract Language

The Contractor acknowledges to and for the benefit of____ ("Owner") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel 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 Owner 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 Owner or the State.

Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner 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 Owner).

While the Contractor has no direct contractual privity with the State, as a lender to the Owner for the funding of its project, the Owner 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.

CONTRACTOR'S AMERICAN IRON AND STEEL CERTIFICATION

As the contractor for the _____ project, I certify that I have read, understand and will comply with the "American Iron and Steel (AIS)" requirements of section 436 of P.L. 113-76, Consolidated Appropriations Act, 2014 (Act) that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works.

_____ _____

Name (Printed) Company

_____ _____

Name (Signature) Date

Davis-Bacon and Related Acts **(DBRA)** Provisions and Procedures for EPA Funded Projects Executed After October 30, 2009

A Supplement to the CWSRF Program Requirements

Updated August 2015

I. Introduction

The Davis Bacon Act requires that all contractors and subcontractors performing construction, alteration and repair work under federal contracts in excess of $2,000 pay their laborers and mechanics not less than the prevailing wage and fringe benefits. Projects executed after October 30, 2009 and are considered "treatment works" are subject to the Davis-Bacon provisions through completion of construction and must comply with the following:

A. This contract clause pertains to minimum wages 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 public building or public work, or building or work 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.

1. **Minimum wages.** 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, 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 at the following web site www.wdol.gov/dba.aspx, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. A "wage determination" is the listing of wage and fringe benefit for each classification of laborers and mechanics which the Administrator of the Wage and Hour Division of the U.S. Department of Labor has determined to be prevailing in a given area for a particular type of construction (e.g., building, heavy, highway, or residential). The wage determination (including any additional classification and wage rates) 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. The poster may be downloaded from: http://www.dol.gov/esa/whd/regs/compliance/posters/fedprojc.pdf

2. **Withholding.** 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 regulations, the loan or grant recipient 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.** 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. The contractor shall submit weekly for each week in which any contract work is performed, a copy of all payrolls to the recipient, sponsor, or owner. The required weekly payroll information may be submitted in any form

desired. A contractor may use Form WH-347 which is available from the Wage and Hour Division web site at: http://www.dol.gov/esa/whd/forms/wh347.pdf

4. **Subcontracts.** The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with the requirements above, the requirements identified in the Davis Bacon Terms and Conditions of the EPA assistance agreement, and the contract clauses in 29 CFR 5.5, which can be found at http://ecfr.gpoaccess.gov/

B. **Contract Work Hours and Safety Standards Act.** In any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act, the following clauses shall apply:

1. **Overtime requirements.** No contractor or subcontractor 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. The overtime rate of time and one half does not apply to fringe payments. For work in excess of forty hours, fringe payments should continue to be paid on a per hour worked basis.

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 therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States government, for liquidated damages.

3. **Withholding for unpaid wages and liquidated damages.** The recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the 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 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) In any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the 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.

II. Davis Bacon Compliance Procedures

A. **Before Contract Award** - Once it is determined that Davis Bacon wage rates will apply to a construction contract, the recipient's contracting organization must state in the solicitation that Davis Bacon Prevailing wage rates are applicable, and bid packages must include the current Davis Bacon general wage determination for the area where construction will occur. To select the prevailing wage rate determination for a specific locality:

(i) Go to website: http://www.wdol.gov/
(ii) Select "DBA WDs"
(iii) Input the State and County where the construction site is located.
(iv) Input the type of construction for the project as Building, Heavy, Highway or Residential.

B. **Before Bid Opening-** The wage determination website should be continually monitored by the contracting organization for modifications. Generally, the most current published wage determination at the time of contract award must be incorporated into the contract. A wage determination update issued less than 10 days before bid opening shall be in effect unless there is not a reasonable time to notify all prospective bidders. In these cases the relevant facts should be documented in the contract file. A convenient way to monitor potential wage determination modifications is to sign up for the alert service as shown on the website: http://www.wdol.gov /

C. **After Contract Award** - After solicitation, bid opening and contractor selection by the recipient contracting organization, the prevailing wage determination shall be included in the final construction contract between the recipient, sub recipient or borrower and its contractor.

(i) In the event the construction contract is not awarded within 90 days of the bid opening date, any modification to the prevailing wage determination published prior to award of the contract shall be effective and should be included in the award documents, or by modification to the contract documents.

Modifications to Bid Documents to comply with Delaware's DRUG TESTING FOR LARGE PUBLIC WORKS CONTRACTS (75 Del. Laws, c. 283, § 1)

The following paragraphs shall be added to the "General Requirements:"

1) Under "STATE LICENSE AND TAX REQUIREMENTS"

During the contract Work, the Contractor and each listed Subcontractor, shall implement an Employee Drug Testing Program in accordance with Delaware's OMB Regulation 4104- "Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on "Large Public Works Projects".

The following paragraphs shall be added to the "Instructions to Bidders:"

1) Under "PREPARATION OF BIDS"

Each bidder shall include signed Affidavit(s) for the Bidder and each listed Subcontractor certifying compliance with OMB Regulation 4104- "Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on "Large Public Works Projects." "

2) Under "ACCEPTANCE OF BID AND AWARD OF CONTRACT"

The successful Bidder shall execute a formal contract, submit the required Insurance Certificate, and furnish good and sufficient bonds, unless specifically waived in the General Requirements, in accordance with the General Requirement, within twenty (20) days of official notice of contract award. The successful Bidder shall provide two business days prior to contract execution, copies of the Employee Drug Testing Program for the Bidder and all listed Subcontractors. Bonds shall be for the benefit of the Agency with surety in the amount of 100% of the total contract award. Said Bonds shall be conditioned upon the faithful performance of the contract. Bonds shall remain in affect for period of one year after the date of substantial completion.

The following forms shall be inserting into the Bidding Documents:

1) EMPLOYEE DRUG TESTING REPORT FORM
2) EMPLOYEE DRUG TESTING REPORT OF POSITIVE RESULTS
3) AFFIDAVIT OF EMPLOYEE DRUG TESTING PROGRAM

EMPLOYEE DRUG TESTING REPORT FORM

Period Ending:_____

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds submit Testing Report Forms to the Owner no less than quarterly.

Project Number: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Number of employees who worked on the jobsite during the report period:_____

Number of employees subject to random testing during the report period:_____

Number of Negative Results _____ Number of Positive Results _____

Action taken on employee(s) in response to a failed or positive random test:

_____

_____

_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

EMPLOYEE DRUG TESTING
REPORT OF POSITIVE RESULTS

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds to notify the Owner in writing of a positive random drug test.

Project Number: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Name of employee with positive test result: _____

Last 4 digits of employee SSN: _____

Date test results received: _____

Action taken on employee in response to a positive test result:

_____

_____

_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

This form shall be sent by mail to the Owner within 24 hours of receipt of test results.

Enclose this test results form in a sealed envelope with the notation "Drug Testing Form – DO NOT OPEN" on the face thereof and place in a separate mailing envelope.

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work Covered by Contract Documents.
   3. Access to Site.
   4. Work restrictions.
   5. Specification and drawing conventions.

B. Related Requirements:
   1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Silver Lake Pump Station Replacement.
   1. Project Location: Silver Lake Boulevard, Dover, Delaware.

B. Owner: City of Dover.
   1. Owner's Representative: Paul Thompson, Construction Manager

C. Engineer: Johnson, Mirmiran & Thompson

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. Mobilization and clearing of the site.
   2. Soil erosion and sediment control measures.
   3. Maintenance of traffic during the work.
   4. Installation of bypass pumping piping connection.
   5. Bypass pumping during the work.
   6. Installation of flow meter chamber.
   7. Installation of a new vacuum primed pump skid.
   8. Wet well liner and rehabilitation.
   9. Demolition of existing skid mounted pump station and controls.

10. Various piping and utility connections.
11. Electrical improvements including new main breaker, manual transfer switch, generator receptacle, branch circuit panel board, disconnect switches, wiring of all equipment, and conduit installation.
12. Furnish and install HighTide.
13. Installation of new site lighting.
14. Installation of Davit Arm Base.
15. Installation of driveway improvements.
16. Startup and testing of all new equipment.
17. Removal of bypass pumping equipment.
18. Site Restoration.
19. Training City employees.
20. All other work of all type or description necessary for completion of the project, whether or not specifically described in the contract documents.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: Confine construction operations to the limit of disturbance shown on the Contract drawings.

C. Cooperate with Owner during construction operations to minimize conflicts and maintain wastewater flow during construction activity. Perform the Work so as not to interfere with Owner's operations.
   1. Provide not less than 72 hours' notice to Owner of activities that will affect continue wastewater flow.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours:
   1. Limit work to normal business working hours of 7:00 a.m. to 3:30 p.m., Monday through Friday, unless otherwise indicated.
   2. Any construction activity outside of these hours shall be requested two days in advance and must be approved by the City of Dover Director of Public Works. Contractor shall be responsible for all costs incurred for inspection services required for working during holidays, weekends, or after City’s normal work hours.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Owner not less than three days in advance of proposed utility interruptions.
   2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 00 00 General Requirements: Requirements of Sections in Division 01 00 00 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

2. Section 01 40 00 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PROJECT BREAKDOWN

A. Schedule Of Unit Prices
   1. Bonds and Insurance
      a. Description: See Sections PERB and MB in Specifications
      b. Unit of Measure: Lump Sum
   2. Mobilization/Demobilization
      a. Description: Staging, site preparation, movement of equipment.
      b. Unit of Measure: Lump Sum
   3. Installation, Maintenance, and Removal of Erosion and Sediment Controls
      a. Description: Furnish, install, and maintain materials as required by the Contract.
      b. Unit of Measure: Lump Sum
   4. Bypass Sanitary Sewer Flow
      a. Description: Furnish, setup, monitoring, and maintenance of bypass flow operations including pumps, piping, and valves necessary for fail-safe operation.
      b. Unit of Measure: Lump Sum
   5. Maintenance of Traffic
      a. Description: Furnish, supply, setup and maintenance of traffic control activity, including flagging and signage in accordance with DelDOT standards.
      b. Unit of Measure: Lump Sum
   6. Unclassified Excavation and Backfill Below Subgrade
      a. Payment: Price and payment shall be full compensation for furnishing all labor, equipment, excavation, dewatering, open cut, backfilling, compacting, shoring and bracing, and compaction testing for replacement of material below subgrade as directed by Engineer.
      b. Measurement: per cubic yard.
   7. Miscellaneous Unclassified Excavation and Backfill
      a. Payment: Price and payment shall be full compensation for furnishing all labor, equipment, excavation, dewatering, open cut, backfilling, compacting, shoring and bracing, and compaction testing for excavation and backfill in as directed by the City of Dover, Department of Public Works, not paid under other bid items.
      b. Measurement: per cubic yard.
   8. Furnish and Install Monitoring System (HighTide)
      a. Description: Furnish and install pump station monitoring equipment including setup and connection to web hosted service.
      b. Unit of Measure: Each

9. Pump Station Demolition and Disposal
    a. Description: Description: Complete demolition, removal, and disposal of existing pumps, controls and materials noted on the Drawings, including items salvaged by Owner. Legal and appropriate disposal of equipment and materials deemed property of the Contractor.
    b. Unit of Measure: Lump Sum.
10. Reconnection to Existing Force Main
    a. Description: Furnish and install materials, including fittings, excavation, backfill and compaction, and trench restoration, with seed and protective mulch.
    b. Unit of Measure: Lump Sum
11. Macadam Within Pump Station Fence
    a. Description: Furnish, place, grade and compact macadam and subbase for pump station work area.
    b. Unit of Measure: Square Foot
12. 6" DIP CL52 Force Main
    a. Description: Furnish and install including excavation, pipe bedding, fittings, bends, backfill and compaction, and trench restoration with seed and protective mulch.
    b. Unit of Measure: Linear feet taken horizontally.
13. 4” CIP Suction Piping
    a. Description: Furnish and install including excavation, pipe bedding, fittings, bends, backfill and compaction, and trench restoration with seed and protective mulch.
    b. Unit of Measure: Linear feet taken horizontally.
14. 4” Sch. 80 PVC
    a. Description: Furnish and install including excavation, pipe bedding, fittings, bends, backfill and compaction, and trench restoration with seed and protective mulch
    b. Unit of Measure: Linear feet taken horizontally.
15. Wet Well Lining
    a. Description: Repair interior and exterior concrete, and furnish and install wet well lining.
    b. Unit of Measure: Lump Sum
16. Emergency Bypass Pump Connection
    a. Description: Furnish and install including materials detailed on the Drawings.
    b. Unit of Measure: Lump sum
17. Pump Station and Meter Vault, Complete
    a. Description: Complete in-place, operating and accepted pump station and meter vault including furnish and install pump station, piping, valves, meter, fittings, bends and materials; excavation, backfill, patching and restoration.
    b. Unit of Measure: Lump Sum
18. Precast Concrete Manhole
    a. Description: Furnish and install including excavation, bedding, backfill and compaction in accordance with City of Dover’s Water/Wastewater Standard Details
    b. Unit of Measure: Each
19. Chain link Fence and Gate, Complete
    a. Description: Furnish and install chain link fence and gate around the pump station site as shown on the drawings and described in Section 32 31 13 “Chain Link Fences and Gates.”
    b. Unit of Measure: Lump Sum

20. Davit Arm Base
    a. Description: Furnish and install davit arm base as detailed on the drawings to fit the existing equipment owned by the City of Dover DPW.
    b. Unit of Measure: Each
21. Site Restoration (Topsoil, Seed, and Mulch Disturbed Areas)
    a. Description: Furnish and place seed mix and protective mulch for disturbed and restored vegetative areas.
    b. Unit of Measure: Lump Sum
22. Pavement Restoration
    a. Description: Repair macadam driveway to original condition after the meter vault and doghouse manhole are in place.
    b. Unit of Measure: Square Feet
23. Electrical Work, Complete
    a. Description: Furnish and install equipment and materials for Electrical work described on the Drawings.
    b. Unit of Measure: Lump Sum

END OF SECTION 01 22 00

SECTION 01 23 00 – ALTERNATES (Not Applicable)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Gravel Surface within the Pump Station Site

1. Base Bid: Provide compacted aggregate base with bituminous wearing surface for the driveway and pump station work area to the extents shown on the drawings. Grade Elevation of bituminous pavement shall meet finished grade elevations shown on the drawings.
2. Alternate: Provide compacted aggregate surface for the pump station work area to the extents shown on the drawings.
    a. Lump sum shall include any saw cutting, pavement restoration, Erosion and Sediment control measures per Delaware Department of Natural Resources and Environmental Control (DNREC) standards, and Maintenance of Traffic measures per Delaware Department of Transportation (DelDOT) standards.

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 23 00 "Alternates" for products selected under an alternate.
2. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of products, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer an advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title, and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product, fabrication, or installation cannot be provided, if applicable.

b. Coordination information; including a list of changes or revisions needed to other parts of the Work, and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of relevant Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data; including drawings and descriptions of products, fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where noted or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including the effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include a letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Engineer’s Action: If necessary, the Engineer will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 14 days of receipt of the request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Engineer does not issue a decision on the use of the proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of the need for change, but no later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Requested substitution provides sustainable design characteristics that the specified product provided.
    c. Substitution request is fully documented and properly submitted.
    d. Requested substitution will not adversely affect Contractor's construction schedule.
    e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    f. Requested substitution is compatible with other portions of the Work.
    g. Requested substitution has been coordinated with other portions of the Work.
    h. Requested substitution provides specified warranty.
    i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Engineer will consider requests for substitution if received within 14 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Engineer.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution provides sustainable design characteristics that the specified product provided.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Owner will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Owner are not instructions either to stop work in progress or to execute the proposed change.
2. Within 10 days, when not otherwise specified after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Owner will issue a Change Order for signatures of Contractor.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Change Directive: Owner may issue a Change Directive. Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

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SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.
   2. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   3. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.

   2. Submit the schedule of values to Owner at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Owner
    c. Owner's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.

3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

5. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be either shown as separate line items in the schedule of values, or distributed as general overhead expense, at Contractor's option.

7. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Owner.

C. Application for Payment Forms: Use AIA Document G702 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Owner by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.

H. Application for Payment at Substantial Completion: After Owner issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project Web site.
5. Project meetings.

B. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Keep list current at all times. Notify Owner immediately of any changes.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. RFI number, numbered sequentially.
6. RFI subject.
7. Specification Section number and title and related paragraphs, as appropriate.
8. Drawing number and detail references, as appropriate.
9. Field dimensions and conditions, as appropriate.
10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
11. Contractor's signature.
12. Attachments: Include sketches, descriptions, measurements, photos, product data, shop drawings, coordination drawings, and other information necessary to describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms:

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Owner Action: Owner will review each RFI, determine action required, and respond. Allow 7 working days for Owner’s response for each RFI. RFIs received by Owner after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Owner's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Owner's action may include a request for additional information, in which case Owner's time for response will date from time of receipt of additional information.
3. Owner's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log with the following information:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Owner.
4. RFI number including RFIs returned without action or withdrawn.
5. RFI description.
6. RFI submission date.
7. Date Owner response was received.

F. On receipt of Owner's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Owner within 7 days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT MEETINGS

A. General: Owner will schedule and conduct meetings and conferences as necessary at Project site unless otherwise indicated.

B. Preconstruction Conference: Owner will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Contractor, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for RFIs.
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.

k. Submittal procedures.
l. Preparation of record documents.
m. Use of the premises.
n. Work restrictions.
o. Working hours.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

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SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Resource Loading: The allocation of labor and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at weekly intervals.

E. Site Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   a. Pump package.

2. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
3. Startup and Testing Time: Include no fewer than 14 days for startup and testing.
4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Owner's administrative procedures necessary for certification of Substantial Completion.
5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
    a. Uninterruptible services.
    b. Use of premises restrictions.
    c. Seasonal variations.
    d. Environmental control.
7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Fabrication.
    e. Sample testing.
    f. Deliveries.
    g. Installation.
    h. Tests and inspections.
    i. Adjusting.
    j. Startup and placement into final use and operation.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion**.**

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 14 days of date established for the Notice of Award. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within 1 day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 00

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SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting photographic documentation.
2. Section 01 77 00 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Section 31 10 00 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within 3 days of taking photographs.

1. Format: In unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
2. Identification: Provide the following information with each image description in file metadata tag:
   a. Name of Project.
   b. Name of Owner.
   c. Name of Contractor.
   d. Date photograph was taken.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 x 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.

D. Preconstruction Photographs: Before commencement of construction activity, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

1. Flag construction limits before taking construction photographs.
2. Take photographs to show existing conditions adjacent to property before starting the Work.
3. Take photographs of existing structures either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Periodic Construction Photographs: Take color photographs monthly with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take color photographs after date of Substantial Completion for submission as project record documents.

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Owner’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Owner’s responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Owner and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead-time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule to reflect changes in status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action, Informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Owner’s final release or approval.
    g. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Owner's Digital Data Files: Owner will not provide electronic digital data files of the Contract Drawings for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 7 days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Owner.
3. Include the following information for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name of Owner.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.
        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Owner observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Owner.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Owner will return without review submittals received from sources other than Contractor.
    a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Owner.
6) Name of Contractor.
7) Name of firm or entity that prepared submittal.
8) Names of subcontractor, manufacturer, and supplier.
9) Category and type of submittal.
10) Submittal purpose and description.
11) Specification Section number and title.
12) Specification paragraph number or drawing designation and generic name for each of multiple items.
13) Drawing number and detail references, as appropriate.
14) Indication of full or partial submittal.
15) Transmittal number, numbered consecutively.
16) Submittal and transmittal distribution record.
17) Remarks.
18) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-06 10 00.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:
   a. Project name.
   b. Date.
   c. Destination (To:).
   d. Source (From:).
   e. Name and address of Owner.
   f. Name of Contractor.
   g. Name of firm or entity that prepared submittal.
   h. Names of subcontractor, manufacturer, and supplier.
   i. Category and type of submittal.
   j. Submittal purpose and description.
   k. Specification Section number and title.
   l. Specification paragraph number or drawing designation and generic name for each of multiple items.

m. Drawing number and detail references, as appropriate.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Remarks.
r. Signature of transmitter.
s. Other necessary identification.
t. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Options: Identify options requiring selection by Owner.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Owner's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.
    a. Owner will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Action Submittals: Submit six (6) paper copies of each submittal unless otherwise indicated. Owner will return two (2) copies.
3. Informational Submittals: Submit six (6) paper copies of each submittal unless otherwise indicated. Owner will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
3. Submit Shop Drawings in the following format:
    a. PDF electronic file.
    b. Six (6) opaque (bond) copies of each submittal. Owner will return two (2) copy.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit three (3) sets of Samples. Owner will retain two (2) Sample sets; remainder will be returned.
        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:
    a. PDF electronic file.
    b. Three (3) paper copies of product schedule or list unless otherwise indicated. Owner will return two (2) copy.

E. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

H. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.

5. Description of product.
6. Test procedures and results.
7. Limitations of use.

R. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

T. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

U. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER'S ACTION

A. Action Submittals: Owner will review each submittal, make marks to indicate corrections or revisions required, and return it. Owner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:

1. If a submittal is acceptable, it will be marked "No Exceptions Taken." Two copies of the submittal will be returned to Contractor. Upon return of a submittal marked "No Exceptions Taken," Contractor may order, ship, or fabricate the materials included on the submittal, provided it is in accordance with the corrections indicated.
2. If a shop drawing is marked "Exceptions taken as Noted," corrections to drawings are required. The Contractor is required to make the corrections indicated. The Contractor may order, ship, or fabricate the materials included on the submittal.
3. If a shop drawing is marked "Note Exceptions and Confirm in Writing," corrections and/or revisions affecting drawings or work are required. The Contractor is required to make the corrections indicated thereon and confirm the corrections in writing. The Contractor may order, ship, or fabricate the materials included on the submittal provided it is in accordance with the corrections indications.
4. If a submittal is unacceptable, two (2) copy will be returned to Contractor noted "Revise and Resubmit".
    a. The "Revise and Resubmit" notation is used to indicate material or equipment that is not acceptable. Upon return of a submittal so marked, Contractor shall repeat the initial approval procedure utilizing acceptable material or equipment.

B. Informational Submittals: Owner will review each submittal and will not return it, or will return it if it does not comply with requirements. Owner will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Owner.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Owner without action.

END OF SECTION 01 33 00

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Provisions of this Section do not limit requirements for Contractor to provide quality assurance and control services required by Owner or authorities having jurisdiction.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated, and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Owner for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Owner for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking, testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

E. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

F. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret, tests and inspections, and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Owner.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Owner's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.
2. Section 01 50 10 “Bypass Pumping”
3. Section 31 23 19 "Dewatering" for disposal of ground water at Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

B. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb./ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet apart.
   1. Height: 4 feet.
   2. Color: High-visibility orange, nonfading.

2.2 TEMPORARY FACILITIES

A. A field office will not be required.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated, with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to maintain wastewater flow through the sanitary sewer collection system including bypass pumping per Section 01 50 10 “Bypass Pumping”.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

E. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

F. Parking: Provide temporary parking areas for construction personnel.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 01 10 00 "Summary."

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

3.4 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 50 10 - BYPASS PUMPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary bypass pumping for sanitary sewer facilities.

B. Related Requirements:

1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.
2. Section 31 23 19 "Dewatering" for disposal of ground water at Project site.

1.3 WORK INCLUDED

A. The work of this item consists of the construction and maintenance of bypass pumping and maintenance of continuous sewer flow of the existing sewer service.

B. The Contractor shall provide all labor, equipment and material for bypass operation and all other measures necessary to install bypass system and maintain sanitary sewer flow without interruptions. The Owner requires the Contractor provide staffing of bypassing pumping system on a 7-day/week - 24-hour basis to assure reliability of bypass while it is in operation.

1.4 SUBMITTALS

A. Prior to installation of any equipment under this contract, the Contractor shall furnish the Owner the proposed bypass operation schematic including the proposed system description, location of suction and discharge pipes, technical drawings for the proposed bypass pipe and pump set-up, copies of all shop drawings, and H/Q performance curve for approval. The Engineer shall review such submissions for conformance with the design concept and compliance with the information given in the contract drawings.

B. The manufacturer shall supply sets of standard submittal drawings consisting of:
1. Outline drawings (dimensional)
2. Typical installation guide and drawings
3. Technical manuals
4. Wiring diagrams

1.5 QUALIFICATIONS

A. Vendor's experience
   1. The temporary bypass pumping vendor shall have not less than five (5) successful years of experience in the design and operation of bypass pumping systems of the type specified at five different locations.
   2. The Owner may require evidence, in the form of operating records, from these locations to substantiate any claims concerning the ability of the system to perform as required.
   3. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
   4. Temporary bypass pumping vendor shall be Xylem Dewatering Solutions (formerly Godwin Pumps) or equal.

PART 2 - PRODUCTS

2.1 PUMPS

A. The pumps and drives shall be rated for continuous duty and shall be capable of pumping the specified flow range without surging, cavitation or vibration. The pump shall not overload the driver at any point on the pump operation curve. Rotative components shall be statically and dynamically balanced. The pump shall be suitable for use with raw unscreened sewage and trash. The pump shall be a self-contained unit, designed for temporary use. Dewatering type pumps or hydraulic submersible pumps will not be acceptable.

B. All pumps used shall be fully automatic, self-priming units that do not require the use of foot valves or vacuum pumps in the priming system. The pumps shall be diesel powered. All pumps used must be built to allow dry running for long periods to accommodate the cyclical nature of effluent flows.

C. Pumps shall be engine driven on skid bases or trailer mounted with centralized lifting bracket and integral fuel tank. The pump shall be direct coupled to an electric start diesel engine and provided with an integral belt driven compressor to operate the air ejector priming system.

D. Pump shall be equipped with an air ejector priming system consisting of an air compressor that blows air through a Venturi ejector. This system should automatically and continuously prime the pump.

E. Pump shall have a cast iron casting, suction cover, separation tank, open impeller front wear plate and non-return valve. Pump shaft shall be alloy steel.

F. Pump seals shall be constructed of silicon carbide, of the mechanical type, and shall be located in an oil bath. The oil bath allows for lubrication by the oil, not the wastewater, and allows pump operation at periods of low flow.

G. Contractor shall provide the necessary start/stop controls for each pump.

2.2 PIPING

A. All discharge systems must be constructed of rigid pipe with positive, leak-proof connections to prevent accidental spillage of flows,

B. Pipe 12" and below shall be HDPE or Goodwin Quick Disconnect Pipe or equal.

C. Pipe 12" and larger shall be high-density polyethylene pipe with fused joints for a leak-proof piping system or Goodwin Quick Disconnect Galvanized Steel Pipe or equal.

D. Temporary force main piping shall be tested prior to use.

2.3 TEMPORARY PLUGS

A. Plugs shall be inflatable plugs constructed of specially treated industrial fabric and reinforced neoprene. Plugs shall be equipped with steel pull rings and aluminum end clamps.

B. All plugs shall be firmly attached to a stationary object at ground level by a steel cable to prevent loss of plug in the pipeline.

2.4 TEMPORARY INSTALLATION

A. Equipment specified in this section shall be installed in strict accordance with the manufacturer's instructions and recommendations. Installation shall include furnishing oil, fuel, grease, lubricants, tools, and spare parts that may be required to maintain the operation of the pump throughout the construction period, as recommended by the manufacturer. The Contractor shall be solely responsible for maintaining the temporary pumps and appurtenances. At the end of the construction period, the Contractor shall remove the pump and appurtenances.

B. The pumps are to be installed where required to bypass the pipe installation operation. It shall be installed for temporary use only and shall be removed by the Contractor prior to completion for the contract. The Contractor shall be responsible for proper operation of the complete pumping system, which includes pump, driver, controls and appropriate pipe connections during the construction period.

C. Adequate hoisting equipment for each pump and accessories shall be maintained on-site.

D. The Contractor shall ensure that the temporary pumping system is properly maintained, and a responsible operator shall be on-hand at all times when pumps are operating.

E. The temporary pumping system shall be placed in service a minimum of 24 hours before any work may begin. It shall remain operable for at least 72 hours after the repairs are completed; and removal is approved, in writing, by the Owner.

F. Once written permission is issued, the Contractor shall remove all components of the temporary pumping system. The Contractor shall perform all restoration work to the satisfaction of the Owner.

PART 3 - EXECUTION

3.1 BYPASS PUMPING AND MAINTENANCE OF SEWER SERVICE

A. Whenever existing sewers and manholes are to be removed or relocated, and the new sewers and manholes are to be constructed, the Contractor shall maintain the sewage flow by pumping the sewage between manholes. The Contractor shall bulkhead an existing upstream manhole and pump all sewage entering that manhole to a manhole downstream from the point of construction. The Contractor shall furnish and operate pumps whenever sewage flow cannot be maintained through a continuous pipeline.

B. Pumps shall have the capacity, under all conditions encountered on this project, to pump sewage flow at a minimum of 100 gpm at a 20-feet TDH.

C. The Contractor's sewage bypass equipment must meet the following:

1. Contractor's bypass equipment must be installed and operational prior to any work on existing pump station.
2. The bypass equipment must be sized to handle the maximum flow in the system with 100% backup.
3. The Contractor assumes full responsibility for continual of sewage flow.
4. The Contractor shall make all provisions to install plugs as required for its bypass operation.

D. The Contractor shall submit proposed bypass pump performance curves and a written plan of every bypass pumping operation (including relocation or addition of pipes) at least one week prior to replacement of existing bypass pumps to the Engineer for its approval for each system to be employed.

E. The Contractor shall have on hand a minimum of one (1) backup pump for every two operating bypass pumps. If only one bypass pump is being utilized, the Contractor shall have one backup pump. Backup pumps shall be of equal or greater capacity as the operating pumps.

F. Under no circumstances shall sewage be allowed to flow into the trench and mix with the groundwater to be diverted to drainage systems. The Contractor is responsible for paying any and all fines or claims resulting from the discharge of sewage or backing up of sewage into local residences. Hose bypass couplings shall be tight and free from leaks. Any fitting, coupling, valve, or pipe section that leaks shall be immediately removed and replaced by a watertight one.

G. Should emergency operation of the system be required, the Owner reserves the right to operate any bypass equipment at the site, supplying fuel, and labor until the Contractor resumes its construction operation.

END OF SECTION 01 50 10

SECTION 01 55 26 - TRAFFIC CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Contractor shall maintain traffic signs and protect the public from damage to persons and property within reasonable limits conforming to requirement of local authority, and for the duration of the contract. Entrance to site shall be marked by signs, delineators or other acceptable methods so that a person who has no knowledge of the condition can safely ride, drive or walk past the entrance to the site of the contract where contractor's access to traffic exists.

B. The Contractor is further advised that throughout the construction period he shall maintain traffic lanes at all times. During his normal daily work period, provide appropriate trained traffic protection personnel and adequate traffic protection devices. In any event, vehicular passage shall be unimpeded for emergency vehicles and for access to home driveways.

C. This work includes but is not limited to providing satisfactory barricades, safety fence, warning signs, detour signs, flashers, traffic cones, flagmen, pedestrian walks, temporary decking; and all materials, equipment and labor necessary for the acceptable maintenance and protection of traffic in accordance with the State of Delaware, Department of Highways and Transportation publication entitled “Traffic Controls for Street and Highway Construction and Maintenance Operations”, latest edition and other appurtenant DelDOT specifications and standards.

D. The Contractor shall maintain vehicular and pedestrian access to adjacent properties at all times during construction, unless otherwise authorized.

E. The Contractor shall monitor parking of construction personnel's vehicles and maintain vehicular access to and through parking areas.

F. The Contractor shall prevent parking on or adjacent to access roads or in non-designated areas.

G. All fire hydrants, water valves, fire alarm boxes and letter boxes shall be left uncovered and readily accessible for use.

H. Where permission for detouring traffic is granted, the Contractor shall post detour signs to the satisfaction of the appropriate authorities, and the Contractor shall maintain such detour routes until such time as they are deemed unnecessary by the appropriate authority.

I. No roadway may be closed to traffic without the approval of the authority having jurisdiction.

J. Contractor shall provide an adequate number of watchmen and flagmen as required or as directed by the Owner.

K. The Contractor shall be responsible for notifying the Local Police Department, School Districts, and Fire Departments when it is necessary to close any roadway 24 hours prior to road closure.

L. The Owner shall have the authority, upon proper written notice to the Contractor, to stop construction progress until such time when all deficiencies have been corrected to the satisfaction of the Owner, if in the opinion of the Owner traffic control is inadequate thereby creating a safety hazard. In such instance, the Contractor shall have no claim for extra compensation or increase to the contract time for such disturbances.

1.3 SUBMITTALS

A. The Contractor shall submit to the Owner for review his proposed plan for the maintenance and protection of traffic.

B. Owner review of the Contractor's traffic control plan shall in no way relieve the Contractor from his full responsibility for the maintenance and protection of traffic.

PART 2 - PRODUCTS

2.1 TRAFFIC CONTROL DEVICES

A. All traffic control devices and roadway signs are to be in conformance with State and local requirements.

PART 3 - EXECUTION

3.1 MAINTENANCE OF TRAFFIC

A. The Contractor shall erect and maintain in good condition barricades, warning signs, flares, yellow traffic flasher units, rubber traffic cones and other traffic control devices appropriately and adequately for the specific needs. All traffic control devices shall be erected, maintained in accordance with the applicable standards, and as approved by the Owner.

B. The Contractor shall provide sufficient watchmen and traffic directors and shall take all other precautions, including any, which may be ordered by the Owner necessary for the safety of the public and protection of the work.

C. When it is necessary to close any roads for which construction is scheduled, the Contractor shall be responsible to make all necessary communication with the Owner and/or local police as required. Where work is scheduled that will interfere with access to driveways, the Contractor shall notify affected owners at least forty-eight (48) hours in advance of any such interference.

END OF SECTION 01 55 26

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 01 23 00 "Alternates" for products selected under an alternate.
2. Section 01 25 00 "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Owner's Action: If necessary, the Owner will request additional information or documentation for evaluation within one week of receipt of a comparable product request. The Owner will notify Contractor of approval or rejection of proposed comparable product request within 14 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
    b. Use product specified if Owner does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Owner will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Owner will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:
    a. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Owner's sample", provide a product that complies with requirements and matches Owner's sample. Owner's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Owner from manufacturer's full range" or similar phrase, select a product that complies with requirements. Owner will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Owner will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Owner may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements incidental to the contract for closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 01 32 33 "Photographic Documentation" for submitting construction photographic documentation.
2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner’s signature for receipt of submittals.

5. Submit test/adjust/balance records.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."

6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Submit As-Built plans showing all completed work and clearly identifying any construction not per original construction documents.
3. Certified List of Incomplete Items: Submit certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
4. Certificates of Release: From authorities having jurisdiction.
5. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
6. Submit pest-control final inspection report.
7. Subcontractor Release of Liens.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction

1. Organize items by major element.
2. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Owner.
    d. Name of Contractor.
    e. Page number.

3. Submit list of incomplete items in the following format:
    a. PDF electronic file. Owner will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Owner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
f. Sweep concrete floors broom clean in unoccupied spaces.
g. Remove labels that are not permanent.
h. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
i. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
j. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch-up, otherwise repair, and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:
1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Owner will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Owner.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Owner will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 14 days before commencing demonstration and training. Owner will return copy with comments.

1. Correct or revise each manual to comply with Owner's comments. Submit copies of each corrected manual within 7 days of receipt of Owner's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Names and contact information for major consultants that designed the systems contained in the manuals.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."

D. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit two (2) sets of marked-up record prints.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of structures.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Change Directive.
    k. Changes made following Owner's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Owner.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as annotated PDF electronic file.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Owner's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed on times.

1. Schedule training with Owner with at least 7 days' advance notice.

C. Conduct training on-site Conduct training using final operation and maintenance data submittals.

END OF SECTION 01 79 00

SECTION 02 32 19 - EXPLORATORY EXCAVATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Utility test pits dug at locations shown on the plans or designated by the Owner to locate underground structures or utilities that may conflict with the proposed work.

B. Related Sections:

   1. Section 31 20 00 "Earth Moving".
   2. Section 32 92 00 "Turf and Grasses".

1.3 INFORMATIONAL SUBMITTALS

A. Details of horizontal and vertical locations, size, material, condition, and applicable information on all utilities and structures encountered during exploratory excavations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXCAVATION

1. The Contractor shall excavate to the limits and depths that may be necessary to locate underground structures or utilities. It shall be the Contractor's responsibility to measure and record the size, material, condition, and horizontal and vertical location of all utilities encountered during test pit excavations; and submit this information to the Owner.
2. All test pits indicated on the plans or ordered by the Engineer shall be dug a minimum of two weeks prior to start of construction. The information obtained from the exploratory excavation enables the Engineer to make any necessary modifications prior to construction. Construction shall not begin until the Engineer gives authorization to proceed after exploratory excavation completion, and submission of necessary information to the Engineer.

3. All provisions of other portions of the specifications, as they relate to the exploratory excavation and excavation of test pits, shall apply. These shall include, but are not limited to, provisions listed for cutting and removal of pavements, protection of underground utilities, excavation and backfill, dewatering trench, temporary sheeting and bracing, temporary pavement, and the provisions of maintenance and protection of traffic.

END OF SECTION 02 32 19

SECTION 02 41 16 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Removing below-grade construction.
   2. Disconnecting, capping or sealing, and abandoning in-place or removing site utilities.
   3. Salvaging items for reuse by Owner.

B. Related Sections:

   1. Section 01 10 00 "Summary" for use of the premises and phasing requirements.
   2. Section 01 32 00 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
   3. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

B. Pre-demolition photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before the Work begins.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Owner assumes no responsibility for structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.

1.7 COORDINATION

A. Arrange demolition schedule so as not to interfere with pump station operation.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 31 20 00 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations. Comply with Section 01 32 33 "Photographic Documentation."

3.2 PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If removal, relocation, or abandonment of utility services will affect continued operations, then provide temporary utilities that maintain continuity of service pump station operation.
   3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

C. Salvaged Items: Comply with the following:
   1. Clean salvaged items of dirt and demolition debris.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to storage area designated by Owner.
   5. Protect items from damage during transport and storage.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways and other facilities during demolition operations.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.

   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

C. Temporary Protection: Erect temporary protection where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect existing site improvements, appurtenances, and landscaping to remain.
2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain adequate ventilation when using cutting torches.
3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

A. Salvage: Items to be removed and salvaged are to be determined by Owner, but may include.

B. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

3.6 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 31 20 00 "Earth Moving."

C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

A. Promptly repair damage to adjacent areas caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

   1. Clean roadways of debris caused by debris transport.

END OF SECTION

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SECTION 03 01 30 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removal of deteriorated concrete and subsequent replacement and patching.
2. Epoxy crack injection.
3. Polymer sealers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Manufacturers.

B. Material Certificates: For each type of material supplied for mixing or adding to products at Project site.

C. Product Test Reports: For each manufactured bonding agent, cementitious patching mortar crack-injection adhesive, and polymer sealer, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Each manufactured bonding-agent, packaged patching-mortar, crack-injection-adhesive, and polymer-sealer manufacturer shall employ factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

B. Store cementitious materials off the ground, under cover, and in a dry location.

C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.7 FIELD CONDITIONS

A. Environmental Limitations for Epoxies: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.

1. Use only Class A epoxies when substrate temperatures are below or are expected to go below 40 deg F (5 deg C) within eight hours.
2. Use only Class A or B epoxies when substrate temperatures are below or are expected to go below 60 deg F (16 deg C) within eight hours.
3. Use only Class C epoxies when substrate temperatures are above and are expected to stay above 60 deg F (16 deg C) for eight hours.

B. Cold-Weather Requirements for Cementitious Materials: Do not apply unless concrete-surface and air temperatures are above 40 deg F (5 deg C) and will remain so for at least 48 hours after completion of Work.

C. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F (32 deg C) and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: For repair products, obtain each color, grade, finish, type, and variety of product from single source and from single manufacturer with resources to provide products of consistent quality in appearance and physical properties.

1. BASF Corporation
2. Sika Corporation
3. Euclid Chemical Company
4. Kaufam Products, Inc.
5. Dayton Superior
6. Or other approved equal.

2.2 BONDING AGENTS

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.
   1. BASF Corporation, MasterEmaco™ P124
   2. Dayton Superior, Perma Prime™

B. Epoxy Bonding Agent: ASTM C 881/C 881M, bonding system Type II and free of VOCs.
   1. BASF Corporation, MasterEmaco™ ADH 1090RS
   2. Dayton Superior, Pro-Poxy™ 300

2.3 PATCHING MORTAR

A. Patching Mortar Requirements:

   1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
   2. Color and Aggregate Texture: Provide patching mortar and aggregates of colors and sizes necessary to produce patching mortar that matches existing, adjacent, exposed concrete. Blend several aggregates if necessary to achieve suitable matches.
   3. Coarse Aggregate for Patching Mortar: ASTM C 33/C 33M, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.

B. Job-Mixed Patching Mortar: 1 part Portland cement and 2-1/2 parts fine aggregate complying with ASTM C 144, except 100 percent passing a No. 16 (1.18-mm) sieve.

C. Cementitious Patching Mortar: Packaged, dry mix for repair of concrete.
   1. Compressive Strength: Not less than **4000 psi (27.6 MPa)** at **28 days** when tested according to ASTM C 109/C 109M.

D. Polymer-Modified, Cementitious Patching Mortar <**Insert drawing designation**>: Packaged, dry mix for repair of concrete and that contains a **non-redispersible** latex additive as either a dry powder or a separate liquid that is added during mixing.
   1. Compressive Strength: Not less than **4000 psi (27.6 MPa)** at **28 days** when tested according to ASTM C 109/C 109M.

2.4 EPOXY CRACK-INJECTION MATERIALS

A. Epoxy Crack-Injection Adhesive: ASTM C 881/C 881M, bonding system Type I, free of VOCs.
   1. Capping Adhesive: Product manufactured for use with crack-injection adhesive by same manufacturer.
   2. Color: Provide epoxy crack-injection adhesive and capping adhesive as indicated by manufacturer's designations that blend with existing, adjacent concrete and do not stain concrete surface.

2.5 CORROSION-INHIBITING MATERIALS

A. Corrosion-Inhibiting Treatment: Waterborne solution of alkaline corrosion-inhibiting chemicals for concrete-surface application that penetrates concrete by diffusion and forms a protective film on steel reinforcement.

2.6 POLYMER-SEALER MATERIALS

A. Epoxy Polymer Sealer: Low-viscosity epoxy, penetrating sealer and crack filler recommended by manufacturer for penetrating and sealing cracks in exterior concrete traffic surfaces; free of VOCs.
   1. Color: As indicated by manufacturer's designations.

2.7 MISCELLANEOUS MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I, II, or III unless otherwise indicated.

B. Water: Potable.

2.8 MIXES

A. General: Mix products, in clean containers, according to manufacturer's written instructions.

   1. Do not add water, thinners, or additives unless recommended by manufacturer.
   2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
   3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

B. Dry-Pack Mortar: Mix required type(s) of patching-mortar dry ingredients with just enough liquid to form damp cohesive mixture that can be squeezed by hand into a ball but is not plastic.

C. Concrete: Comply with Section 03 30 00 "Cast-in-Place Concrete."

D. Grout for Use with Preplaced Aggregate: Proportion according to ASTM C 938. Add grout fluidifier to mixing water followed by portland cement, pozzolan, and fine aggregate.EXECUTION

2.9 CONCRETE MAINTENANCE

A. Have concrete-maintenance work performed only by qualified concrete-maintenance specialist.

B. Comply with manufacturers' written instructions for surface preparation and product application.

2.10 EXAMINATION

A. Notify Engineer seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.

B. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.

C. Pachometer Testing: Locate at least three reinforcing bars using a pachometer, and drill test holes to determine depth of cover. Calibrate pachometer using depth of cover measurements, and verify depth of cover in removal areas using pachometer.

D. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

2.11 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of structure being repaired, and site improvements from harm resulting from concrete maintenance work.

1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
2. Use only proven protection methods appropriate to each area and surface being protected.
3. Provide temporary barricades, barriers, and directional signage to exclude public from areas where concrete maintenance work is being performed.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance work.
5. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
6. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
7. Protect floors and other surfaces along haul routes from damage, wear, and staining.

C. Preparation for Concrete Removal: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.

1. Verify that affected utilities have been disconnected and capped.
2. Inventory and record the condition of items to be removed for reinstallation or salvage.
3. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement, settlement, or collapse of construction being demolished and construction and finishes to remain. Strengthen or add new supports when required during progress of removal work.

D. Surface Preparation for Overlays:

1. Remove delaminated material and deteriorated concrete surface material.
2. Roughen surface of concrete to produce a surface profile matching CSP 3 according to ICRI 310.2.
3. Use shot blasting.
4. Sweep and vacuum roughened surface to remove debris followed by low-pressure water cleaning.

E. Acidic Surface Preparation for Sealers: Acid etch surface of concrete to produce a surface profile matching CSP 1 according to ICRI 310.2. Prepare surface for acid etching by detergent scrubbing to remove oils and films that may prevent acid penetration.

1. Remove excess acid solution, reaction products, and debris by squeegeeing or vacuuming.
2. Scrub surface with an alkaline detergent, rinse, and squeegee or vacuum.
3. Check acidity of surface with pH test paper and continue rinsing until pH is acceptable according to sealer manufacturer's written instructions.
4. When pH is acceptable according to sealer manufacturer's written instructions and surface is clean, vacuum dry.

2.12 CONCRETE REMOVAL

A. Do not overload structural elements with debris.

B. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.

C. Remove additional concrete if necessary to provide a depth of removal of at least **1/2 inch (13 mm)**.

D. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least 3/4-inch (19-mm) clearance around bar.

E. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.

F. Provide surfaces with a fractured profile of at least 1/8 inch (3 mm) that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.

G. Thoroughly clean removal areas of loose concrete, dust, and debris.

2.13 BONDING AGENT APPLICATION

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Apply to reinforcing bars and concrete by stiff brush or hopper spray according to manufacturer's written instructions. Apply to reinforcing bars in two coats, allowing first coat to dry two to three hours before applying second coat. Allow to dry before placing patching mortar or concrete.

B. Slurry Coat for Cementitious Patching Mortar: Wet substrate thoroughly and then remove standing water. Scrub a slurry of neat patching mortar into substrate, filling pores and voids.

2.14 PATCHING MORTAR APPLICATION

A. Place patching mortar as specified in this article unless otherwise recommended in writing by manufacturer.

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.

B. Pretreatment: Apply specified bonding agent.

C. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.

D. Vertical Patching: Place material in lifts of not more than **1-1/2 inches (38 mm)** or less than **1/4 inch (6 mm)**. Do not feather edge.

E. Consolidation: After each lift is placed, consolidate material and screed surface.

F. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.

G. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a surface matching adjacent concrete.

H. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

2.15 CONCRETE PLACEMENT

A. Place concrete according to Section 03 30 00 "Cast-in-Place Concrete" and as specified in this article.

B. Pretreatment: Apply epoxy bonding agent to reinforcement and concrete substrate.

C. Wet-cure concrete for not less than seven days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.

2.16 EPOXY CRACK INJECTION

A. Clean cracks with oil-free compressed air or low-pressure water to remove loose particles.

B. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond.

C. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.

D. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch (6 mm) thick by 1 inch (25 mm) wider than crack.

E. Inject cracks wider than 0.003 inch (0.075 mm) to a depth of 8 inches (200 mm).

F. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.

G. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

2.17 POLYMER SEALER APPLICATION

A. Apply polymer sealer by brush, roller, or airless spray at manufacturer's recommended application rate.

B. Apply to top and exposed exterior surfaces of the wet well.

2.18 FIELD QUALITY CONTROL

A. Owner will observe repairs and review materials on-site.

END OF SECTION 03 01 30

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall furnish all labor, materials and equipment for the construction of all concrete structures conforming with the Contract Drawings, all supplemental working drawings and as specified herein. The Contractor shall furnish and install concrete specialty items, and shall do all miscellaneous concrete and cement work and all cutting, patching and repairing of concrete, cement and masonry work as required to install or accommodate the work.

B. The work shall include, but not be limited to, the following: design mix preparation and casting of test cylinders; formwork; reinforcing steel; the furnishing and placing of all aggregate and cement; the cleaning and finishing of concrete surfaces; all work and materials for construction of expansion joints, including waterstops; all bevel edges; vibrating of the forms or steel reinforcements, or both, as required; curing and maintenance of suitable temperatures; wire brushing, rubbing, and the sloping of finished surfaces; screeding, floating and troweling of surfaces wherever required; and the accurate placing and securing of thimbles, sleeves, pipes, conduits, wall castings, anchor bolts, rolled channels, and all other material which may be required to be imbedded in concrete work. The work shall also include all necessary recessing or drilling, and preparing the surfaces of existing concrete, such as roughening, and applying epoxy bonding compound in cases where new concrete is to be poured against existing surfaces.

1.2 RELATED SECTIONS

A. Section 31 20 00 “Earth Moving”

B. Section 09 90 00 “Painting”

C. Section 03 01 30 “Maintenance of Cast-in-Place Concrete”

1.3 REFERENCES

A. Cast-in-place concrete work shall comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown on the Contract Drawings or specified.

1. ACI 301 - "Specifications for Structural Concrete for Buildings," latest edition
2. ACI 318 - "Building Code Requirements for Reinforced Concrete," 1995, or latest edition
3. ACI 350 R - "Concrete Sanitary Engineering Structures," 1983

4. ACI 315 - "Manual for Standard Practice for Detailing Reinforced Concrete Structures," latest edition
5. ACI 305 - Hot Weather Concreting
6. ACI 347 - Construction of Formwork
7. ACI 306 - Cold Weather Concreting
8. IBC 2000 International Building Code
9. Concrete Reinforcing Steel Institute "Manual of Standard Practice," latest edition
10. American Society for Testing and Materials

B. DelDOT Standard Specifications

C. City of Dover Public Works Specifications

1.4 SUBMITTALS

A. The Contractor shall submit manufacturer's product information for Owner's approval prior to delivery and installation including instructions for installation of proprietary materials and items, including accessories for reinforcement and forming, complete design mix including test data and standard deviation, admixtures, patching compounds, joint systems, curing compounds, bonding compounds, waterstops and inserts.

B. The Contractor shall submit shop drawings for the fabrication, bending, and placement of all concrete reinforcement complying to the requirements of ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures," latest edition. Concrete reinforcement shop drawings shall show all concrete dimensions, bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement location and type of bar supports, location of construction joints, location and type of waterstops and location size and type of all inserts, anchor bolts, sleeves and penetrations.

1.5 REDESIGN

A. If the Contractor makes, or causes to be made, any substantial change in the type, form, system or details of construction from those shown on the drawings, it shall pay for all costs arising from such changes.

B. The Contractor shall pay all engineering fees required to check the adequacy of such changes, and for any redesign resulting from such changes.

C. Any changes or departures from the construction and details shown on the drawings shall be made only after approval is obtained in writing from the Owner.

D. Concrete work which does not conform to specified requirements, including strength, tolerances and finishes, is to be corrected at the Contractor's expense, without extension of time. The Contractor is responsible for the cost of corrections to any other work affected by, or resulting from, corrections to the concrete work.

1.6 TESTING

A. The Owner will designate a testing laboratory to perform all testing and inspection services required to evaluate materials used and to evaluate concrete mixes. All testing and inspection reports to be submitted to the Owner for review.

B. The Contractor shall make test cylinders in accordance with the requirements of the "Methods of Making and Curing Concrete Compression and Flexure Test Specimens in the Field" ASTM Designation C31, latest edition. A minimum of two test cylinders per pour shall be made or as directed by Owner. The tests shall be performed by the testing laboratory in accordance with the requirements of the Standard Method of Test for Compressive Strength of Molded Concrete Cylinders, ASTM Designation C39. Test cylinders shall be made at intervals spaced to provide a representative sampling of the entire pour. Two specimens shall be tested at seven days, two specimens tested at 28 days, and one specimen shall be retained in reserve for later testing, if required.

C. Contractor shall pay the cost of casting and proper storage of test cylinders. The cost of delivering to the laboratory and testing of said cylinders shall also be paid for by the Contractor.

D. If required by the Owner, an inspector from the testing laboratory shall be directed to inspect the concrete at the batching plant at the Contractor’s expense.

E. Every delivery of concrete to the work must be accompanied by a certificate showing weights of materials, type and quantity of admixtures and date and time of loading.

F. The testing laboratory will perform the following sampling and testing of fresh concrete in accordance with ASTM C172 and ASTM C94 at the Contractor's expense:
   1. Slump: ASTM C143; one test for each concrete load made at point of discharge. Slump measurement shall be recorded for each set of concrete cylinders as indicated in Section 3.7.1.5.
   2. Air Content: ASTM C173; volumetric method for lightweight or normal weight concrete, one test shall be made for each set of concrete cylinders.
   3. Concrete Temperature: Temperature of concrete shall be checked hourly when air temperature is 40°F or less and when the air temperature is 80°F or above. Temperature of concrete shall be recorded for each set of concrete cylinders.
   4. Admixtures: Note all admixtures used in test samples in submitted reports.

G. Testing laboratory shall perform probe tests of in place concrete if cylinders fail compression tests. Equipment and test procedures will comply with ASTM C670 and 830. Tests must be accomplished using the three probe method utilizing Windsor Probe Model C-P7-532-CF, or equivalent. The Contractor shall pay for all probe tests.

H. If an individual probe test falls below the specified compressive strength, the Owner reserves the right to require core tests in accordance with ACI 318, Article 5.6.4.2. The entire verification procedure, including core borings and elevation test, shall be performed by the Testing Laboratory at the Contractor's expense, at no additional cost to the Owner. When the ultimate compressive strength of any cylinder falls below the specified strength for the class of concrete specified, the design mix and water content shall be adjusted to produce the

specified strength for concrete that is subsequently placed. Such changes shall be made without delay; however, the mix adjustment shall be reviewed by the Engineer prior to placement. The Engineer shall have the right to require replacement of those portions of the structures containing substandard concrete. Methods of strengthening of in-place concrete shall be as directed by the Engineer.

I. Additional continuous moist curing shall consist of an extension of the periods of protection specified as in the judgment of the Engineer may be necessary. The minimum period of additional moist curing shall be five calendar days. The Engineer shall have the right to order additional curing prior to receipt of 28 day job test cylinder results, if earlier test results indicate that the minimum 28 day strength required by the specifications may not be met.

J. When moist curing is performed beyond 28 days after concrete placement, the measure of the adequacy of such curing in increasing the concrete strength shall be judged from the average and minimum strength of cores drilled from the hardened concrete. Cores shall be drilled from the concrete by the Testing Laboratory not later than the final day of the additional curing period. The number and location of cores shall be determined by the Engineer. Cores shall have a diameter of approximately 3 times the maximum size of coarse aggregates and shall be secured, capped, and tested in accordance with ASTM C42. If the average and minimum strength of cores so made and tested are less than the minimum values required, the Engineer shall have the right to require replacement of those portions of the structure of which the core are representative.

K. Reinforcing material shall be properly identified and supplied with two copies of mill certification. If mill certifications are not provided the Contractor shall pay for the testing of the reinforcement.

L. Reinforcing steel failing to meet the requirements of the following specifications shall be rejected and removed from the site. No steel shall be used for reinforcing until satisfactory test reports on such steel are received by the Engineer.

M. The Contractor shall allow the Engineer's testing laboratory free access to material stockpiles and work areas. Tests not specifically indicated, including retesting of rejected materials and installed work shall be done in accordance with the Resident Engineer's instructions at the Contractor's expense.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Design and construction

1. The design and engineering of the formwork, as well as its construction and safety, shall be the responsibility of the Contractor. Form design, tolerance of finished lines, and camber to compensate for deflections due to weight of fresh concrete shall conform to "Recommended Practice for Concrete Formwork ACI 347-78," or as otherwise required.

B. Materials for formwork

1. Forms for surfaces that are exposed after completion and forms for waterways and interior walls of structures shall be fabricated from large metal or exterior grade waterproof plywood panels, either plastic coated or coated with non-staining mineral oil, or other approved form release agent. Forms shall be arranged with joints either vertical or horizontal having uniform spacing. Formwork for these surfaces shall be designed to provide a smooth surface requiring a minimum of finishing. The inside surfaces of Parshall flume channel, whether covered with fiberglass or not, are to be considered exposed to view. Undressed matched lumber may be used to form unexposed surfaces. Steel forms are permitted for all surfaces.
2. Lumber used in forms shall have nails withdrawn, and surfaces to be in contact with concrete shall be thoroughly cleaned before being used again. Joints in forms shall be horizontal or vertical. The re-use of forms is permitted only if the forms, in the opinion of the Resident Engineer, are suitable for the intended purpose.
3. Split, frayed, delaminated or otherwise damaged form facing material are not be acceptable. "Patched" forms for exposed concrete surfaces shall not be used unless such forms are first approved by the Resident Engineer.
4. Earth cuts shall not be used as forms for vertical surfaces, unless otherwise specified and shown on the drawings as an acceptable alternate detail.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing shall be of deformed grade, 60,000 psi minimum yield strength, new billet steel manufactured in the United States, and conforming to the requirements of ASTM Designation A615-92 or latest edition, Grade 60.

B. Welded wire fabric shall conform to the requirements of ASTM Designation A185-90 or latest edition (70,000 psi minimum yield point).

C. Reinforcing tie wire shall be No. 16 U.S. steel wire gauge black annealed wire.

2.3 CAST-IN-PLACE CONCRETE

A. General

1. All material shall be obtained from the same source and/or manufacturer throughout the duration of construction.

B. Portland cement

1. Domestic Portland cement shall conform to the latest edition of ASTM C150, Type 2. High early strength Portland cement or other special cement shall be used only when specifically authorized by the Owner.

C. Fine aggregate

1. Fine aggregate shall be clean; natural siliceous sand consisting of hard, strong, durable, uncoated particles, and shall conform to the requirements of ASTM C33.

D. Coarse aggregate

1. Coarse aggregate shall consist of clean, hard, uncoated, strong, durable gravel or crushed stone and shall conform to the requirements of ASTM C33. The aggregate shall be size #67 (3/4" to No. 4).

E. Water

1. Water shall be potable, clean, fresh, free from oils, alkali, or vegetable and organic or other deleterious matter.

F. Concrete

1. All concrete shall conform to the requirements of the specifications for Ready-Mixed Concrete, ASTM Designation C94, except as modified herein.
2. The use of non-agitating equipment for the transporting of concrete is not be permitted.
3. 4,000 psi Normal Weight Concrete shall have a minimum 28-day compression strength of 4,000 pounds per square inch, a Type II cement content not less than 7, 94 lb. bags per cubic yard and water content not exceeding 6.5 gallons per bag of cement and shall contain an approved set controlling admixture and an air entraining agent. 4,000 psi concrete shall be used for all concrete work unless otherwise specified on the Contract Drawings or herein.
4. All concrete, regardless of classification, shall contain coarse aggregate such that the hardened concrete weight is equal to 150+ 3% lbs. per cubic foot.
5. Prior to the ordering of any concrete, the Contractor shall submit to the Engineer for approval, a design mix indicating the proposed proportioning of materials to be used for each class of concrete, together with a certificate of an approved testing laboratory that the proportions proposed will meet the specified requirements. At a minimum, all concrete should meet the standard of Class “B” State Mix.
6. The design mixes shall be prepared in accordance with Sections 5.3 and 5.4, ACI 318-95 or latest edition. Each design mix shall reflect the effects of the addition of those admixtures hereinafter permitted.
7. Contractor will pay the cost of preparing the design mixes.

G. Flowable fill

1. Flowable fill (controlled low strength material) shall be a uniform mixture of sand, Type I Portland cement, fly ash, admixtures, and water. The mix design shall produce a flowable material with little or no bleed water which produces a minimum compressive strength of 50 psi and maximum compressive strength of 300 psi at 28 days. The cured material shall be removable by excavation and have a maximum dry unit weight of 100 pounds per cubic foot. Slump shall be from 7-inches to 10-inches.
2. Admixtures specifically designed for flowable fill shall be used to improve flow ability, reduce unit weight, control strength development, reduce settlement and reduce bleed water.
3. Admixtures shall be:
    a. Rheocell-Rheofill by Master Builders, Inc.,
    b. DaraFill by Grace Construction Products,
    c. or equal.

H. Hydrophilic rubber waterstop

1. Hydrophilic rubber waterstop materials shall be bentonite-free and shall expand by a minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast. For location, see the Contract Drawings.
2. The material shall be composed of resins and polymers which absorb water and cause an increase in volume in a completely reversible and repeatable process. The waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.
3. Hydrophilic rubber waterstop shall be solid rectangular shape with minimum cross sectional dimensions of 3/8-inch by ¾-inch.
4. Products
   a. Duroseal Gasket, Type 2010, by BBZ USA, Inc.
   b. Adeka Ultraseal MC-2010, by Asahi Denka Kogyo KK.
   c. Or equal.

2.4 ADMIXTURES

A. Air-entrainment

1. Air-entrainment shall be provided for all 4,000 psi concrete, through the addition of an air-entraining admixture conforming to the requirements of Specifications for Air-Entraining Admixture for Concrete ASTM Designation C260-77. The admixture shall be Darex "AER" as manufactured by the Construction Products Division of W.R. Grace and Company, MB-VR as manufactured by Master Builders, Wayne, NJ, or equal. The admixture shall be used in strict accordance with the manufacturer's written recommendations and such quantity to produce the required air content.
2. Air entraining agents shall be added at the plant and the air content shall be as follows:

a.	Interior Slabs and Beams	3%	±1.5%
b.	Curbs, sidewalks, exterior slabs and stairs	6%	±1.5%
c.	All other	5%	±1.5%

B. Set-controlling admixtures

1. All 4,000 psi concrete shall contain a set controlling admixture as required conforming to the requirements of Specifications for Chemical Admixtures for Concrete, ASTM Designation C494-81. The admixtures shall be Plastocrete-161HE (accelerator), Plastiment (retarder), and Plastocrete-161 (Normal Water Reducer), Sikament 300 (High Range Water Reducer) and Sikament 10 ESL (High Range Water Reducer) as manufactured by Sika Chemical Corporation, Lyndhurst, NJ; Pozzolith 122 HE (Accelerator), Pozzolith 122N (Normal Water Reducer), and Pozzolith 122R (retarder), P0ZZ0 Lith 400N (High Range Water Reducer) and P0ZZ0 Lith 440N (High Range Water Reducer) as manufactured by Master Builders, Wayne, NJ, or equal. The admixtures shall be used in strict accordance with the manufacturer's written recommendations.

C. Curing compound
   1. Membrane curing compounds shall be as listed below or equal and shall be used in accordance with the manufacturer's recommendations.
      a. "Klearseal"; Setcon Industries
      b. "Floor Coat"; The Euclid Chemical Corp.
      c. "MB-429"; Master Builders
      d. "Kure-N-Seal 800"; Sonneborn-Contech
      e. "Klorkure 800"; Setcon Industries
      f. "Clear Seal 800"; W.R. Grace
      g. "Dress and Seal"; L&M Construction Chemical Co.

D. Non- metallic, non- shrink grout
   1. Where non-metallic, non-shrink grout is specified, the grout shall conform to the Corps of Engineers CDR-C 621 with the following amendments:
      a. The grout shall be of a plastic consistency.
      b. The color of the hardened grout, where visible, shall match the color of the adjacent hardened concrete.
      c. The minimum compressive strength of 2-inch cubes when cured shall be as follows:

Curing Procedure	Strength (PSI)
24 hour air cure at 75^{o}F	2500
7 day air cure at 75^{o}F	6000
7 day air cure, 10 day water submersion	6000
7 day air cure, 24 hour water submersion, 25 cycles freeze-thaw	6000

   2. The grout shall have a minimum working life of 30 minutes from the time the water is added and shall contain not more than 0.05 percent chlorides or 5.0 percent sulfates by weight.
   3. The grout shall not contain any corrosion-promoting agents.
   4. Epoxy and other types of non-metallic, non-shrink grout may be used.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF FORMWORK

A. Forms shall conform to required shapes, lines, surface scoring and dimensions of the members as shown on Drawings. They shall be structurally secure, and shall insure safety to workmen and public; formwork shall be sufficiently tight to prevent leakage or bleeding of concrete, rigid, true, plumb, well-braced, and secured together to prevent warping or displacement.

B. Forms shall be constructed with proper shoring and cross-bracing required to safe-guard the total structure. Formwork shall have sufficient lateral stability, and be sufficiently strong to stand vibrations of concrete and to carry, without excessive deflection or displacements, all

dead and live loads imposed. Supporting shores shall be properly cross-braced to firm unyielding supports and shall be provided with adjustable devices for setting, wedging and leveling of the finished forms in correct alignment and position.

C. Where supporting shores start on the ground, proper provisions must be made to spread the load by the use of planking or other spreading devices so as to avoid settlements which may be caused by placing of the concrete or due to other conditions. Care shall be taken not to use frozen or yielding ground as the supporting medium. The Contractor shall provide all safeguards and take all other necessary precautions in the design, construction and maintenance of all formwork and shoring to insure the safety of this work at all times.

D. Proper safe shoring, re-shoring and time of stripping of forms, plus number, adequacy, size and location of these shores, and forms shall be in accordance with good construction practices and shall be so designed and constructed that all local codes are adhered to. It shall be the sole responsibility of the Contractor to provide a safe structure at all times, and to provide safety to human life and property.

E. The Contractor shall provide all chamfers, bevels, "V" scores, construction and expansion joints, waterstops, recesses, notches, reveals, keyways, reglets, inserts, anchors, depressions, ledges, knock-out panels, and temporary cleanout openings of suitable shaped materials in order to produce the cast-in-place concrete work as indicated on the drawings. Unless otherwise directed, suitable moldings or 45^{o} chamfers of approved shape and dimensions shall be placed in the angle of forms or on exposed edges of walls, beams and slabs to round or bevel the edges of the concrete.

F. The Contractor shall provide openings in forms to accommodate all work, including work of other Contractors. It shall accurately place and secure all items required to be built into the forms.

G. Forms shall be properly braced and tied together so as to maintain position and shape. Special precautions shall be taken to prevent deflection or bulging. Form ties and spacers shall be designed so that no metal will remain in the concrete, closer than the minimum clearances from the outside face of finished concrete specified on the contract drawings. Ties and spacers shall incorporate an approved waterstop washer not less than 3/4" in diameter. Ties and spacers shall be placed at uniform intervals.

H. An epoxy bonding coat shall be used to bond between old and new concrete, at cold joints, and where shown on the contract drawings. A product such as "Sikadur Hi-Mod" Sika Chemical Corp., Lyndhurst, NJ, or equal, shall be used.

I. Forms for any curved surface shall be of circular segments constructed to a true radius complying with the dimensions shown on the plans.

J. The inside of forms shall be coated with non-staining mineral oil or other approved form release agent, as per the manufacturer's instruction, and thoroughly wetted (except in freezing weather). Where oil is used, it shall be applied before the reinforcement is placed to prevent deposit of oil on the reinforcement.

K. The Contractor shall secure all plates including sliding plates, bulkheads, sleeves, frames, anchors, anchor bolts, angles, flashing reglets, hangers, recesses, necessary ties, anchors and inserts; required to anchor any brick, masonry, precast concrete, or other special items into the formwork at the correct locations.

3.2 CONSTRUCTION JOINTS

A. The Contractor shall provide construction joints as shown on the drawings unless the elimination or relocation of said joints is approved by the Owner.

B. In general, vertical construction joints shall be provided in all straight or non-circular walls at intervals not to exceed 30 feet, whether shown on the drawings or not. In addition, a vertical construction joint shall be located between re-entrant and exterior corners as directed by the Resident Engineer. Where construction joints are not shown on the drawings, the location of said joints shall be as approved by the Resident Engineer.

C. Construction joints in slabs, if not shown on the drawings, shall be located such that the appearance, strength, or stability of the structure or any part of the structure is not impaired. Should additional construction joints be required by the Contractor, it shall submit a detailed plan of proposed joint locations to the Resident Engineer for approval. The Contractor shall also resubmit reinforcing shop drawings covering such additions for the Resident Engineer's approval.

3.3 EXPANSION JOINTS

A. Expansion joints shall be constructed as detailed and installed where shown on the drawings.

B. Expansion joint fillers shall be as manufactured by W.R. Grace and Company, Inc., or equal.

C. Expansion joints shall be formed by means of a preformed foam or asphalt joint filler consistent with the joint detailed on the drawings. Foam filler material shall be equal to "Closed Cell Plastic Foam Filler," Code No. 5401. Asphaltic filler material shall be equal to "Asphalt Expansion Joint Filler," Code No. 1301. The joint fillers shall be installed in strict accordance with the joint details shown on the drawings.

D. Where a joint sealing compound is required; the sealant shall be a two component polysulfide troweling gun grade sealant equal to Vertiseal Code No. 2382 as manufactured by the Dewey and Almy Chemical Division, W.R. Grace and Co., Colma Joint Sealer NS/Colma Joint Sealer SL, as manufactured by the Sika Chemical Corp., Lyndhurst, NJ, or equal. Under no circumstances will the use of a one-component sealant be permitted. Where mastic joint sealants other than polysulfide sealants are required as noted on the drawings, the sealants shall be Igas, pressure grade, as manufactured by the Sika Chemical Corp., or equal.

E. Sealant material shall be installed in strict accordance with the manufacturer's recommendations. A primer compatible with the sealant used shall be applied to all concrete surfaces.

3.4 SUPPORT FOR REINFORCEMENT

A. Reinforcing steel shall be supported in a manner that will maintain the clear distances between bars and the face of concrete as called for on the Drawings or in the Specifications. Supports shall include slab and beam bolsters, low and high chairs, spacers and other devices suitable for the proper spacing, supporting and fastening of reinforcing bars and welded wire fabric in place with any and all loads applied. Supports for slabs on grade shall include support plates, laterally welded braces for high chair legs and specially designed steel framed and vertical supports for heavy slab reinforcing bars. Details of support chairs must be shown on shop drawings.

B. Bar supports and their placement shall conform to the provisions of the "Manual of Standard Practice for Detailing Reinforced Concrete Structures" of the American Concrete Institute, ACI 315, except as modified herein.

C. Bar supports shall be provided for footings and slabs on ground as well as framed beams and slabs. In no case will the use of masonry concrete blocks or stones be permitted for bar support. Plastic or non-staining supports shall be used for slabs or beams exposed to view, or where legs rest on form work which when removed allows concrete to be exposed to view.

D. Welded wire fabric shall be provided in the longest lengths practicable. Lap adjoining pieces at least two full mesh and lace splice with tie wire.

E. Minimum wire sizes and spacing for support accessories is to be as follows:
   1. Continuous high chairs or individual high chairs are to have legs of not less than #4 wire. Continuous high chair legs are to be spaced not more than 8" on center. Continuous longitudinal wires are to be not less than #1 wire. The connection of the legs to the continuous wire is to be strong enough to prevent bending of the legs out of the vertical plane or the breaking off of the legs from the continuous longitudinal wire.
   2. Slab and beam bolsters are to be not less than #4 wire. Slab bolster legs are to be spaced not more than 5" on center. Beam bolster legs are to be spaced not more than 2" on center.
   3. The Contractor is to vary the support bar diameters and spacing to suit each specific support requirement and detail them to suit the condition of loading.
   4. The Contractor is not to place reinforcing bars more than two inches beyond the last leg of any continuous bar support. The Contractor is not to use supports as bases for runways for concrete conveying equipment and similar construction loads.
   5. Under no circumstances will the Contractor be permitted to install dowels or other reinforcing after the concrete has been placed, nor shall it bend reinforcing extending from hardened or previously placed concrete.
   6. All hoop or ring reinforcement for circular walls or slabs shall be rolled or otherwise bent to conform as closely as practicable to a true radius. Excessive kinking of reinforcement shall be a cause for rejection. Splices in circumferential reinforcement shall be lapped splices of 40 bar diameters or 2'-6," whichever is greater. Adjacent splices shall be progressively staggered at 5'-0" centers.

3.5 PLACEMENT OF REINFORCING

A. Reinforcing shall be cleaned of all rust, mill scale, earth, ice, and other material that may reduce or destroy bond with concrete.

B. Reinforcing bars shall be spaced and securely tied and supported in accordance with the approved shop drawings or as directed by the Resident Engineer. Cut ends of tie wires shall be directed into concrete, not toward exposed concrete surfaces.

3.6 PLACEMENT OF CONCRETE

A. General

1. Concrete placement shall conform to ACI-614, ACI-304, and as specified herein.
2. Before placing concrete, the Resident Engineer will inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. The Contractor shall notify other crafts to permit installation of their work; and cooperate with other trades in setting such work. Where form coating is not used, moisten wood forms immediately before placing concrete. Clean all debris and loose material from forms prior to pouring of concrete.
3. All necessary measures shall be taken to insure uninterrupted delivery and placement of concrete. Placing of concrete shall not commence, until, in the opinion of the Resident Engineer, adequate manpower and equipment are available to satisfactorily handle the quantity of concrete to be placed. Such equipment shall be meant to include vibrators, chutes, buckets, hoppers, "elephant trunks" and the Contractor's delivering machinery required for proper placement of concrete.
4. The maximum length of time from loading at the ready-mix supplier's plant to the discharge of concrete at the project site is not to exceed 75 minutes, except that under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85°F or above, this time limit shall be 60 minutes. Under very severe conditions, the Resident Engineer may further reduce the time limits or require a reduction in the size of the batches.
5. The concrete slump shall be 3 and $\pm$1 inches as required for the various portions of the work. The addition of water to the mix for the purpose of increasing the slump will be permitted only at the approval of the Resident Engineer.
6. Concrete shall be placed continuously in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation. Concrete shall not fall freely for more than 5'-0".
7. The vertical drop of concrete shall be controlled in such a manner as to prevent segregation of the aggregate.
8. Concrete shall be placed in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. All concrete layers shall be vibrated thoroughly together to ensure continuity.
9. All concrete shall be consolidated by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping in accordance with ACI recommendation

practices. Vibrators shall not be used to transport concrete inside forms. Inserted vibrators shall be withdrawn vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Vibrators shall not be used in concrete that has begun to set. Concrete shall not be over-vibrated in order to avoid segregation of the mix.

10. Freshly deposited concrete is to be protected from premature drying or mechanical injury. The concrete is to be maintained with a minimum moisture loss, at a relatively constant temperature, for the time period necessary for the hydration of the cement and proper hardening of the concrete.
11. Reinforcement shall be maintained in the proper position during concrete placement operations.

B. Cold weather placement

1. All concrete placement and controls shall conform to ACI Building Code requirements of "Recommended Practice for Cold Weather Concreting" (ACI 306), and as herein specified.
2. For air temperature between 40°F and 70°F when it is not anticipated that temperatures will drop below 40°F, no special protection is required for placing concrete other than providing heated concrete and the means for maintaining concrete temperatures of at least 50°F for a period of five (5) days after placing.
3. For the temperature below 40°F, concrete must be delivered to the project site at between 55°F and 70°F. Water shall not be heated over 180°F. Concrete work shall be protected by wind breaks, curing compounds, heating, blanket covers if necessary in order to maintain the concrete-in-place temperatures of at least 50°F for five (5) days.
4. Frozen materials or materials containing ice or snow shall not be used. Concrete shall not be placed on frozen subgrade or subgrade containing frozen material.
5. Calcium chloride, salt and other materials containing anti-freeze agents or chemical accelerators shall not be used unless otherwise accepted in mix designs. In no case is calcium chloride to be used in concrete work that is placed on metal decks.
6. Accelerating admixtures shall not be used in any concrete work without the Resident Engineer's written approval.
7. All methods proposed for heating materials, and protecting the concrete shall be subject to approval by the Resident Engineer. Concrete shall never be heated over 90°F nor will any other overheating which would produce a flash set be permitted.

C. Hot, warm and inclement weather placement

1. During very warm weather, concrete shall be delivered to the form at the coolest practicable temperature. In no case shall concrete above 90°F be placed. For air temperatures over 70°F, all concrete placement and controls shall conform to ACI Building Code requirements of "Recommended Practice for Hot Weather Concreting" (ACI 305, latest revision). If ordered by the Resident Engineer, the Contractor shall add a retarding admixture.
2. Concrete placement is not permitted when, in the opinion of the Resident Engineer, the sun, heat, wind, rain, sleet, snow or humidity would prevent proper placement and curing.

3. Ingredients shall be cooled before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of the ice is calculated to the total amount of mixing.

3.7 CONCRETE CURING AND PROTECTION

A. General

1. All concrete work shall be continuously protected against the harmful action of the sun, rain, flowing water, frost, or other injury and shall conform with the recommendations of ACI 318-89 or latest edition, and ASTM C309-81 or latest edition.
2. As soon as practicable after placing concrete, the Contractor shall apply a curing medium that will retain adequate moisture to facilitate proper hydration of the concrete. Proper hydration may be accomplished by continuous water spraying, saturated sand, burlap, or the application of a curing method approved by the Resident Engineer. If water curing is employed, all horizontal and vertical surfaces shall be kept continuously wet for a minimum of six (6) days.

3.8 REMOVAL OF FORMS

A. Concrete forms and shores shall remain in place until, in the opinion of the Resident Engineer, the concrete has attained 75 percent 28-day compressive strength. In general, form removal shall adhere to the following minimum schedule:

B. Minimum Elapsed Setting Time Prior to Form Removal

Item	Atmospheric Temperature Above 60°F	Below 60°F
Walls, Column, and Beam Sides	48 Hours	72 Hours
Slab Bottoms	7 Days	12 Days
Beam and Girder Bottoms	7 Days	12 Days

C. The intent of the above schedule is to serve as a guide, however, forms shall remain in place or greater period than indicated above if, in the opinion of the Resident Engineer, the removal of such forms would be detrimental to the stability or safety of the structure.

D. The Contractor is to assume full responsibility for the premature removal of concrete forms. Any concrete that is damaged or does not achieve its design strength as a result of early form removal is to be removed and replaced at no cost to the Owner.

E. Forms may be removed earlier than indicated above upon receipt of satisfactory evidence by the Engineer that the concrete supported thereon has attained sufficient strength to maintain the stability and safety of the structure. Laboratory test reports of job-cured test specimens shall be considered satisfactory evidence. All test specimens taken for the purpose of establishing justification for early form removal shall be made and tested at the expense of the Contractor.

F. As soon as forms have been removed, all tie rod holes and rough spots shall be cleaned, wetted, and patched to match original concrete mix for this area.

3.9 WATERTIGHTNESS OF CONCRETE WORK

A. It shall be the responsibility of the Contractor to provide concrete work which shall, with the exception of the natural porosity of the concrete, be watertight in every respect. Any defects or cracking which will permit the exfiltration of water shall be repaired and rendered watertight by the Contractor at no additional expense to the Owner.

B. Concrete cracks shall be repaired by cutting out the crack to a depth of one inch and a width of one-half inch and sealing the resulting recess with a two-component epoxy sealant as directed by the Resident Engineer.

3.10 WORK IN CONNECTION WITH OTHER SECTIONS AND/OR SUBCONTRACTORS

A. Forms shall be provided with all necessary openings, pockets, slots, chases and the like required for the work of others, which are indicated on the Drawings or for which directions are given, prior to placing concrete.

B. Openings in slabs shall be provided for pipes, conduits, and the like required for the work of others, where indicated or for which directions are given prior to the placing of concrete. When the work of others is completed, the respective opening shall be completely closed up with formwork matching the adjoining work.

3.11 MISCELLANEOUS CONCRETE AND CEMENT WORK

A. All miscellaneous concrete and cement work required to complete the work, and not specified under other Sections of the Specifications shall be constructed in accordance with the requirements of materials and workmanship as hereinbefore specified and shall match other items of work hereinbefore specified.

3.12 CUTTING, PATCHING, AND REPAIR OF CONCRETE SURFACES

A. Concrete repairs shall be provided where shown on the drawings in addition to areas referred to in this section and shall be in accordance with the drawings and these specifications.

B. Defective area in concrete surfaces shall be repaired immediately after removal of forms as specified herein or directed by the Resident Engineer.

C. Cut out honeycomb, rock pockets, voids of 1/4" in any dimension, and holes left by tie rods and bolts down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with approved bonding agent. Place patching mortar after bonding compound has dried.

D. Surfaces exposed to view or liquids shall be repaired with a blend of white Portland cement and standard Portland cement so that, when dry, patching mortar will match the color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

E. Formed surfaces not exposed to view or liquids shall be repaired by removing and replacing concrete having defective surfaces if defects cannot be repaired to the satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surfaces; and stains and other discolorations that cannot be removed by cleaning.

F. Unformed surfaces that contain defects which affect the durability of concrete shall be repaired. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions shall be repaired.

G. High areas in unformed surfaces shall be corrected by grinding, after concrete has cured at least 14 days.

H. Low areas in unformed surfaces shall be corrected during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds shall be approved by Resident Engineer prior to application.

I. Other defective areas, except random cracks and single holes not exceeding 1-inch diameter shall be repaired, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all round. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

J. Use epoxy-based mortar or epoxy modified concrete for structural repairs, where directed by Resident Engineer. Epoxy modifier for mortar and concrete must be approved by the Resident Engineer prior to use.

K. Repair methods not specified above may be used, subject to acceptance by Resident Engineer.

3.13 CLEANING UP

A. Cleanup shall be undertaken upon completion of the work in this Section; in each room, space or area. Upon final completion of all work included herein, all surplus and waste materials resulting from the concrete and cement finishing work, including all tools and implements employed therein, shall be removed from the premises. The entire structure and portions of the site affected by work under this Section shall be left in a neat, clean, and acceptable condition as approved by the Resident Engineer.

3.14 CONCRETE SURFACE TREATMENT AND FINISHES

A. All finishing operations shall begin immediately upon form removal. As a minimum, the Contractor shall be expected to remove all projecting form ties, patch all honeycombing, point all form tie voids, remove all irregular and/or projecting edges, and in general prepare the concrete surface for its surface finish.

B. Waterway areas requiring fill concrete shall be brought to their proper final grades by using a 1:2 cement-sand, mortar mix placed as dry as possible and steel troweled to a hard finish.

C. Concrete Finishes for Horizontal Surfaces:

Used For	Finishing Method
Slabs exposed to weather. Flow channels acting as waterways. Top of flow channel wall. Floor Slabs.	Steel trowel after wood float development.
Flow channel slabs receiving a grout fill finished surface.	Wood float

END OF SECTION 03 33 00

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SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Metal ladders.

B. Products furnished, but not installed, under this Section:
   1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections:
   1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
   2. Section 12 93 00 "Site Furnishings" for bollards. N/A

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Ladders
   2. Access Doors

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.5 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 316L.

B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.

2.3 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

C. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners unless otherwise noted on plans.

B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy **Group 2**.

C. Stainless-Steel Anchor Bolts: ASTM F 593, Type 316, of dimensions indicated; with nuts, ASTM F 594; and, where indicated, flat washers. Minimum diameter anchor bolt shall be 3/4" diameter, unless otherwise indicated.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 ALUMINUM LADDERS

A. The ladder shall be Model L1B and ladder extension shall be Model L1E as manufactured by Halliday Products or Approved Equal.

B. The ladder shall be constructed entirely of aluminum. The rails shall be 1/2" x 2 3/4" aluminum extrusion and shall be spaced 16" apart. The wall mounted standoffs shall be 3/8" x 2 1/2" flat bar and welded to the rails at a maximum of 60" on center. The standoffs shall be a minimum of 7" and manufactured to fit flush with the wall. 1 3/8" diameter type "D" rungs with flat resistant surface shall be spaced at 12" on center and welded to the outside of each rail.

C. The ladder extension shall be constructed entirely of aluminum and stainless steel. The aluminum housing shall mount to the ladder by means of stainless steel channel clamps secured to the ladder rungs with stainless steel "U" bolts. The aluminum telescoping post shall extend above the top of the housing and lock into position with a stainless steel pin.

2.7 STAINLESS STEEL WELD PLATES AND ANGLES

A. Provide stainless steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.8 ANGLE FRAME ACCESS DOORS:

A. Single leaf and double leaf styles of materials and components as follows:
   1. Cover Leaf (s): 1/4" (7mm) aluminum diamond plate.
   2. Angle Frame: 1/4" (7mm) with continuous anchor flange.
   3. Load Rating : H-20, Uniform live load with a maximum allowable deflection of 1/150 of the span.
   4. Locking System: non-corrosive locking bar used in conjunction with an owner supplied padlock.
   5. Cover equipped with the following: Type 316 stainless steel features: heavy duty hinges, tamper proof attaching hardware, automatic hold open arm with aluminum latch.
   6. Safety Grate: 1 inch (25 kg.) 6061-T6 aluminum "I" bar grating with Safety Orange powder-coated finish. Grating shall be hinged with tamper proof stainless steel bolts, and shall be supplied with a positive latch to maintain unit in an upright position. Grating shall have a 6-inch (152mm) viewing area on each lateral unhinged side for visual observation and limited maintenance. Grating support ledges on 300 psf (1464 kg. per sq. meter) loaded access covers shall incorporate nut rail with a minimum of four (4) stainless steel spring nuts. A padlock hasp for owner-supplied padlock shall be provided.
   7. Guarantee: Access covers shall carry a lifetime guarantee against defects in material and/or workmanship.
   8. Acceptable Manufacturers:
      a. EJ USA
      b. Halliday Products
      c. Or approved equal with dimensions as indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ACCESS DOOR INSTALLATION

A. Access Door Installation: Install access door in accordance with manufacturer’s instructions and the following additional requirements.
   1. For surface mounts:
      a. Use ¼-inch min. expansion wedge drilled-in anchors for surface mount installations.
      b. Use ozone resistant gasket composed of blended synthetic, neoprene, and nitrile rubbers of 45-55 durometer hardness and installed minimum compressed thickness of 1/8-inch.
      c. Apply gun-grade sealant to inside and outside edges.

END OF SECTION 05 50 00

SECTION 09 90 00 - PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This Section includes all work to be painted including, but not limited to equipment, interior piping, conduits, and other related items.

1.2 SUBMITTALS

A. Submit for approval Shop Drawings and product data for all materials in accordance with Section 01 33 00 “Submittal Procedures.”

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

A. Steel Structures Painting Council Surface Preparation Standards:
   1. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Structures
   2. SSPC-SP2 Hand Tool Cleaning
   3. SSPC-SP3 Power Tool Cleaning
   4. SSPC-SP5 White Metal Blast Cleaning
   5. SSPC-SP6 Commercial Blast Cleaning
   6. SSPC-SP10 Near-White Metal Blast

B. Manufacturers regularly engaged in the manufacture of the paints and coatings as specified herein and who can demonstrate usage in actual service for a period of not less than 10 years will be considered as acceptable manufacturers.

C. The Contractor shall warrant all paints and coatings to be free from defects in material and workmanship; and that it will repaint, any part or parts which examination shows to have a failed coating under normal use and service by the user within twelve (12) months from the date of **Substantial Completion Acceptance**.

1.4 STORAGE AND DELIVERY

A. Extra materials may not be allowed for publicly funded projects.

B. Bring materials to the job site in the original sealed and labeled containers.

C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 GENERAL

E. The term "paint" is defined as both paints and coatings including emulsions, enamels, stains, varnishes, sealers, and other coatings whether organic or inorganic and whether used as prime, intermediate, or finish coats.

F. Purchase paint from an approved manufacturer. Manufacturer shall assign a representative to inspect application of their product both in the shop and field. The manufacturer's representative shall submit a report to the Engineer at the completion of the Work identifying products used and verifying that surfaces were properly prepared, products were properly applied, and the paint systems were proper for the exposure and service.

G. Provide primers and intermediate coats produced by same manufacturer as finish coat. Thinners shall not be used unless approved by paint manufacturer, and only within manufacturer's recommended limits, and in compliance with all AIM/VOC regulations.

H. Ensure compatibility of total paint system for each substrate. Test shop primed equipment delivered to the site for compatibility with final paint system. Provide an acceptable barrier coat or totally remove shop applied paint system when incompatible with system specified, and repaint with specified paint system.

I. Use painting materials suitable for the intended use and recommended by paint manufacturer for the intended use.

J. Paints and coatings used shall meet all Federal, State and Local AIM/VOC requirements.

K. Require that personnel perform work in strict accordance with the latest requirements of OSHA Safety and Health Standards for construction. Meet or exceed requirements of regulatory agencies having jurisdiction and the manufacturer's published instructions and recommendations. Maintain a copy of all Material Safety Data Sheets at the job site of each product being used prior to commencement of work. Provide and require that personnel use protective and safety equipment in or about the project site. Provide respiratory devices, eye and face protection, ventilation, ear protection, illumination and other safety devices required to provide a safe work environment.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Specifications, provide products from one of the following manufacturers:
   1. Tnemec Company Inc.
   2. Carboline
   3. Sherwin- Williams

2.3 MATERIALS

A. Paint and coatings shall be as specified in the PAINTING SCHEDULE included herein.

PART 3 - EXECUTION

3.1 SHOP PAINTING

B. Shop prime fabricated steel and equipment with at least one shop coat of prime paint compatible with finish paint system specified. Prepare surface to be shop painted in strict accordance with paint manufacturer's recommendations and as specified. Package, store and protect shop painted items until they are incorporated into Work. Repair painted surfaces damaged during handling, transporting, storage, or installation to provide a painting system equal to the original painting received at the shop.

C. Identify surface preparation and shop paints on Shop Drawings. Verify compatibility with field applied paints.

3.2 SURFACE PREPARATION

A. General
   1. Surfaces to be painted shall be clean and dry, and free of dust, rust, scale, and foreign matter. No solvent cleaning, power or hand tool cleaning shall be permitted unless approved by the Engineer.
   2. Protect or remove, during painting operations, hardware, accessories, machined surfaces, nameplates, lighting fixtures, and similar items not intended to be painted prior to cleaning and painting. Reposition items removed upon completion of painting operations.
   3. Examine surfaces to be coated to determine that surfaces are suitable for specified surface preparation and painting. Do not start surface preparation until unsuitable surfaces have been corrected.
   4. Surface preparation shall be in accordance with specifications and manufacturer's recommendations.
   5. Touch-up shop or field applied paint damaged by surface preparation with same type of shop or field applied paint, even to the extent of applying an entire coat. Touch-up coats are in addition to and not considered the first field coat.

6. Protect motors and other equipment during blasting operation to ensure blasting material is not blown into motors or other equipment. Inspect motors and other equipment after blasting operations and certify that no damage occurred, or where damage occurred, the proper remedial action was taken.
7. Field paint shop painted equipment in compliance with Color Coding and as approved by Engineer.

B. Metal Surface Preparation
1. Conform to current Steel Structures Painting Council (SSPC) Specifications for metal surface preparation. Use SSPC-Vis-1 pictorial standards or NACE visual standards TM-01-70 or TM-01-75 to determine cleanliness of abrasive blast cleaned steel.
2. Perform blast cleaning operations for metal when following conditions exist:
a. Moisture is not present on the surface.
b. Relative humidity is below 80%.
c. Ambient and surface temperatures are 5°F or greater than the dew point temperature.
d. Painting or drying of paint is not being performed in the area.
e. Equipment is in good operating condition.
f. Proper ventilation, illumination, and other safety procedures and equipment are being provided and followed.
3. Sandblast ferrous metals to be shop primed, or component mechanical equipment in accordance with SSPC-SP5, White Metal Blast.
4. Sandblast field prepared ferrous metals in accordance with SSPC-SP10, Near White Metal Blast, where metal is to be submerged, in a corrosive environment, or in severe service.
5. Sandblast field prepared ferrous metals in accordance with SSPC-SP6 Commercial Blast, where metal is to be used in mild or moderate service, or non-corrosive environment.
6. Clean nonferrous metals, copper, or galvanized metal surfaces in accordance to SSPC-SP1, Solvent Cleaning, or give one coat of metal passivator or metal conditioner compatible with the complete paint system.
7. Prime cleaned metals immediately after cleaning to prevent rusting.
8. Clean rusted metals down to bright metal by sandblasting and immediately field primed.

C. Concrete Surface Preparation
1. Cure concrete a minimum of 30 days before surface preparation, and painting begins.
2. Test concrete for moisture content using test method recommended by the paint manufacturer. Do not begin surface preparation or painting until moisture content is acceptable to manufacturer.
3. Brush-off blast (Reference ASTM D 4259) concrete to remove contaminants, open bug holes, surface voids, air pockets, and other subsurface irregularities. Do not expose underlying aggregate. Use dry, oil-free air for blasting operations. Surface texture after blasting shall be similar to that of medium grit sandpaper. Remove residual abrasives, dust, and loose particles by vacuuming or blowing with high pressure air.

4. Surface defects, such as hollow areas, bug holes, honeycombs, and voids shall be filled with polymeric filler compatible with painting system. Complete fill coats may be used in addition to specified painting system and as approved by the Engineer. Fins, form marks, and all protrusions or rough edges shall be removed.
5. Repair existing concrete surfaces which are deteriorated to the point that surface preparation exposes aggregate with fill coats or patching mortar as recommended by paint manufacturer and as directed by the Engineer.
6. Clean concrete of all dust, form oils, curing compounds, oil, tar, laitance, efflorescence, loose mortar, and other foreign materials before paints are applied.

D. Previously-Painted Surfaces
1. Remove surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers.
2. Clean and dull glossy surfaces prior to painting in accordance with the manufacturer's recommendations.
3. Check existing paints for compatibility with new paint system. If incompatible, totally remove existing paint system or apply a barrier coat recommended by the paint manufacturer. Remove existing paints of undetermined origin. Prepare a test patch of approximately 3 square feet over existing paint. Allow test patch to dry thoroughly and test for adhesion. If proper adhesion is not achieved, remove existing paint and repaint.

3.3 APPLICATION OF PAINT

A. Apply paint by experienced painters with brushes or other applicators approved by the Engineer, and paint manufacturer.

B. Apply paint without runs, sags, thin spots, or unacceptable marks.

C. Apply at rate specified by the manufacturer to achieve at least the minimum dry mil thickness specified. Apply additional coats, if necessary, to obtain thickness.

D. Special attention shall be given to nuts, bolts, edges, angles, flanges, etc., where insufficient film thicknesses are likely. Stripe paint prior to applying prime coat. Stripe painting shall be in addition to coats specified.

E. Perform thinning in strict accordance with the manufacturer's instructions, and with the full knowledge and approval of the Engineer and paint manufacturer.

F. Allow paint to dry a minimum of twenty-four hours between applications of any two coats of paint on a particular surface, unless shorter time periods are a requirement by the manufacturer. Longer drying times may be required for abnormal conditions as defined by the Engineer and paint manufacturer. Do not exceed manufacturer's recommended drying time between coats.

G. Suspend painting when any of the following conditions exist:
1. Rainy or excessively damp weather.
2. Relative humidity exceeds 85%.

3. General air temperature cannot be maintained at 50°F or above through the drying period, except on approval by the Engineer and paint manufacturer.
4. Relative humidity will exceed 85% or air temperature will drop below 40°F within 18 hours after application of paint.
5. Surface temperature of item is within 5 degrees of dew point.
6. Dew or moisture condensation are anticipated.
7. Surface temperature exceeds the manufacturer's recommendations.

3.4 OSHA SAFETY COLORS

A. Paint wall around wall-mounted fire extinguishers with the appropriate safety red color; Area not exceed 2-feet wide by 3-feet high, unless apparatus covers the area.

3.5 COLOR CODE FOR PIPING AND EQUIPMENT

A. Pipes shall be identified by color, label, and flow direction. Labels and flow direction arrows shall be stenciled on the piping at the horizontal or vertical centerlines at a minimum spacing of 20 LF or more frequently as needed for clarity.

B. The painting color schedule, for all final coats of color code painting for all pipe lines, pipe line insulation and equipment shall be as in accordance with the following:

Piping System	Pipe Color	Labeling & Flow Arrow Color
Vent	Black	White
Potable Water	Dark Blue	White
Non-Potable Water	Blue/Black	White
Drains	Light Gray	Black
Sewage	Dark Gray	Green
Tank Drains and Overflows	Black	White

C. Stencil same size arrows and letter indicating direction of flow pointing away from the legend. Letter sizes shall be based upon nominal pipe diameter as follows:

Outside Diameter of Pipe	Height of Lettering
1 ½" – 2 ½"	¾"
3" – 6"	1 ¼"
7" – 10"	2 ½"
> 10"	3 ½"

3.6 **PAINTING SCHEDULE**

SURFACE	APPLICATION	PAINTING SYSTEM AND NO. OF COATS	PRODUCT REFERENCE (TABLE 9.2)	TOTAL MIN. DRY FILM THICKNESS (MILS)
<u>Concrete and Masonry</u> Submerged wastewater	Water retaining side of new wall surfaces where opposite side of wall is interior and dry and where indicated "epoxy waterproofing" on drawing	2 coats high solids epoxy Provide filler as required and recommended by manufacturer	119	6-10/coat
<u>Metals</u> Interior and exterior nonsubmerged (gloss)	All new blowers, pumps, motors and mechanical equipment, piping, etc.	1 coat epoxy polyamide primer 1 coat epoxy polyamide 1 coat aliphatic polyurethane	104 102 115	4-6 4-6 3-5
Submerged Wastewater		2 coats high solids epoxy	119	8-10/coat
Steel doors, windows and door frames, steel stairs, monorails, structural steel, misc. metals (steel)		1 coat epoxy polyamide 1 coat aliphatic polyurethane	102 115	5-8 3-4
Aluminum surfaces in contact with concrete		2 coats coal tar	107	26

3.7 **PRODUCT LISTING**

REF.	SYSTEM	PURPOSE	Tnemec Series	CARBOLINE	Sherwin-Williams
102	Epoxy polyamide	Finish coat semi-gloss or gloss	69	Carbogard 890	Macropoxy 646
104	Epoxy Polyamide – metal	Primer	69	Carbogard 890	Macropoxy 646
107	Coal tar	Sealer	46-465	Bitumastic 300	Hi-Mil Sher-Tar Epoxy
115	Aliphatic Polyurethane	Finish coat	1075	Carbothane 134HS	Acrolon 218HS
119	High solids epoxy	Finish coat	104	Carboline 890	Tank Clad HS

END OF SECTION 09 90 00

SECTION 09 97 26 - TRIPLEX LINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 WARRANTY

A. Triplex Authorized Licensed Installer, jointly provide their standard Ten (10) Year Materials and Five (5) Year Labor non-prorated warranty for all Triplex Liner Systems. The standard warranty is extended up to an additional pro-rated 10 years on material and 5 years on labor, dependent on the series of liner system used. Triplex fabrics and resins are warranted to be free of defects in materials and workmanship, to prevent infiltration, prohibit root intrusion and provide a surface coating resistant to sewer gases and chemicals typically found in domestic sewer collection systems. This warranty is for the repair or replacement of the liner as needed. Labor and Materials Warranties are as follows:
   1. Triplex Liner System for Manholes – Non-prorated Ten-Year Materials and Five-Year Labor
   2. Sewage Pump Stations, Wet Wells & Culverts – Non-prorated Ten-Year Materials and Five-Year Labor
   3. Depending on the system installed, the Triplex Liner System comes with up to an additional Ten- Year Material/Five-Year Labor, pro-rated warranty. Together, this provides the Triplex Liner System with up to Twenty Year Material and 10 Year Labor warranty protection.

B. Product Data: For each type of the following manufactured products required:
   1. Controlled low-strength material, including design mixture.
   2. Warning tapes.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The liner system used shall be McNeil Technologies Triplex Liner System or Approved Equal.

B. McNeil Technologies Contact Information:
   1. Mailing Address: P.O. Box 1200, Destin, Florida 32540
   2. Phone: (850) 687-9696
   3. Email: ronmcneil2012@gmail.com
   4. Website: www.triplex-liner.com

2.2 DESCRIPTION

A. Usage: The Triplex Liner System is a cured-in-place structural liner designed for use as a non-porous, multi-layer structural system for rehabilitation for structures such as manholes, pump stations, wet wells, vaults, storage tanks, large diameter pipe, and corrugated culvert pipe. It provides an impervious water and sewer gas resistant membrane, layered between layers of structural fiberglass or polyester fiber. Therefore, the liner system is ideal for correcting H S gas deterioration, infiltration and exfiltration problems in structures of most any shape or size.

B. This waterproof liner system completely seals off infiltration and exfiltration. The epoxy resins used in conjunction with the fiberglass liner fabric are resistant to gases and chemicals typically encountered in domestic sewer systems. The liner permanently adheres to wet or dry surfaces of brick, concrete, PVC, and ductile iron; it prevents further deterioration, infiltration, and exfiltration, while providing structural reinforcement to the existing structure, and provides a chemical and sewer gas resistant protective lining system. Other epoxy or vinyl-ester resins may also be used in conjunction with the Triplex Liner for special chemical and industrial applications.

C. The Triplex Liner System is manufactured in five (5) standard liner weights that are designed for varying depths and varying structural conditions. These five liner designs provide the end-user with the right choice for fulfilling lining needs ranging from preventive maintenance to very serious structural problems with infiltration and/or ex-filtration.

D. Each liner is a type that allows rehabilitation of concentric, eccentric or flat top structures without removing the ring top section or corbel. This minimizes traffic disruption and eliminates the need for road repairs. All liner material and components are custom fabricated at the Triplex Technologies, Inc., manufacturing facility to fit the size and shape of each individual structure. Structure measurements are taken and liners are manufactured prior to commencement of the liner installation to minimize the on-site field time required for the liner installation.

2.3 MATERIALS

A. The PTLS-6800 series is a three-layered composite system with a total pre-saturated fabric weight of 68-ozs. per square yard. PTLS-6800 is typically designed for structures up to 24-feet in depth. Layer #1 is 24-oz. structural fiberglass impregnated with a modified epoxy resin and bonded to the existing substructure. Layer #2 is a 20- oz. non-porous membrane of special synthetic materials bonded to layer #1 and layer #3. Layer #3 consists of 24-oz. structural fiberglass saturated with epoxy and bonded to the nonporous membrane, forming a smooth interior wall to the host structure. For structures deeper than 24 feet, or for structures experiences heavy infiltration, additional layer(s) of fiberglass may be added as needed.

B. The PTLS-11600 series is a three-component composite system with a total pre-saturated fabric weight of 116-ozs. per square yard. PTLS-11600 is designed for culvert pipe and structures over 24-feet in depth. Component #1 is (2) 24-oz. structural fiberglass layers impregnated with a modified epoxy resin and bonded to the existing substructure. Component #2 is a 20-oz. non-porous membrane of special synthetic materials bonded to layer #1 and layer #3. Component #3 consists of (2) 24-oz. structural fiberglass layers saturated with epoxy and bonded to the nonporous membrane, forming a smooth interior wall to the host structure. Additional layer(s) of fiberglass may be added as needed.

C. The standard impregnating resin for typical domestic wastewater sewer system liners is a modified Polyamide Bisphenol "A" Epichlorodhydrin system that is field applied. After the resin is applied, the liner is lowered into the manhole where, in most cases, it is cured in place with a temperature inversion system of air pressure and steam heat injection. Most liners are cured within two hours and become a structural monolithic wall bonded to the host structure. Other chemical and industrial applications may require alternate resin system depending on the site conditions and chemicals present in the structures. In these cases, the Owner shall supply an analytical report of chemicals present to Triplex Technologies, Inc. The resin system used in these cases is determined on a case-by-case basis.

D. Sizes: Each liner is custom fabricated to fit the individual structure. There is no standard configuration in manholes and many other structures; therefore, exact measurements must be completed and submitted prior to manufacturing each liner. Triplex Technologies, Inc. provides diagrams for location, configuration, measurements, site & structure conditions, notes and observations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cleaning: All surfaces of the host structure are to be cleaned with a high-pressure hydro-jet sprayer with an operating pressure of at least 4,000-psi. After pressure cleaning, surface may be cleaned with degreaser or other solvents, as needed, in order to remove any film or residue on the surface. Structure shall then be pressure rinsed with water.

B. Final Preparation: All incoming laterals and main truck line openings shall be properly trimmed and grouted with hydraulic or Portland Type II Cement, forming a filet between the structure wall and each pipe. All inlet and outlet pipes should be trimmed so they do not extend into the structure more than two inches. Such application of grout shall extend at least six inches from the outlet onto the wall area. Manhole steps shall be removed flush to within ½" of the structure wall. Any remaining protrusion shall be grouted over to provide smooth surface for the liner.

C. Benches, walls, and floors shall be repaired or refinished as appropriate, using chemical grout, hydraulic cement or Portland type II cement. Bench areas and floors shall be lined with Triplex Liner System materials saturated with the epoxy resin and placed in the bottom, extending approximately 6 inches up the wall section, so as to overlap with the liner wall section.

D. Manhole Liner Installation:

1. Once the liner is fully saturated with resin at the job site, it shall be lowered into the structure to the pre- marked position at the cover seat of the structure entrance. The liner shall form a monolithic structure permanently connecting the ring & cover seat to the chimney, corbel, walls, and benches. Unless otherwise required, the liner will end at, but include, the bench. In cases where invert channel lining is required, the sewage flow must be stopped for a minimum period of 3 hours, and should be a separate cost item.

2. Normal installation procedures do not require the restricting or bypassing of the main trunk line in manholes where the sewage flow is contained within the channels, and channel lining is not required.
3. In cases where channel is required to be lined, the same process may be used as on the bench area however, the sewage flow must be stopped. Channels may also be lined with a hand lay-up method using PT-Epoxy Fast Setting Mastic and Fiberglass. Using the hand lay-up method, the channel shall be dry and free of infiltration of groundwater. The channel will receive not less than 1 24-oz structural fiberglass layer along with structural fiber reinforced epoxy mastic. Once the channel lining is cured, additional layers may be applied as needed. If channel lining is required it shall be specifically noted in the liner proposal or the client's quotation request.
4. The Triplex Liner for manholes shall be pressurized with air or water, and cured with steam, ambient or heated air, or ambient or heated water. Most typical Triplex manhole liner installations will be pressurized at 432-1,008 lbs. per square foot, depending on the condition of the structure and the amount of hydrostatic pressure from incoming infiltration.

E. Pump Station, Wet Well and Vault Installation:
1. All pumps, pipes, and switches shall be removed from the structure, providing the Triplex Liner installer an empty structure. Unless otherwise specified by the owner, the liner will include walls, the floor, and the underside of top slab. The underside of the top slab may be lined in conjunction with the walls and floor, or it may be coated with RAM-750 Epoxy Mastic. The underside of the top slab may also be lined by removing the top slab for installation of the liner and applying Triplex materials or RAM-750 Epoxy Mastic, then allowing it to cure at ambient temperature. Removal of the top slab method will allow the top slab to be removed in the future.
2. Once the liner is fully saturated with resin, it shall be lowered into the structure to the appropriate pre-marked position at structure entrance. In the case of large or non-cylindrical structures, the liner may be installed in sections with multiple cure times. The liner shall form a monolithic structure permanently connecting the walls and floor of the structure (and top slab where applicable).
3. Pump stations and larger structures are typically pressurized at a minimum 300 lbs. per square foot, with major infiltration being stopped prior to installation. This is due to the limited weight of the deck slab restricting the amount of internal pressure that can be applied during the installation process. The liner may also be pressurized and cured-in-place at ambient temperature by filling the structure with water to approximately one foot above the surface area to be lined. Depending upon specific site conditions, the water method is preferred for structures such as square or rectangular manholes, or vaults and large pump stations.

END OF SECTION 09 97 26

SECTION 26 00 00 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 NOTICE

A. The General Conditions, Special Conditions, General Requirements and Drawings are hereby made a part of this Section as fully as if repeated herein. Contractor shall consult these sections in detail as he will be responsible for and governed by conditions set forth therein and work indicated.

B. Attention is directed to other sections of the specifications, which affect the work under this section.

1.2 JOB CONDITIONS

A. The Contractor shall visit the sites and familiarize himself with all existing and limiting conditions that have a bearing on his work. Failure to do so will not relieve him of any subsequent responsibilities pertinent to this project.

B. The Contractor shall be responsible for familiarizing himself with the civil drawings, pump and pump control requirements for the project. All power and control wiring and raceways shall be provided for the project.

1.3 PERMITS AND INSPECTIONS

A. Permits and licenses necessary for the execution of this work shall be secured and paid for by the Contractor.

B. Contractor shall arrange for all inspections specified herein or required by all agencies having jurisdiction and furnish required certificates of inspection to Owner, including electrical certificate from State licensed agency.

1.4 CODES AND STANDARDS

A. The installations shall conform to all applicable codes and standards. The construction of the systems indicated and called for in these specifications shall be performed in accordance with practices, except as otherwise indicated or specified. The Contractor shall be responsible for obtaining the necessary information to comply with these requirements. Any modification of the drawings or specifications that may be necessary to meet these requirements must be approved by the Engineer or authorized representative before they are made.

B. The Contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the drawings and/or specifications are at variance therewith, he shall promptly notify the Engineer in writing of any necessary changes of work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations without first providing written notice to the Project Engineer, the Contractor shall bear all costs arising from same.

C. Requirements of the following organizations shall be considered minimum:
   1. National Electrical Code
   2. National Electrical Safety Code
   3. Local Utility Company
   4. OSHA
   5. Local City and County Codes

1.5 ELECTRICAL ABBREVIATIONS, REFERENCES AND DEFINITIONS

A. Abbreviations and symbols herein and on Drawings are in accordance with ANSI Standard Y1.

B. References to technical societies, trade organizations and governmental agencies in the Electrical Division are in accordance with the following:
   1. ANSI - American National Standards Institute
   2. ASTM - American Society for Testing Materials
   3. IEEE - Institute of Electrical and Electronics Engineers, Inc.
   4. NEC - National Electrical Code
   5. NEMA - National Electrical Manufacturers Association
   6. NFPA - National Fire Protection Association
   7. OSHA - Occupational Safety and Health Administration
   8. UL - Underwriters' Laboratories, Inc.

C. The following definitions of terms and expressions are applicable to the Electrical Division.
   1. "Provide" shall mean "furnish and install."
   2. "Herein" shall mean "contents of a particular Division" where this term appears.
   3. "Indicated" shall mean "indicated on Contract Drawings."
   4. "Equal" shall mean "approved equivalent."
   5. "Contractor" shall mean "Contractor or subcontractor for work described."

1.6 TESTS

A. Arrange and pay for all tests. Notify Engineer three (3) working days before tests are made. Conduct tests in presence of Engineer or authorized representative. Repeat tests after defects are corrected.

B. Prior to tests, provide feeders and branch circuits continuous from main distribution panels to outlets, fixtures and equipment.
   1. Demonstrate system is free from short circuits and properly grounded.
   2. Test lighting circuits for correct operation after lamps are installed.
   3. Check all motors for correct rotation.
   4. Test load balance as specified herein.

1.7 SYSTEM OPERATION INSTRUCTIONS

A. Verbal Instruction

   1. After all tests and adjustments, Contractor shall instruct attendant or Owner's representative in all details of operation of distribution.
   2. Supply attendants to operate the systems until Engineer is satisfied that the systems have been installed in accordance with these Drawings and Specifications and are functioning properly.
   3. Provide services and equipment manufacturer's engineer to instruct representative of Owner in operation and maintenance of Electrical equipment.

B. Written Instruction
   1. Provide two (2) copies of printed instructions and diagrams covering operation and maintenance of each item of equipment.
   2. Instructions furnished in bound covers and posted at locations designated by Engineer or authorized representative.

1.8 LAYOUTS

A. Electrical system layouts indicated are generally diagrammatic and location of outlets and equipment is approximate; exact routing of raceways, locations of outlets and equipment shall be governed by structural conditions and obstructions. The Contractor shall be responsible for the exact layout of all equipment. This is not to be construed to permit redesigning systems; all outlets and equipment shall be interconnected as indicated. Locate and install equipment requiring maintenance and operation so that it will be readily accessible. Any relocation of outlets or equipment must be approved by the Engineer or authorized representative before erection. The right is reserved to make any reasonable change in location of outlets and equipment prior to "roughing-in" without involving additional cost.

B. Coordinate the installation of wiring, raceways, outlet boxes, sleeves, anchors, and other concealed or embedded items so that this work is properly in place before concrete or partitions are in place.

1.9 SHOP DRAWINGS

A. The Contractor shall submit within 30 days after the award of the contract a list of materials required for the project. This list shall be complete and include all items or systems called for in this contract. Partial lists submitted from time to time will not be acceptable. The list shall identify the specific item, manufacturer, and vendor. Vendor information only will not be acceptable.

B. After approval of the material list, the Contractor shall secure descriptive drawings or catalog cuts of equipment to be furnished under his contract. He shall review these Shop Drawings for conformance to contract documents prior to submission for approval. No equipment shall be ordered until they have been approved.

C. Shop Drawings shall be in accordance with General Conditions and Supplementary General Conditions of these Specifications.

D. All Shop Drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
   1. Project name
   2. Project number
   3. Subcontractor's Vendor's and/or Manufacturer's name and address
   4. Product identification
   5. Applicable contract drawings and specifications section number
   6. Shop Drawing title, drawing number, revision number, and date of drawing and revision

1.10 SUBSTITUTES

A. Manufacturers' names and catalog numbers of materials and equipment are given to describe type, quality and design of material and equipment required. Where possible three (3) or more manufacturers are listed.

B. Where materials or manufacturers are specified and where the words "or equal" or "approved equal" are not used, only those specified shall be furnished and installed.

1.11 MATERIALS AND EQUIPMENT REQUIREMENTS

A. Provide materials and equipment conforming to those specified herein. Manufacturers' names and catalog numbers are given to describe type, quality and design of material and equipment required.

B. All material and equipment shall conform to capacity, efficiency, design and material specified and shall meet dimension and space requirements. Sizes of materials and equipment indicated or specified are minimum requirements. The Contractor may use larger sizes to expedite the work provided that such change meets space requirements and does not result in additional installation, maintenance or operating cost to the Owner. Equipment or materials of the same type or classification, used for the same purpose, shall be the products of the same manufacturer.

C. All materials shall be new, of the best of their respective kind and shall conform to accepted standards of the trade in every case where such a standard has been established for the particular type of material in question. Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with applicable technical standards and specification of societies, organizations and/or agencies listed herein, suitable for maximum working pressure and shall have neat and finished appearance.

D. Materials and appliances of types for which there are UL standard requirements, listings or labels shall have such listing of UL, be so labeled, and shall conform to their requirements.

E. In all cases where a device or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such items as are required to complete the installation.

F. Contractor shall, without charge, replace any work or material, which develop defects, except ordinary wear and tear, or fail to perform satisfactorily, within one (1) year from the date of final acceptance.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION 26 00 00

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SECTION 26 05 00 – BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SCOPE

A. Provide material and perform all work necessary to furnish a complete, functional installation as outlined in this and associated Specifications and associated project drawings. Installation consists of provisions for secondary service with secondary metering, lighting, power, control, telemetry, enclosed breakers, panelboards, transfer switches, standby power generator, disconnects, conduit and wiring, receptacles, toggle switches and control devices.

B. Contractor shall consult Section 26 00 00, General Provisions, in detail, as he will be responsible for and governed by conditions set forth therein.

1.2 SUBMITTALS

A. Furnish shop drawings and descriptive data, complete with project designation for the following:
1. Conductors
2. Conduits
3. Panelboard and Panelboard Circuit Breakers
4. Main Circuit Breaker with Power Monitor
5. Surge Protective Devices
6. Wiring Devices
7. Outlet Boxes and Fittings
8. Junction and Pull Boxes
9. Connectors
10. Tags and Nameplates

1.3 ELECTRIC SERVICE

A. New secondary metered, 200A, 208/120, 3-phase, 4-wire, underground supply from the City of Dover Electric Department's pad mounted transformer shall be provided. The new service will be metered at the equipment enclosure. Contractor shall provide City of Dover Electric Department approved meter assembly with lever-bypass.

B. Contractor shall provide new underground service conduit and conductors. Final terminations in the service transformer are to be performed by the Contractor in coordination with the City of Dover Electric Department. Contractor shall perform all other service connections and grounding of the service neutral per the NEC.

1.4 RELATED WORK SPECIFIED ELSEWHERE – please refer to the following specification sections for additional information. The information included in these sections does not supersede any information included herein, but complements and supplements it.

A. Related Electrical Specifications Sections
   1. Section 26 00 00 – Electrical General Provisions
   2. Section 26 32 15 – Manual Transfer Switch
   3. Section 27 51 24 – Supervisory Control and Data Acquisition System

PART 2 - PRODUCTS

2.1 ENCLOSED CIRCUIT BREAKERS

A. Electronic Trip Molded Case Type
   1. Circuit Breaker:
      a. Circuit protective device shall be of the molded case circuit breaker type. Circuit breaker shall be UL Listed for 80% continuous current when applied in manufacture's recommended enclosure for applicable project mounting location.
      b. Provide a Fixed Instantaneous (High Level Selective Over-ride) circuit on breaker. The circuit shall have a defeatable instantaneous adjustment to allow the breaker to remain closed for up to 30 cycles during overcurrents below 35 kA RMS symmetrical short time withstand rating at 600 volts. The circuit shall instantaneously trip when current levels exceed applicable withstand ratings.
      c. Circuit breaker shall be constructed in accordance with the following standards:
         1) UL 489.
         2) NEMA AB1.
         3) CSA 22.2, no. 5-M1986.
         4) Federal Specification W-C 375B/GEN.
         5) IEC 157-1
      d. Circuit breaker shall utilize a glass reinforced insulating material providing high dielectric strength. Current carrying components shall be completely isolated from the trip unit and accessory mounting area. Breaker shall have common tripping of all poles and shall be trip free. The circuit breaker shall be UL Listed for reverse connection without requiring special construction or labeling. The breaker shall have quick-make, quick-break contacts with an overcenter toggle operating mechanism. All circuit breakers shall be equipped with electrical accessories as noted on the Drawings.
      e. Circuit breaker shall be factory sealed and shall have a date code on the face of the circuit breaker. Poles shall be labeled with respective phase designations.
      f. Breaker handle and faceplate shall indicate rated ampacity. Breaker faceplate shall indicate UL and IEC certification standards with applicable voltage systems and corresponding AIC ratings.

g. Circuit breaker escutcheon shall have International I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the “ON” or “OFF” position.

2. Terminations
   a. All lugs shall be UL Listed to accept solid and/or stranded copper conductors only. Lugs shall be suitable for 90°C rated wire.
   b. Circuit breaker shall be UL Listed to accept field installable/removable compression type lugs.
   c. Circuit breaker shall be supplied with insulated groundable solid neutral and be suitable for service entrance use.
3. Manufacturer: Square D Co., PowerPact Electronic Trip Circuit Breaker with MicoLogic trip unit, L-Frame (250A), Trip Function “LSI” with Trip Unit “3.3S” or the equal by Eaton and Siemens.

2.2 CONDUCTORS

A. Copper Conductors
1. Copper, single- or multi-conductor, 600 volts, THWN-2, 90°C dry and wet.
2. Minimum wire size for branch circuits shall be #12 AWG, except non-power carrying control circuits may be #14 AWG.
3. Conductors #8 AWG and larger shall be stranded.
4. Manufacturers: Aetna, Allied, Okonite or Southwire.

B. Multi-conductor Cable
1. 600 volt multi-conductor power and control cable shall be composed of single conductors, Type THHN/THWN. The single conductors are to be cabled and taped, with a flame-retardant, moisture and sunlight resistant PVC jacket.
2. 600 volt multi-conductor cables shall satisfy the requirements of NEC and UL for Type TC power and control cables for installation in wet and dry locations.
3. Conductors to be sequentially numbered.
4. Manufacturers: Aetna, Belden, Southwire or Okonite.

C. Instrumentation/Signal Cable
1. 600 volt rated, individual shielded pairs or triads, or multiple pairs or triads individually and overall shielded, per project requirements, composed of #16 AWG, soft annealed stranded copper conductors, XPLE insulation moisture and sunlight resistant PVC jacket.
2. Shield type: 100% coverage, aluminum polyester foil or tape with drain wire.
3. NEC and UL for Type TC control cables suitable for installation in wet and dry locations.
4. Color coded per ICEA Table E-2
5. Manufacturer: Belden UL Industrial Cable.

D. Variable Frequency Drive (VFD) Cables
1. 1000 volt flexible power motor supply cable: XLPE insulated tinned copper power conductors, full-size PVC insulated copper ground, overall aluminum foil-polyester tape with 85% tinned copper braid shield. Full-size tinned copper drain wire flame-retardant, moisture and sunlight resistant PVC jacket.
2. Conductors: 600V UL1277, Type TC-ER, 90°C wet/dry rated per NEC and UL for Type TC power.
3. Conductors to be sequentially numbered.
4. Manufacturers: Belden or Olflex.

2.3 CONDUITS

A. Galvanized Rigid Steel Conduit
   1. Material: Hot dipped galvanized rigid steel.
   2. Fittings: Cast metal, screwed fittings; 1-1/2" and larger, mogul type. (Zinc coupling or nonferrous metal fittings are not acceptable).
   3. Standards: ANSI C80.1, ANSI C80.4 and UL6.
   4. Manufacturers: Allied, O-Z/Gedney, Robroy, Thomas & Betts, Triangle, Wheatland

B. Rigid Aluminum Conduit
   1. Material: Aluminum
   2. Fittings: Cast copper-free aluminum screwed fittings: 1-1/2" and larger, mogul type.
   3. Standard: UL listed and labeled.
   4. Manufacturers: Anaconda, American Brass Co. and Reynolds Metal Co.

C. Rigid Polyvinyl Chloride Conduit (PVC)
   1. Material: Polyvinyl chloride, rigid conduit, listed for 90°C conductors or cable and use in direct sunlight. Use Schedule-80 for underground installations and Schedule-40 for above ground installations.
   2. Fittings: Coupling type.
   3. Joints: Connections shall be made by solvent welding.
   4. Standards: NEMA, UL, NEC, ASTM D 1784.
   5. Manufacturers: Carlon EPC-40 (Sch 40), EPC-80 (Sch 80) or equal.

D. Liquidtight flexible metallic conduit (LFMC)
   1. Flexible, galvanized-steel core, with continuous copper ground in the convolutions, covered with extruded polyvinyl chloride.
   2. Connectors: Thermoplastic insulated screw-in ground core type connectors constructed of 304 stainless steel Thomas & Betts Liquidtight 5331SST series fittings or equal.
   3. Manufacturers: Electri Flex, Thomas & Betts, Triangle and Southwire.

2.4 PANELBOARD AND PANELBOARD CIRCUIT BREAKERS

A. Panelboards
   1. Type: Factory assembled dead front safety type.
   2. Cabinet: Constructed in accordance with UL Standard 50 for cabinets, 20" minimum width, and 14-gage minimum steel.
   3. Door: Flush mounted with lock, two keys, and typewritten directory. Doors shall be flush or surface type as required. All panelboard locks are to be keyed alike.
   4. Gutters: Sizes of gutters shall be in accordance with UL Standard 67 for panelboards; 5" minimum on top, bottom and sides.
   5. Finish: Rust inhibiting primer and gray baked enamel finish.
   6. Bussing assembly: Copper bus structure and main lugs or main breaker shall have current ratings as indicated. Ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50°C rise shall be constructed of copper.
   7. Safety barriers: Main lugs, main breakers and bus structure shall have proper barriers.
   8. For panelboard enclosure shall be NEMA type 3R, with front cover removed.

B. Panelboard Circuit breakers
   1. Type: Bolt-on (Plug-on for lighting and power branch circuit breakers), quick-make and quick-break type with inverse time characteristics secured through use of bimetallic tripping element supplemented by magnetic trip.
   2. Interrupting capacity: Minimum RMS symmetrical amperes rating shall be 10,000amps AIR for lighting and power branch circuit breakers operating at 240 VAC and below. For main circuit breakers in lighting and power panels, and all circuit breakers operating at 480 VAC or 240VAC, the minimum rating shall be 25,000 amps AIR.
   3. Tripping element: Non-interchangeable, non-removable type for 225 amperes and less: interchangeable type for over 225 amperes.
   4. Tripping indication: Tripping indication shall be clearly visible by operating element assuming neutral position between "on" and "off".
   5. Identification: Each breaker shall be identified by an individual circuit number.
   6. Multi-pole breakers: Breakers designed so that overload in one pole automatically causes all poles to open by means of common trip.
   7. HACR breakers: Circuit breakers rated for use in serving heating, air conditioning and refrigeration equipment.
   8. EPD breakers: Breakers provide overcurrent and short circuit protection combined with Class B ground fault protection of equipment at a 30 milliamp level and trip actuated auxiliary contact.
   9. Handle clamps for single pole breakers and fixed padlocking attachments for 2 and 3 pole breakers shall be provided where indicated.

C. Standards: Panelboards shall be UL-listed and bear the UL Label.

D. Manufacturers: Square D panelboard Type as listed or the equal of Siemens or Eaton.
   1. Light & Power - Type “MPZ”.

2.5 SURGE PROTECTIVE DEVICES

A. General:
   1. Surge Protective Devices (SPD) shall be provided to protect the 208 volt system. The system components are to be as specified herein.
      a. Each complete suppression unit shall be Underwriters Laboratories (UL) listed as a surge suppressor per UL 1449, 1987 and if the unit contains an electromagnetic interference filter which consists of capacitors and/or inductors, the unit shall be Complementary Listed under U.L. 1283, Standard for Safety for EMI Filters.
      b. Units shall bear the suppressed voltage rating issued by UL for all protected modes.
   2. System shall be tested to meet ANSI/IEEE C62.41 1991, and as per ANSI, IEEE C62.45 1987. per 50 ohm insertion loss measurement method of RF frequencies up to 100 MHZ.

B. Materials/Construction:
   1. The circuit configuration of the suppression units shall be thermal stress reducing, custom parallel, and solid state.
   2. Protection Modes: All modes shall be protected; i.e., Normal (L-L, L-N) and Common (N-G, L-G). Protectors for starters and VFDs shall be internally fused.
   3. The suppression units shall be housed in NEMA 4 (IP 56) enclosures.

4. The design of each model shall be tested in all modes to demonstrate the capability to withstand 1,000 sequential, category B3/C1, 6kV/3kA, 8 X 20us impulses (units installed at the service entrance must be tested to withstand 1000 consequential category C3, 20kV/10kA impulses) as described in ANSI/IEEE C62.41-1991 IEEE Guide for Surge Voltages in Low-Voltage AC Power Circuits. The interval between impulses shall not exceed 30 seconds. Other aspects of the test shall be in accordance with ANSI/IEEE C62.45-1987 Guide on Surge Testing for Equipment Connected to Low Voltage AC Power. The resultant peak let-through voltage of the last impulse shall not vary from the first impulse by more than +10% or -20%. Test results shall be made available to purchaser's engineer upon request.
5. The suppression circuit shall be totally encapsulated in a thermally conductive chemical compound to enhance transient energy dissipation.
6. The SPD shall have peak surge current of no less than 120 KA/phase.
7. The unit shall have threshold suppression network circuit design. All circuitry shall be encapsulated in a thermally conductive chemical compound. Transient energy dissipation must not be accomplished solely by air and/or by the electronics contained in the suppression unit.

C. Quality Assurance and Warranty
1. The panel mounted SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of thirty (30) years from the date of substantial completion of service and activation of the system to which the suppressor is attached. Additionally, during the applicable warranty period, any SPD which fails due to any electrical anomaly, including lighting, shall be repaired or replaced by the manufacturer without charge. Special or optional warranties in excess of the unit's standard warranty for purposes of this bid are not acceptable.

D. Manufacturer: Joslyn, Inc., Surge-Track ST120, or the Liebert equal.

2.6 WIRING DEVICES

A. Manufacturers: Arrow-Hart, Hubbell, or Bryant devices equivalent to those listed herein.

1. Wall switches: Hubbell No. HBL-1221, -1222, -1223, and -1224, 20 ampere, 120/277 volt, brown nylon toggle, back and side wiring, single-pole, two-pole, three-way, or four-way as indicated.
2. General Purpose Receptacles: Hubbell No. HBL5362, duplex type with grounding, 20 ampere, 125 volt, brown nylon face, back and side screw terminals. Sump Pump dedicated receptacle shall be provided with Hubbell, Series WP26, while-in-use cast aluminum weatherproof cover, selected for vertical or horizontal mounted device.
3. Outdoor GFCI Receptacle: Hubbell No. GFR5362TR, weather-resistant, duplex, 20 ampere, 125 volt, brown polyester face, back and side screw terminals, flashing red failure indicator, with test and reset buttons.
4. Wall plates:
    a. Hubbell, Series WP26, while-in-use cast aluminum weatherproof cover, selected for vertical or horizontal mounted device.
    b. Outdoor GFCI Receptacle: Hubbell, Series WP26, while-in-use cast aluminum weatherproof cover, selected for vertical or horizontal mounted device.

2.7 OUTLET BOXES AND FITTINGS

A. Cast boxes, Fittings, and Conduit Bodies
   1. Standard, general purpose, copper-free cast aluminum boxes with threaded inlets, gaskets, cast aluminum fittings, and conduit bodies with gasketed cover.
   2. Choice of body types shall be made to conform to installation arrangement, wiring, device content, etc.
   3. Sealing fitting shall be expanded-filling type, rated for Class I, Division 1, Groups B, C, D, provided with fiber filler and sealing compound.
   4. Aluminum metallic finish.
   5. Manufacturers: Crouse Hinds, Appleton, or Killark.

2.8 JUNCTION AND PULL BOXES

A. Smaller than 150 cubic inches: Standard NEMA-4X outlet box with cover.

B. 150 cubic inches and larger: Construct same as NEMA-4X cabinets conforming to UL "Standards for Cabinets and Boxes".

C. Junction and pull boxes shall be:
   1. NEMA Type-4X enclosure
   2. Type-316L stainless steel enclosure and exterior hardware.
   3. Type-316L stainless steel hinged door, clamps, hasp and stable for padlocking, and neoprene gaskets.
   4. External mounting brackets.
   5. Manufacturers: Hoffman Bulletin A4S, or equal.

2.9 CONNECTORS

A. Connectors
   1. Conductors #8 AWG and larger terminated and spliced with Burndy or Thomas & Betts mechanical pressure connectors.
   2. Conductors #10 AWG and smaller terminated and spliced with insulated expandable live spring type twist-on compression type connectors. Connectors shall be Buchanan "B-Cap" or 3M "Hy-Flex".
   3. Connect conductors to apparatus by means of approved lugs or connectors as manufactured by Thomas & Betts, or equal.

B. Insulating tape
   1. Vinyl plastic insulating tape, 7-mil thick, Scotch 33+ or equal.
   2. Apply at all joints and splices.

2.10 TAGS AND NAMEPLATES

A. Identify electrical conductors in boxes and cabinets with letters and numerals as manufactured by W. H. Brady, Cat. No. B-500, vinyl, or equal with prior approval. Letters and numerals shall be black printing on a white, vinyl background, 0.006 inches thick. Identification is to include circuit number and panel designation.

B. Provide adhesive-backed, black-faced, laminated-plastic nameplates with engraved white lettering.
   1. Panelboard nameplate shall be 4" x 1-5/8" x 1/16"
   2. Motor Starters: 4" x 1-5/8" x 1/16".
   3. Pump Control Panel: 4" x 1-5/8" x 1/16".

C. Panelboard nameplate shall include voltage and phase identification.

2.11 GROUNDING

A. QUALITY ASSURANCE
   1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Comply with UL 467 for grounding and bonding materials and equipment.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferules: 1-5/8 inches wide and 1/16 inch thick.

C. CONNECTORS
   1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
   2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
      a. Pipe Connectors: Clamp type, sized for pipe.
      b. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. GROUNDING RODS
   1. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet. a. Couplings: Heavy bronze sleeve, female threads.
      a. Manufacturer: Joslyn, Chance or equal
   2. Concrete-Encased Electrode:
      a. Footing Encasement: 20 ft maximum of electrically conductive coated steel reinforcing bars or rods of not less than 1/2" in diameter encased by at least 2" of concrete. Reinforcing bars or rods to be bonded together with steel tie wires.
      b. Column Footing Encasement: Vertical rod wire tied to reinforcing network with 1/2" rebar tied to vertical and horizontal rebar assembly at footing; a 1/2" rebar welded to a building column anchor bolt on two faces and stenciled "G" on top of each grounded anchor bolt.

E. A sign shall be placed at the service entrance rated manual transfer switch indicating that the neutral of the normal and emergency sources is connected to the grounding electrode conductor at that location.

2.12 FOUNDATIONS

A. Provide concrete pads for all electrical equipment and all outside fixture anchor bases.
   1. Construct pads and bases of 3000 psi concrete.
   2. Provide reinforcement wire in anchor bases as indicated

B. Provide hook type galvanized anchor bolts, sleeves, washer, nuts and templates to locate position of bolts for equipment on foundations; Contractor furnishing equipment shall be responsible for location of anchor bolts.

2.13 EQUIPMENT SUPPORTS AND STANDS

A. Design and construct supporting structures of strength to safely withstand stresses to which subjected and to distribute the load properly. Provide supports constructed of American Steel "Kindorf" or equal.

B. Respective Contractor shall provide required supports for equipment provided by them and submit detailed shop drawings for approval before construction.

PART 3 - EXECUTION

3.1 ELECTRIC SERVICE INSTALLATION

A. Contractor shall coordinate with the utility for the new service work.

B. Contractor to provide grounding and bonding per utility, 2011 NEC, and local Authority Having Jurisdiction requirements.

3.2 CIRCUIT BREAKER AND PANELBOARD INSTALLATION

A. Install circuit breaker and panelboard in accordance with manufacturer's recommended procedures. Provide necessary protection during construction period to insure against mechanical damage and dust accumulation.

B. Field tests prior to energization:
   1. Megger checks of phase to phase and phase to ground insulation level.
   2. Continuity.
   3. Short Circuit.

C. Adjust operating mechanisms for free mechanical movement. Tighten all bus connections and mechanical fasteners per manufacturer's torque requirements. Touch-up scratched or marred surfaces to match original finish.

D. Connect panelboard branch circuit loads so that the load is distributed as equally as possible between the phase busses.

E. Type circuit directories giving location and nature of load served. Install circuit directories in each panelboard.

F. Attach an identification engraved nameplate as specified in paragraph 2.9 of this specification.

3.3 CONDUIT CLASSIFICATION

A. Rigid galvanized steel conduit shall be used for wiring installed underground or under floors unless noted otherwise, and shall rise a minimum of 6 inches above the surface where emerging from below.

B. Rigid aluminum conduit shall be used for all building wiring. Aluminum conduits shall not be placed in contact with concrete or installed underground. Installation shall be in accordance with supports and hangers specified herein.

C. PVC conduit shall be used for underground secondary service and as indicated otherwise.

D. Liquid-tight flexible metal conduit shall be used for final connections to motors or other equipment subject to motion or vibration (length: 2-feet max.).

3.4 CONDUIT INSTALLATION

A. Install conduit in accordance with the following:

1. Generally, conduits in the building are to be installed exposed on walls and ceilings unless otherwise indicated. Conduits may be run concealed in accessible ceiling spaces where applicable. Minimum size conduit shall be 3/4". Other sizes shall be as indicated or required by the National Electrical Code for number and size of conductors installed.
2. All joints shall be cut square, reamed smooth, and made up tight. Rigid metal conduit shall be threaded. Bends or offsets in metal conduit shall be made with conduit ells, field bends made with approved bender or hickey, or hub type conduit fitting. Radius of bends shall conform to the National Electrical Code. Number of bends per run shall conform to National Electrical Code limitations. All scratched, cut, threaded, or where galvanized finish is disturbed and has exposed steel in the conduit system shall have two coats of Zinc-Rich's ZR or Zink-X applied after cleaning off dirt, chips, and oil.
3. Concealed and exposed conduits shall be run with long sweep bends and offsets (parallel to and at right angles to building lines).
4. Conduits shall be continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes, and shall be secured to all boxes with locknuts and bushings in such a manner that each system shall be electrically continuous throughout. Conduit ends shall be capped to prevent entrance of foreign materials during construction.
5. Conduit terminations at cabinets and boxes shall be rigidly secured with locknuts and bushings as required by the National Electrical Code. On all conduit 1-1/4" trade size and larger, bushings shall be of the insulated or insulating type with double locknuts as manufactured by Thomas & Betts or approved equal.
6. All conduit systems must be installed complete before conductors are pulled. All empty raceways shall have a #12 galvanized-steel pull wire installed, with 12-inches coiled in box for future wire pulling.
7. All underground conduits entering building shall be effectively sealed to prevent water moisture, or any other foreign matter, from entering building.
8. Underground conduit system shall consist of wide sweep elbows and bends and shall be completely watertight. Conduits shall be not less than 30" below finish grade.

9. Route of all underground conduits to be identified by placing a continuous plastic tape in the trench backfill, six to eight inches below finished grade. The tape is to be non-biodegradable type plastic at least 4" wide, red in color, and imprinted with the legend "Caution - Buried Electric Lines Below".

B. Support conduit in accordance with the following:
   1. Horizontal and vertical conduit runs shall be supported by one-hole malleable straps, clamp backs, split ring, or other approved devices with suitable machine threaded bolts. Provide concrete inserts, expansion anchors, and strut assemblies for mounting to building concrete structure. See "SUPPORTS AND HANGERS" section on requirements for electrical work being mounted on masonry surfaces, steel beams, and on columns.
   2. Trapeze hangers may be used to support groups of parallel conduits; U-bolt or similar type clamps shall be used at the end of a conduit run and at each elbow, J-bolts or approved clamps shall be installed on each third intermediate trapeze hanger to fasten each conduit.
   3. Hangers shall be made of malleable iron and have a steel insert that bites into structural member and shall be suitable for the application involved. Finish shall be electro-plated. Where excessive corrosive conditions are encountered, hanger assemblies shall be protected, after fabrication, by sherardizing or galvanizing, special paint, or other suitable preservative methods.

3.5 SUPPORTS AND HANGERS

A. Conduits shall be secured and supported in accordance with the National Electrical Code.

B. Conduits shall be supported by Unistrut or Kindorf channels and straps, or equal, with prior approval, or by beam clamps fastened to building steel.

C. Continuous rigid cable supports, such as wireways, cable troughs, ladders and channels, shall be supported by brackets or hangers made of Unistrut or Kindorf channels, or equal with prior approval.

D. No electrical equipment of any nature shall be fastened directly to masonry surfaces, steel beams, or columns. Lengths of Unistrut or Kindorf steel channel shall first be fastened to the structure, and then the electrical equipment fastened to the steel channel with metal fasteners designed for the purpose.

E. Where steel supporting channels are fastened to masonry walls, toggle bolts, expansion shields or through bolts shall be used. Wood plug masonry anchors shall not be used.

F. The required strength of the supporting equipment, and the size and type of anchors, shall be based on the combined weight of conduits, hangers, and cables.

3.6 JUNCTION AND OUTLET BOX INSTALLATION

A. Install junction and outlet boxes approximately as indicated:
   1. Set boxes true and flush, and rigidly secure in position.
   2. Use painted or galvanized iron hangers to support ceiling outlets.
   3. Set boxes so that front edges of box are flush with finished wall or ceiling line, or not more than 1/4" back of same, except where conduit is exposed.

B. Provide junction and outlet boxes of sizes and types to accommodate the following:
   1. Structural conditions.
   2. Size and number of conductors, or cables, entering the device or fixture for which the box serves.

3.7 CONDUCTOR INSTALLATION

A. All electrical conductors shall be copper unless specifically noted otherwise.

B. Install conductors of size and quantity indicated or required in accordance with requirements of the National Electrical Code.
   1. Do not draw conductors into conduit until conduit is free from moisture.
   2. Leave sufficient slack to permit connection of fixtures, switches and equipment without additional splices; 8" minimum.
   3. Minimum wire size for branch circuits shall be #12 AWG except that home runs longer than 100 feet from panel to load shall be minimum #10 AWG.
   4. Each motor shall be supplied by an individual branch circuit, unless indicated otherwise.

C. Make taps and splices in wire as follows:
   1. Conductors shall be square cut with a hacksaw or cable cutter without deforming the strands. Insulation shall be removed with a penciling cut to avoid nicking the strands and surface oxides shall be removed by brushing exposed strands with a wire brush or card file.
   2. Compression connectors shall be selected to fit the conductor.
   3. Splice only in accessible pull, junction, or outlet boxes.
   4. Use mechanical wire splices and joints for #8 wire and larger, and AL/CU pressure connectors for #10 wire or smaller.
   5. Insulate joint at least 100% in excess of wire insulation.

3.8 GROUNDING

A. Ground neutral of service and all noncurrent-carrying metallic parts of the electrical system to the service grounding system.
   1. Service to be grounded to ground rod and metallic water piping.
   2. Metallic parts to be grounded shall include, but not be limited to, cabinets, panelboards, conduits, outlet boxes, junction and pull boxes, motor frames, control panels.
   3. Bond with suitable ground clamps.
   4. Provide all wiring, grounding conductors, grounding devices, and electrical bonding required to comply with the National Electrical Code and local authorities having jurisdiction.

B. Maximum ground resistance to conform to the strictest requirements of the power utility, the National Electrical Code, and local authority having jurisdiction.

3.9 CUTTING AND PATCHING

A. Contractor shall install all hangers, supports and sleeves in floors, walls, partitions, ceilings, and roof slabs as construction progresses to permit their work to be built into place and to eliminate unnecessary cutting of construction work.

B. All cutting of concrete or other material for the passage of conduit through floors, walls, partitions and ceilings shall be done by the Contractor where necessary to install his work. Contractor will close all such openings around conduit with material equivalent to the fire-rating and structural integrity of that removed. All exposed surfaces shall be left in suitable condition for refinishing without further work.

C. Where conduits penetrate fire-rated walls, floors, or ceilings, seal openings with appropriate UL-approved firestop material.

D. No structural member shall be altered or cut without the written special permission of the Engineer.

3.10 WIRING DEVICES

A. Where wiring devices are indicated, install device complete with outlet box and cover plate Ground connections between device and metallic outlet box are required on both standard and self-grounding devices equipped with a ground terminal.

3.11 MOUNTING HEIGHTS - WIRING DEVICES AND SPECIAL SYSTEMS

A. Mount wiring devices and special system outlets at height above-finished-floor (AFF) as herein specified, except where indicated otherwise.
   1. Receptacles 36" AFF
   2. Switches 48" AFF

3.12 EXCAVATION AND BACKFILLING

A. Contractor shall perform all necessary excavation and backfilling required for the installation of their work.

B. Excavate bottom of trenches to exact depth, refill excavation below required grade of cable or raceway with firmly compacted sand. Deposit excavated materials on side of trench; do not leave material where it will interfere with traffic. Suitably protect trenches and openings with signs, barricades, enclosures, or flashing lights.

C. Trenches shall not be backfilled until all required tests are performed and until the utilities systems, as installed, conform to the requirements of the various utilities for the installation. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as permitted by the Owner.
   1. Lower Portion of Trench:
      a. Backfill material shall be deposited in 6-inch maximum thickness layers and compacted with suitable tampers to the density of the adjacent soil until there is a cover of not less than one foot. The backfill material in this portion of the trench shall consist of sandy clay, sand, gravel, soft shale, or other approved materials free from hard clods and stones larger than one inch in any dimension.
   2. Remainder of Trench:
      a. The remainder of the trench shall be backfilled with material that is free of stones larger than 1-inch in any dimension. Backfill material shall be deposited in layers not exceeding the thickness specified, and each layer shall be compacted to the minimum density specified as applicable to the particular area.

b. For installation involving directly buried cable, stones or pieces of paved surfacing larger than one inch in any dimension, or pieces of scrap cable, shall not be buried in the trench as a means of disposal.

c. Routing of all underground lines is to be identified by placing a continuous plastic tape in the trench backfill 6" to 8" below finished grade. The tape is to be non-biodegradable type plastic at least 4" wide, red in color, and imprinted with the legend “Caution-Buried Electric Line Below”.

D. Construction shall be arranged so that trenches will be left open for the shortest practical time to avoid creating a hazard to the public and to minimize the likelihood of trench collapse due to other construction activity, rain, accumulation of water in the trench, etc.

3.13 ACCEPTANCE CABLE TESTING (SINGLE CONDUCTOR & MULTI-CONDUCTOR ASSEMBLIES)

A. Cables - Low Voltage (600 volts and less)

1. Visual and Mechanical Inspection
   a. Cables to be inspected for physical damage and proper connection in accordance with single-line diagram.
   b. Cable mechanical connections shall be tested to manufacturer's recommended torque values with a calibrated torque wrench.
2. Electric Tests
   a. Perform insulation resistance test on each cable with respect to ground and adjacent cables.
   b. Perform continuity test to insure proper cable connections.

3. Test Values
   a. Insulation resistance tests shall be performed at 1000 volts D.C. for one (1) minute.
   b. When insulation resistance must be determined with all switchboards, panelboards, fuse holders, switches, and overcurrent devices in place, the insulation resistance, when tested at 500 volts D.C., shall be no less than Table 3.1.

Table 3.1 Minimum Insulation Resistance

Conduit or Conductor Size	Minimum Resistance
No. 14 and 12 AWG	1,000,000 ohms
25 ampere circuits and above	250,000 ohms

3.14 EQUIPMENT CONTROL WIRING

A. Provide all wiring, conduit, terminal blocks, labeling, surge protection, and final connections for the instrument and control wiring required for the proper operation of all equipment.

END OF SECTION 26 05 00

SECTION 26 05 71 – ELECTRICAL POWER SYSTEM STUDIES

PART 1 - GENERAL

1.1 SUMMARY

A. The electrical equipment manufacturer shall provide electrical power system studies for both the new and remaining existing equipment at this facility. The type and content of each study is specified in the following articles.

1.2 SUBMITTALS

A. Completed electrical power system studies, a digital copy of software model developed for the study and copies of arc-flash labels shall be bound and submitted to Owner.

PART 2 - PRODUCTS

2.1 ELECTRICAL POWER SYSTEM STUDIES

A. Short-Circuit Analysis
   1. Calculation of the maximum RMS symmetrical three-phase short-circuit current at each significant location in the electrical system shall be made using a digital computer.
   2. Appropriate motor short-circuit contribution shall be included at the appropriate locations in the system so that the computer calculated values represent the highest short-circuit current the equipment will be subjected to under fault conditions.
   3. A tabular computer printout shall be included which lists the calculated short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings, and notes regarding the adequacy or inadequacy of the equipment.
   4. The study shall include a computer printout of input circuit data including conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
   5. Include a computer printout identifying the maximum available short-circuit current in RMS symmetrical amperes and the X/R ratio of the fault current for each bus/branch calculation.
   6. The system one-line diagram shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.
   7. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

8. The contractor shall be responsible for supplying pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the short-circuit analysis to be completed prior to final installation.
9. Any inadequacies shall be called to the attention of the engineer and recommendations made for improvements as soon as they are identified.

B. Protective Device Time-Current Coordination Analysis
1. The time-current coordination analysis shall be performed with the aid of computer software intended for this purpose, and will include the determination of settings, ratings, or types for the overcurrent protective devices supplied.
2. Where necessary, an appropriate compromise shall be made between system protection and service continuity with system protection considered more important than service continuity.
3. A sufficient number of computer generated log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
4. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, the short-circuit current availability at the device location when known, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
5. The study shall include a separate, tabular computer printout containing the suggested device settings of all adjustable overcurrent protective devices, the equipment where the device is located, and the device number corresponding to the device on the system one-line diagram.
6. A computer generated system one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
7. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
8. Significant deficiencies in protection and/or coordination shall be called to the attention of the engineer and recommendations made for improvements as soon as they are identified.
9. The contractor shall be responsible for supplying pertinent electrical system conductor, circuit breaker, and other component and system information in a timely manner to allow the time-current analysis to be completed prior to final installation.

C. Arc-Flash Hazard Analysis
1. The Arc-Flash Hazard Analysis shall be performed with the aid of computer software intended for this purpose and will result in Arc-Flash Incident Energy (AFIE) levels and approach boundary distances.
2. The Arc-Flash Hazard Analysis shall be performed in conjunction with a short-circuit analysis and a time-current coordination analysis.
3. Results of the Analysis shall be submitted in tabular form, and shall include device or node bus name, bolted fault and arcing fault current levels, approach boundary distances, personal-protective equipment classes and AFIE levels.

4. The analysis shall be performed under worst-case Arc-Flash conditions, and described in the final report, how these conditions differ from worst-case bolted fault conditions.
5. The Arc-Flash Hazard Analysis shall be performed by a registered professional engineer.
6. The Arc-Flash Hazard Analysis shall be performed in compliance with IEEE Standard 1584-2002, the IEEE *Guide for Performing Arc-Flash Calculations*.
7. The Arc-Flash Hazard Analysis shall include recommendations for reducing AFIE levels and enhancing worker safety.
8. The proposed vendor shall demonstrate experience with Arc-Flash Hazard Analysis by submitting names of at least ten actual Arc-Flash Hazard Analyses it has performed in the past year.
9. The proposed vendor shall demonstrate capabilities in providing equipment, services, and training to reduce Arc-Flash exposure and train workers in accordance with NFPA 70E and other applicable standards.
10. The proposed vendor shall demonstrate experience in providing equipment labels in compliance with NEC-2012 section 110 and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.
11. The Arch-Flash Hazard labels shall be provided for the electrical equipment included in analysis and placed on equipment by project Electrical Contractor.

PART 3 - EXECUTION

3.1 ADJUSTMENTS

A. Protective device settings on the secondary equipment shall be adjusted by the contractor in accordance with the results of the studies.

3.2 LABELS

A. Arch-Flash Hazard labels provided shall be applied to the electrical equipment included in analysis.

END OF SECTION 26 05 71

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SECTION 26 09 00 - ELECTRICAL CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work necessary and/or required and furnish all materials and equipment for complete system of electrical controls for the project. Such work includes, but is not limited to, the following:

1. Installation of electrical controls and instrumentation devices in association with the installation of sewage pumping station.
2. Installation of miscellaneous relays, contractors, limit switches, intrinsically safe barriers, operators, pilot lights, signal and control devices.

1.2 SUBMITTALS

A. Furnish submittals and descriptive data, complete with project designation, for the following:
1. Relays, contactors, and other miscellaneous components
2. Sensors: Thermostats, etc.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).
1. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

B. Instrument Society of America (ISA)
1. ISA S5.2 - Binary Logic Diagrams for Process Operations
2. ISA S5.3 – Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic and Computer Systems.
3. ISA S5.4 - Standard Instrument Loop Diagrams

C. American National Standards Institute (ANSI)
1. ANSI X3.5 - Flowchart Symbols and Their Usage in Information Processing

D. National Electrical Manufacturers Association (NEMA)

E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

A. The manufacturers of the equipment and fabricators of panels and/or cabinets supplied under this Section shall allow the Engineer and/or Owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems, level measuring devices and other pertinent systems and/or devices. A minimum of ten working days notification shall be provided to the Engineer prior to testing. No shipments shall be made without the Engineer's prior, written approval.

1.5 WARRANTY

A. The warranty shall provide (a) a minimum of next-day, on-site service for emergency failures, and (b) replacement of the defective component within one week, if repairs cannot be affected within that time. A five-day response time, on-site service, is required for non-critical failures. Warranty work shall be provided by the installation Contractor. This warranty shall cover a period of one year from the date of final acceptance of the project.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS COMPONENTS

A. Pilot Type Indicating Lights
   1. Type
      a. Heavy duty oiltight type, which utilizes a LED 7 lumen lamp.
   2. Functional/Performance
      a. Units shall be provided with voltage lamps suitable for the voltage supplied.
      b. Lamps shall be replaceable from the front of the unit.
   3. Physical
      a. Lens color shall be as indicated on the instrument device schedule.
      b. Lens shall be approximately 1-1/4-in in diameter.
      c. Provide legend faceplates engraved to indicate the required function of each device.
      d. Units shall be rated NEMA 13 for indoor panels. Units located outdoors or indicated to be weatherproof shall be rated NEMA 4X.
   4. Manufacturers: Square D, Allen Bradley, or Microswitch

B. Selector Switch and Pushbutton Operators
   1. Type
      a. Operators shall be 30 mm heavy-duty oiltight type with stackable contact blocks.
   2. Functional/Performance
      a. Provide contact arrangement and switching action as required for the control system specified.

3. Physical
    a. For 120 VAC service provide contacts rated 10 Amps at 120 VAC, for 24 VDC service provide silver sliding contacts rated 5 Amps at 125 VDC, for electronic (millivolt/ milliamp) switching provide contacts rated lamp at 28 VDC.
    b. Pushbuttons shall have flush type operators. Selector switches shall have knob or wing lever operators.
    c. Units shall be rated NEMA 13 for indoor service. Units located outdoors or indicated to be weatherproof shall be rated NEMA 4X.
    d. Provide legend plates denoting switch/pushbutton position/ function.
    e. Provide padlock attachments for outdoor selector switches and pushbuttons and where indicated otherwise. Padlock attachments for stop pushbuttons shall hold button in the depressed position.
4. Options/Accessories Required
    a. Provide lock-out-pushbuttons, key-operators, etc, as indicated on the instrument device schedule.
    b. Provide make-before-break bridging contacts where required.
    c. Provide operators in Type 304 stainless steel enclosures.
5. Manufacturers: Square D, Allen Bradley, or Microswitch

C. Industrial Relays and Time Delays
1. Type
    a. Industrial heavy duty NEMA rated relays.
2. Functional/Performance
    a. Contact arrangement/function shall be as required to meet the specified control function specified.
    b. Standard contacts shall be rated 10 Amps continuous at 600 Volts. Master contacts (when required) shall be rated 20 Amps continuous at 600 Volts.
    c. Relays shall be provided with convertible contact blocks.
    d. Pneumatic time delay relays shall be used on time delays less than 180 seconds and shall be adjustable.
    e. Solid state time delay relays shall be used on time delays between 180 seconds and one-hour.
3. Options/Accessories Required
    a. Provide all mounting rails, etc, that are required.
4. Manufacturers: Square D Class 8501, Type X or equal Allen-Bradley or Cutler-Hammer.

D. General Purpose Relays and Time Delays
1. Type
    a. Units shall be of the general purpose NEMA rated plug-in type.
2. Functional/Performance
    a. Coil voltage shall match supply voltage.
    b. Contact arrangement/function shall be as required to meet the specified control function.
    c. Mechanical life expectancy shall be in excess of 10 million.
    d. Duty cycle shall be rated for continuous operation.
    e. Units shall be provided with integral indicating light to indicate if relay is energized.

f. Solid state time delays shall be provided with polarity protection (DC units) and transient protection.
g. Time delay units shall be adjustable and available in ranges from .1 second to 4.5 hours.

3. Physical
   a. For 120 VAC service provide contacts rated 10 Amps at 120 VAC, for 24 VDC service provide contacts rated 5 Amps at 28 VDC, for electronic (milliamp/millivolt) switching applicator provide gold plated contacts rated for electronic service.
   b. Relays shall be provided with dust and moisture resistant covers.
4. Options/Accessories Required
   a. Provide mounting sockets with pressure type terminal blocks rated 300 Volt and 10 Amps.
   b. Provide mounting rails/holders as required.
5. Manufacturers: Square D, Allen-Bradley, Cutler-Hammer or Potter & Brumfield.

E. Power Relays
1. Type: Electromagnetically operated and held type, single and double pole and single and double throw as indicated.
2. Contacts: 30 ampere rated at 300V resistive load and a horsepower rating of 1.5.
3. Coil: Continuous duty rated.
4. Operating Voltage: 120 VAC, 60 Hz unless indicated otherwise.
5. Manufacturer: Square “D” Class 8501, Type C or equal Allen Bradley.

F. Contactors (Lighting):
1. Type: Multiple, electrically operated, mechanically held with coil clearing contacts.
2. Manufacturer: Square “D” Class 8903 or equal Allen Bradley.

G. Alarm Horn
1. The alarm horn shall be an electronic tone-generating unit, operating on 120VAC/DC. Horn shall generate a minimum of 68db output at 2 feet at a frequency of 2900Hz.
2. Manufacturer shall be Mallory Sonalert Audible signaling device, type no. SC110, or approved equal.

H. Elapsed Timer Meters shall have six digits, 120V, be non-resettable, and shall be provided on motor starter contactor enclosure, or for surface mounting as indicated.

2.2 AMBIENT TEMPERATURE SWITCHES

A. Temperature switches for ambient indoor temperatures.

B. Provide wall-mount temperature switch (thermostat) with the following requirements:
1. Allowed temperature: 40°F to 100°F
2. Standard material: anodized aluminum
3. Contacts: 25A, 120VAC, SPDT
4. Differential: 2.5°F

5. Enclosure
    a. Dimensions: 5.87” X 3.5” X 3.68”
    b. NEMA 4X

C. Manufacturers – Chromalox Model WCRT

2.3 FLOW TOTALIZER

A. Type:
1. Remote microprocessor-based transmitter.
2. IP67/NEMA type 4X/6 to IEC 529.
3. Measuring Principle – electromagnetic with pulse constant field
4. Detection of empty pipe.
5. All inputs and outputs galvanically isolated.
6. UL listed

B. Input:
1. Digital Input: 11…30 VDC, Ri = 4.4k ohms.
2. Activation Time: 50ms.

C. Output:
1. Current Output:
    a. Signal Range: 0…20mA or 4…20mA, Alarm.
    b. Load: <800 ohms.
    c. Time Constant: 0.1…30s, adjustable.
2. Digital Output:
    a. Frequency: 0…10kHz, 50% duty cycle (uni/bidirectional).
    b. Pulse (active): DC 24V, 30mA, 1k ohms$\leq$Ri$\leq$10k ohms, short-circuit protected.
    c. Time Constant: 0.1…30s, adjustable.
3. Relay Output:
    a. Load: 24V DC/1A.
    b. Time Constant: Changeover relay, same as current output.

D. Low Flow Cutoff:
1. Range: 0…9.9% of maximum flow.

E. Environmental:
1. Temperature Range: -20° to 60°C.

F. Functions:
1. Flow rate.
2. Low-flow cut-off.
3. Flow direction.
4. Error system.
5. Operation time.
6. Uni/bidirectional flow.
7. Limit Switches.
8. Pulse output.
9. Control for cleaning and batch.

G. Communication:
   1. MODBUS RTU/RS485.

H. Electrical:
   1. Supply Voltage: 11…30V DC or 11…24V AC.
   2. Circuit Protection: transient voltage surge protection.
   3. Electrical Connection: 1/2” NPT, with 72” 18 AWG color coded leadwires.

I. Physical:
   1. Weight: 2 lbs.
   2. Enclosure: Fiber glass reinforced polyamide.
   3. Display protection lid to be provided.

J. Manufacturers:
   1. Siemens: Sitrans F M Mag 6000
   2. Or equal, as approved by Owner.

2.4 FLOW SENSOR

A. Type:
   1. Electromagnetic induction flow sensor.
   2. Conforming to PED-97/23 EC.
   3. All inputs and outputs galvanically isolated.
   4. Remote transmitter junction box potted to IP68.

B. Physical:
   1. Diameter Normal (DN) 100 (4”), to be coordinated with actual DIP force main to be installed.
   2. Carbon Steel Flanges ASTM A, 300 micrometer coating.
   3. Corrosivity category “C4”, according to ISO 12944-2.
   4. Measuring pipe shall be stainless steel AISI 304/1.4301.
   5. Electrode: Hastelloy C.
   6. Terminal Box: Fibre glass reinforced polymide with ½” NPT.
   7. Liner Material: NBR Hard Rubber.

C. Communication:
   1. Modbus RTU/RS 485.

D. Mechanical Loading (Vibration):
   1. 18…1000 Hz random in X, Y, Z directions for 2 hours according to EN 60068-2-36.

E. Manufactures:
   1. Siemens: Sitrans F M Mag 5100W (7M6580).
   2. Or equal, as approved by Owner.

2.5 CONTROL PANELS, ENCLOSURE AND CABINETS

A. The following Paragraphs describe general fabrication requirements of control panels, enclosures, consoles and cabinets.

B. Wiring

1. All interconnecting wiring, except for electronic circuits, shall have 600 Volt insulation and rated for not less than 90 degrees C.
2. Power distribution wiring on the line side of fuses shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 14 AWG minimum. Electronic analog circuits shall utilize 16 AWG shielded, twisted pair, cable insulated for not less than 300 Volts.
3. Power and low voltage dc wiring systems shall be routed in separate wireways. Crossing of different system wires shall be at right angles. Different system wires routed parallel to each other shall be separated by at least 12-in. Different wiring systems shall terminate on separate terminal blocks. Wiring troughs shall not be filled to more than 60 percent visible fill.
4. All wiring shall terminate in a master terminal board, rigid type and numbered. The master terminal board shall have a minimum of 25 percent spares. Terminal blocks shall be arranged in vertical rows and separated into groups. (Power, AC control, DC signal, alarm, and graphic). Terminal blocks shall be barrier type with the appropriate voltage rating (600 Volts minimum). They shall be the raised channel mounted type. Wire connectors shall be the hook fork type with non-insulated barrel for crimp type compression connection to the wire. Wire and tube markers shall be the sleeve type with heat impressed letters and numbers. Direct interlock wiring between equipment will not be allowed. 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 6-in of the side panel or adjacent terminal.
5. All wiring to hand switches and the like which are live circuits independent of the panel's normal circuit breaker protection shall be clearly identified as such.
6. All wiring shall be clearly tagged and color-coded. All tag numbers and color-coding shall correspond to the panel wiring diagrams and loop drawings. All power wiring, control wiring, grounding and DC wiring shall utilize different color insulation for each wiring system used.
7. Each control loop or system circuit shall be individually protected by a fuse or breaker. All protecting devices shall be clearly labeled and located for ease of maintenance.
8. Provide surge protectors on all incoming power supplies and 15A 125V duplex receptacle in each panel.

C. Control Components

1. All components required for the monitoring and control functions specified and or required shall be provided. Control functions shall be performed by relay logic or by a microprocessor duplex controller or PLC controller customarily used in pump control panels.

D. Equipment Mounting/Arrangement

1. All components shall be mounted in a manner that shall permit servicing, adjustment, testing and removal without disconnecting, moving or removing any other

component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Components mounting shall be oriented in accordance with the internal components shall be identified with suitable plastic or metal engraved tags attached with drive pins adjacent to (not on) each component identifying the component in accordance with the drawing, specifications and supplier's data.

2. All exterior panel mounted equipment shall be installed with suitable gaskets, faceplates, etc, required to maintain the NEMA rating of the panel.

E. Nameplates

1. All panels shall be supplied with suitable nameplates, which identify the panel and individual devices as required. Nameplates used to identify individual panels shall use the descriptive name, not the acronym/abbreviation.

F. Indoor Wall or Unistrut Mounted Cabinets

1. Unless noted otherwise on the Contract Drawings, all indoor panels shall be minimum of NEMA 12 and fabricated of not less than USS 14 gauge steel.
2. All panels shall be by Hoffman or equal.

G. Outdoor Enclosures

1. Unless noted otherwise on the Contract Drawings, all outdoor panels shall have a NEMA 4X rating and shall be constructed of Type 316 stainless steel.
2. All panels shall be by Hoffman or equal.
3. The Flow Totalizer described in Part 2.3 and the Recorder described in Section 40 91 23 Flow Process Measurement Devices Part 2.2 shall be installed in a Type 316 stainless steel NEMA 4X rated Hoffman enclosure, catalog number A24H2412SSLP3PT, with 3-Point Latch.

H. SERIALIZED UL LABEL REQUIREMENT (508A) – all control panels provided under this section shall be constructed in compliance with Underwriter's Laboratories Inc. category 508A standards - Enclosed Industrial Control Panels listing and following-up. The control panel(s) shall bear the Underwriter's Laboratories serialized label for “Enclosed Industrial Control Panel”.

1. While the use of U.L. listed components is encouraged, their use alone will not be considered an acceptable or satisfactory alternate to the “Enclosed Industrial Control Panel” serialized label specified above.
2. Upon request from the Engineer, the panel manufacturer shall supply documentation to the owner proving they are a U.L. recognized manufacturing facility for the type of equipment required.
3. Only the labeled products of U.L.508A/“Enclosed Industrial Control Panel” recognized panel manufacturer would be considered acceptable for use on this project.

PART 3 - EXECUTION

3.1 EQUIPMENT CONTROL WIRING

A. Provide all wiring conduit and final connections for the interlock and control wiring of all equipment.

END OF SECTION 26 09 00

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SECTION 26 32 15 - MANUAL TRANSFER SWITCH

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install a Manual Transfer Switches (MTS) with number of poles, amperage, voltage, and withstand current ratings as shown herein and on the plans.

1.2 ACCEPTABLE MANUFACTURERS

A. Manual transfer switches shall be as manufactured by Schneider Electric. Any alternate shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Each alternate bid must list any deviations from this specification.

1.3 CODES AND STANDARDS

A. The manual transfer switch and accessories shall conform to the requirements of:
1. UL 98 - Enclosed Switches
2. NFPA 70 - National Electrical Code
3. NFPA 110 - Emergency and Standby Power Systems
4. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
5. NEMA Standard ICS 10-1993 (formerly ICS2-447) – AC Transfer Switch Equipment
6. NEC Article 702
7. International Standards Organization ISO 9001
8. NEMA KS 1 – Enclosed Switches
9. NEMA 250 – Enclosures for Electrical Equipment

1.4 SUBMITTALS

A. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage and short circuit.

PART 2 - PRODUCTS

2.1 SWITCH INTERIOR

A. All switches shall have switch blades which are visible when the switch is OFF and the cover is open.

B. Lugs shall be front removable and UL Listed for aluminum or copper 75° C conductors.

C. All current carrying parts shall be plated to resist corrosion.

2.2 SWITCH MECHANISM

A. Switch operating mechanism shall be quick-make, quick-break 100 ampere, 3-pole device.

B. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

2.3 SWITCH ENCLOSURES

A. Switch covers shall be top hinged, attached with removable screws and securable in the open position, NEMA Type 3R.

B. The switch enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel.

C. The enclosure shall be supplied with a metal nameplate which includes ON-OFF-ON markings.

D. Switch shall be provided with tangential knockouts to facilitate ease of conduit entry.

E. Switches in Type 3R enclosures through 200 Ampere shall have provisions for interchangeable bolt-on hubs in the top endwall. Hubs shall be Square D B-Type hubs sized as indicated on the plans.

2.4 CSWITH RATINGS

A. The UL Listed short circuit current rating of the double throw switches shall be: minimum 45,000 rms symmetrical amperes.

2.5 TESTS AND CERTIFICATION

A. The complete MTS shall be factory tested to ensure proper operation of the individual components.

B. The MTS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

2.5 SERVICE RE PRESENTATION

A. The MTS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

END OF SECTION 26 32 15

SECTION 26 56 13 - LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Poles and accessories for support of luminaires.

1.3 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete luminaire.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.4 ACTION SUBMITTALS

A. Product Data: For each pole, accessory, and luminaire-supporting device, arranged as indicated.
   1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
   2. Include finishes for lighting poles and luminaire-supporting devices.
   3. Anchor bolts.

B. Shop Drawings:
   1. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
   2. Anchor bolt templates keyed to specific poles and certified by manufacturer.

1.5 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

B. Material Test Reports:
   1. For each foundation component, by a qualified testing agency.
   2. For each pole, by a qualified testing agency.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample Warranty: Manufacturer's standard warranty.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Pole repair materials.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-6-M.

B. Dead Load: Weight of luminaire and its horizontal and vertical supports, and supporting structure, applied according to AASHTO LTS-6-M.

C. Ice Load: Load of 3 lbf/sq. ft, applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.
   1. Basic wind speed for calculating wind load for poles 50 feet high or less is 100 mph.

      a. Wind Importance Factor: 1.0.
      b. Minimum Design Life: 25 years.
      c. Velocity Conversion Factor: 1.0.

E. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.

F. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 ALUMINUM POLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Lighting, an Eaton business.
   2. H.E. Williams.
   3. Hapco.
   4. Hubbell Incorporated.
   5. Lithonia Lighting; Acuity Brands Lighting, Inc.
   6. Valmont Industries, Inc.

B. Poles: Seamless, extruded structural tube complying with ASTM B 221, Alloy 6061-T6, with access handhole in in pole wall.
   1. Shape: Square, straight.
   2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
   1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with stainless-steel bolts.
   2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.

D. Grounding and Bonding Lugs: Bolted 1/2-inch threaded lug, listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.
   1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
   2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

F. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

G. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
   3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I clear coating of 0.018 mm or thicker), complying with AAMA 611.
   4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

H. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
   1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
   2. Powder coat shall comply with AAMA 2604.
      a. Electrostatic applied powder coating; single application with a minimum 2.5- to 3.5-mils dry film thickness; cured according to manufacturer's instructions. Coat interior and exterior of pole for equal corrosion protection.
      b. Color: As indicated by manufacturer's designations.

2.3 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

2.4 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F 1554, Grade 55, with a minimum yield strength of 55,000 psi.
   1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.

B. Nuts: ASTM A 563, Grade A, Heavy-Hex
   1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
   2. Two nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.

C. Washers: ASTM F 436, Type 1.
   1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
   2. One washers provided per anchor bolt.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE FOUNDATION

A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123 M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories.

B. Anchor Bolts: Install plumb using manufacturer-supplied steel template, uniformly spaced.

3.3 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing.
   1. Fire Hydrants and Water Piping: 60 inches.
   2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet.
   3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.
   1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
   2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
   3. Install base covers unless otherwise indicated.
   4. Use a short piece of 1/2 -inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.5 GROUNDING

A. Ground Metal Poles and Support Structures:
   1. Install grounding electrode for each pole unless otherwise indicated.
   2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

END OF SECTION 26 56 13

SECTION 26 56 19 – LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
   2. Luminaire supports.
   3. Luminaire-mounted photoelectric relays.

B. Related Requirements:
   Section 26 56 13 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaire.
   4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
   5. Photoelectric relays.
   6. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing laboratory providing photometric data for luminaires.

B. Product Certificates: For each type of the following:
   1. Luminaire.
   2. Photoelectric relay.

C. Source quality-control reports.

D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.
   1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
   2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.9 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:

      a. Structural failures, including luminaire support components.
      b. Faulty operation of luminaires and accessories.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

   2. Warranty Period: 5 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. UL Compliance: Comply with UL 1598 and listed for wet location.

D. CRI of minimum 70. CCT of 4000 K.

E. L70 lamp life of 50,000 hours minimum.

F. Lamps dimmable from 100 percent to 0 percent of maximum light output.

G. Internal driver.

H. Nominal Operating Voltage: 120 V ac.

I. In-line Fusing: On the primary for each luminaire.

J. Lamp Rating: Lamp marked for outdoor use.

K. Source Limitations: Obtain luminaires from single source from a single manufacturer.

2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Cooper Lighting, an Eaton business.
   2. GE Lighting Solutions.
   3. Intermatic, Inc.
   4. Lithonia Lighting; Acuity Brands Lighting, Inc.
   5. Schneider Electric USA, Inc.

B. Comply with UL 773 or UL 773A.

C. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
   1. Relay with locking-type receptacle shall comply with ANSI C136.10.
   2. Adjustable window slide for adjusting on-off set points.

2.3 LUMINAIRE TYPES

A. Area and Site:
   1. Luminaire Shape: Square.
   2. Mounting: Pole with extruded-aluminum rectangular arm, 4 inches in length.
   3. Luminaire-Mounting Height: 12” Above Finished Grade.
   4. Distribution: Type III.
   5. Diffusers and Globes: Prismatic acrylic.
   6. Housings:
      a. Extruded-aluminum housing and heat sink.
      b. Dark Bronze powder-coat finish.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:
   1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

G. Housings:
   1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
   2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp characteristics:

      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter, shape, size, wattage and coating.
      c. CCT and CRI for all luminaires.

2.5 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
   1. Color: As selected from manufacturer's standard catalog of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Install lamps in each luminaire.

C. Fasten luminaire to structural support.

D. Supports:
   1. Sized and rated for luminaire weight.
   2. Able to maintain luminaire position after cleaning and relamping.
   3. Support luminaires without causing deflection of finished surface.
   4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Wiring Method: Install cables in raceways. Conceal raceways and cables.

F. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

G. Coordinate layout and installation of luminaires with other construction.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   2. Verify operation of photoelectric controls.

C. Luminaire will be considered defective if it does not pass tests and inspections.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION 26 56 19

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SECTION 27 51 24 - SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

A. NATIONAL FIRE PROTECTION AGENCY (NFPA)
   1. ANSI/NFPA 70 (2014) National Electric Code

1.3 SUMMARY

A. The OWNER is accepting sealed proposals from manufacturers of Supervisory Control and Data Acquisition (SCADA) System equipment for the installation on individual sanitary sewer pump stations. The CONTRACTOR (Manufacturer) shall provide design, programming, documentation, equipment, installation and start-up services for SCADA system. The CONTRACTOR (Manufacturer) shall install all SCADA equipment specified herein including all wiring and conduit to connect to equipment at the sites.

B. The system specified herein shall be manufactured by High Tide Technologies, LLC., or equal.

1.4 GENERAL PROJECT INFORMATION

A. The project shall include all work required to create a working SCADA system suitable for expansion of the Owner's existing SCADA system. The project work shall include all software, all screens, and documentation for a complete system.

1.5 ACTION SUBMITTALS

A. Manufacturer shall submit all component data sheets in an orderly manner for review and approval.
   1. Submit bill-of-material for all SCADA components for project.
   2. The specified product in the data sheet shall be highlighted with a pointed stamp to clearly identify the submitted item.
   3. The sheets shall list all pertinent product data such as name, catalog number, model number, nameplate data, dimensions etc.
   4. The bill-of-material shall precede the data sheets and the sheets shall be organized according to the order of the bill-of-material.

5. A detailed description and/or list of functions, including spares for future items, for each SCADA SYSTEM site shall be submitted to the ENGINEER. The Manufacturer shall meet with OWNER and ENGINEER, as requested, to explain functionality submittal.

B. Manufacturer's Catalog Data
   1. Software.
   2. DC power supplies.
   3. Terminal blocks.
   4. Conductors.
   5. Surge protection.
   6. Enclosures.

C. Drawings
   1. Wiring diagrams.

D. Operation and Maintenance Manuals.

1.6 QUALIFICATIONS

A. Installers Qualifications: Only firms who have been regularly engaged in the installation of Supervisory Control and Data Acquisition equipment and have completed the certification course for High Tide Technologies installers need respond.

B. Manufacturer shall meet the following requirements:
   1. Acknowledge that shipment of the SCADA RTU nodes and related equipment shall be authorized only by the OWNER – no exceptions.
   2. Utilize only UL listed and rated components in enclosure manufacture.
   3. Provide 100 percent of all hardware and software technical manuals to the OWNER in digital format. The manuals shall be in Adobe pdf format.
   4. Provide complete bill-of-materials and enclosure layouts that are numerically cross-referenced together for each SCADA node with the standard factory supplied part numbers instead of proprietary numbers – no exceptions.

1.7 PRODUCT REQUIREMENTS

A. Central Hosted Software
   1. The telemetry system shall provide a web based software hosted on High Tide Technologies, LLC central server. The software will provide the following statuses: pump start/stop statistics, pump run time statistics, alarm history, text alarm configuration page, voice alarm configuration page, and monthly reports.
   2. Alarms shall be programmable to provide alarm acknowledgement via text or voice line, repeat alarms at programmed intervals, alarm rollover to another alarm recipient and work shift alarms for night or weekend shift employees.
   3. Provide wet well level statistics and high/low wet well alarms for level sensors and/or floats present.
   4. Provide password access to the OWNER and the OWNER's employees with Administrative, Operator, and View privileges as directed by the OWNER.

B. Remote Terminal Units (RTU)
   1. The remote terminal units shall be powered from site power distribution system, as designated by the Engineer/Owner. The RTU's shall be provided in a NEMA 4 enclosure with a raised door supported by stainless steel hinges on the left and a stainless steel latch configured for a pad lock (By Owner). The electronics provided will be din-rail mounted for easy replacement without removal of the enclosure. The power supply shall accept 110 or 220 volts AC with an adjustable output set to 13-14 volts DC. The input/output (I/O) structure of each unit shall be determined on a site-by-site basis. The manufacturer shall have available the following unit with I/O structure:
      a. HTT1100 8 Digital Inputs, 4 Analog Inputs and 4 Digital
   2. Three of the digital inputs shall be capable of accepting pulse outputs from flow monitoring equipment.
   3. Provide with a modem capable of communicating with the central server via low earth orbit satellite, GSM OR CDMA cellular or Ethernet. The modems will be interchangeable based upon the available coverage, no exception.

C. Communication Platforms
   1. The manufacturer shall be capable of providing low earth orbit satellite or GSM OR CDMA cellular to each of the remote units as designated by the contractor to communicate bi-directionally from the RTU to the Central Server. The manufacturer shall be capable of utilizing the Owner provided Ethernet to the RTU to communicate bi-directionally to the Central Server.

D. Customer Service
   1. The manufacturer shall provide 24-hour, seven days per week access by the Owner to the manufacturer's customer service personnel. Customer Service personnel shall provide assistance with software, communications, and hardware upon request from the Owner. The manufacturer shall provide the Owner with a toll free number to contact High Tide Technologies Customer Service personnel. No additional fees will be charged by the manufacturer for configuring the Owner's software for his applications.

E. Site Minimum Input/Output Structure
   1. Inputs/Outputs for pump station are shown as follows:
      a. Pump Start/Stop for each pump, total of 2.
      b. Pump Running Time Meter for each pump, total of 2.
      c. Power Loss.
      d. Generator Run/Stop.
      e. Phase Loss.
      f. High Water Alarm.
      g. Transducer Level Reading.
      h. Flow Meter/Totalizer Reading.

1.8 WARRANTY

A. Provide a warranty and customer support for a period of not less than one (1) year after OWNER's acceptance of operable system.

B. Provide primary technical support to the OWNER by full-time qualified staff members only. Technical support provided by manufactures representatives, salespersons or local distributors is not acceptable - no exceptions.

PART 2 - PRODUCTS

2.1 REMOTE TERMINAL UNIT DESCRIPTION

A. The satellite telemetry system design shall use High Tide Technologies' Model HTT1100 cellular or satellite monitoring unit.

B. Manufacturer's products, including design, materials fabrication, assembly, examination, inspection, and testing shall be in accordance with ANSI/NFPA 70, except as modified herein or indicated otherwise.

C. Contractor's Responsibility: Provide a complete cellular or satellite telemetry system, including RTUs, and satellite telemetry equipment; indicating devices; power supplies; enclosures; conduit, wire, and installation. Provide interconnecting wiring for the system to be based upon general requirements of specified components with spare capacity. Coordinate the interconnecting wiring requirements with OWNER provided instruments and provide necessary wiring for the system. Coordinate the loop impedance requirements of the equipment provided and provide additional loop isolation, noise suppression, surge protection, drivers, and other devices necessary to provide a complete and operating system properly installed and protected in accordance with the device manufacturer's recommendations.

2.2 BASIS OF DESIGN

A. The SCADA RTU programming is based on ANSI C protocol Software – no exceptions.

2.3 MODEM SYSTEM REQUIREMENTS

A. Satellite Modems
   1. Modems shall use the mobile frequency designated by the Iridium Satellite System.
   2. Modems shall be programmable.
   3. Communication protocol shall be Iridium Satellite Communication standard.
   4. Modems shall be model Iridium i9602 by Quake Global, Inc. or approved equal.

B. Cellular Modems
   1. Modems shall use the mobile frequency designated by the Verizon CDMA Systems.
   2. Modems shall be able to be programmed.
   3. Communication protocol shall be UDP standard.
   4. Modems shall be model GSM OR CDMA 2358 by Enfora, Inc. or approved equal.

C. Antennas
   1. Omni-directional antennas tuned specifically for the Iridium Satellite frequency bands. (Satellite)
   2. Omni-directional antennas tuned specifically for the Verizon frequency bands. (Cellular)
   3. Directional antennas tuned specifically for the Verizon frequency bands. (Cellular)

2.4 SITE COMMUNICATIONS

A. Methods
   1. Each RTU shall be capable of communicating bi-directionally with the central server.

2.5 SITE CONTROL

A. Control Methods
   1. The control of the typical remote booster pump shall be based upon the pump control system; ie., floats or analog level sensor shall provide the pump starts/stops and determine the run time.
   2. Each booster pump location shall have an operator interface on the web based software for display of local alarm messages, pump statistics, wet well levels (if available).
   3. The ability to operate pumps manually will be by Hand-Off-Auto (H-O-A) switches.
   4. The status of all H-O-A switches shall be observed on the web based software interface.

2.6 PROGRAMMABLE RTU PROCESSOR

A. Provide a High Tide Technologies system. The control system shall consist of individual RTUs and the existing pump control system located at each monitoring location. The capability shall exist to allow for expansion of the system by the addition of hardware and/or software. Program development is the responsibility of the Manufacturer of the SCADA system.
   1. All hardware of the RTU shall operate at an ambient temperature of minus 20 to 60 degrees C (-4 to 140 degrees F), with an ambient temperature rating for storage of minus 40 to plus 60 degrees C.
   2. All RTU hardware shall function continuously in the relative humidity range of 5 to 95 percent with no condensation.
   3. Each RTU shall have at least one dedicated serial port.

B. Processor Hardware
   1. The processor shall be an integral piece of the modem, and will provide control program execution and support remote or local programming.
   2. The user program, data, and operating system shall include EEPROM or equivalent for backed memory storage.
   3. Each processor shall contain enough base memory for at least 30% growth room after the program has been completed and tested.
   4. The front enclosure of the processor shall include an RS232 serial port.
   5. All system modules, local and remote 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.

C. RTU Power Supplies
   1. The RTU power supplies shall operate in compliance with an electrical service of 85-265 VAC, single phase, in the frequency range from 47 to 63 Hz, operating at 13.7 VDC.
   2. The manufacturer shall, if electrical power is unavailable, provide a solar powered RTU.
   3. The RTU shall have an integral AC to DC power converter.
   4. The power supply shall monitor the incoming line voltage for proper levels. When the power supply is wired to utilize AC input, the system shall function properly within the range of 85 to 265 VAC. When the power supply is wired to utilize DC input, the system shall function properly within the range of 17 to 32 VDC. In addition, the power supply shall provide surge protection and isolation.
   5. In addition to the electronic protection described above the power supply shall offer a failsafe fuse that is not accessible by the customer.

D. RTU Networking and Communications
   1. RTUs in the cellular or satellite telemetry system shall have standard communications that support ASCII or Modbus protocols.
   2. The RTU shall have a standard programming instruction that allows bi-directional cellular or satellite messaging with the central server.
   3. The RTUs shall support both scheduled and unscheduled bi-directional communications with the central server.

E. Digital Inputs
   1. Number of Digital Inputs: 8 (eight)
   2. All digital inputs shall be optically isolated
   3. Ambient Operating Temperature Rating: Minus 20 degrees C to 60 degrees C.

F. Analog Inputs
   1. Input Type: voltage.
   2. Number of Analog Inputs: 4 (four).
   3. Input Power: Loop Power.
   4. Current/Voltage Ranges: 0-5 dc or 4-20 mA
   5. Resolution: 10 bits.
   6. Ambient Operating Temperature Rating: Minus 20 degrees C to 60 degrees C.

G. Digital Outputs
   1. Number of Digital Inputs: 4 (four)
   2. All digital outputs shall be optically isolated
   3. Ambient Operating Temperature Rating: Minus 20 degrees C to 60 degrees C.

H. RTU System Technical Support
   1. The manufacturer of the RTU shall provide multiple-channels of technical support to the OWNER. These channels include toll free telephone, fax, and web-based support.
   2. The satellite telemetry system manufacturer shall maintain technical assistance toll free telephone “hotline”.

2.7 RTU SYSTEM ENCLOSURES

A. The system enclosure shall contain the RTU, complete with inputs/outputs, power supplies, surge protection, terminals and all associated wiring. The enclosures shall come pre-assembled with all associated components mounted on din-rail and wired.

B. Remote Terminal Enclosures: Provide pre-built and wired remote terminal enclosures. Each remote terminal enclosure shall consist of:
   1. One (1) molded FRP NEMA 4 rated enclosure.

2.8 DC POWER SUPPLIES

A. Regulated: Solid-State

B. Input: 85-230 volts ac, single phase, 60 hertz.

C. Output: 13.7 volts DC

D. Output Current: 3.0A.

E. Ambient Temperature Range: Minus 20 to 50 degrees C.

F. Mounting: Enclosure-mount acceptable.

G. Primary Protection: Internal fuse

H. Additional Protection: Over-current protection for secondary

2.9 TERMINALS

A. Provide single-circuit feed-through terminal blocks for all control system enclosures. Provide the following:
   1. Voltage Rating: 30 volts AC/DC maximum.
   2. Screw Type

2.10 CONDUCTORS

A. Shielded twisted pairs for signal wiring such as instrument signals. General wiring for enclosures. Group and neatly route conductors within enclosures.

B. Wire Color Codes: General internal wiring color code specifications for all supplied enclosures/enclosures. There shall be no exceptions.
   1. All 120V single-phase AC wiring shall be red.
   2. All single-phase AC neutral wiring shall be white.
   3. All wiring originating outside the enclosure/enclosure that is not controlled by the local disconnect or main breaker shall be yellow.
   4. All 24V DC positive wiring shall be blue.
   5. All 24V DC common wiring shall be blue or blue w/white tracer.
   6. All ground wiring shall be green or green with yellow tracer.

C. Shielded Twisted Pair
   1. Tinned, soft copper and insulated with nylon-jacked polyvinyl chloride.
   2. Color code each conductor pair.
   3. Twist conductors into pairs with a 1-1/2-to 2-1/2-inch lay.
   4. Code each pair with a unique pair number.
   5. 100 percent shielded coverage, aluminum-polyester.
   6. No. 22 AWG.
   7. No. 22 AWG stranded copper drain wire.
   8. Rated 300 volts, 60 degrees C.

D. Conductors: General internal wiring of specified electrical enclosures. Group and neatly route conductors within enclosures.
   1. All wiring internal to the supplied enclosures/enclosures shall be machine tool wiring rated MTW/AWM/TFF with an insulation rating of at 600-volts and UL approved - no exceptions.
   2. All non-input/output module point-to-point wiring shall be 16 AWG.
   3. All discrete input module to terminal wiring shall be 20 AWG.
   4. All discrete output module to terminal wiring shall be 18 AWG.
   5. Provide nylon wrapping around wire bundles crossing door hinges for protection.

2.11 ANALOG SURGE PROTECTION

A. Provide surge protector on 4-20mA inputs and outputs to each RTU. Provide the following:
   1. Rated Maximum Voltage: 28-30 volts DC.
   2. Operating Current: 80 - 300 mA maximum.
   3. Terminals: Screws or terminal mounts only.
   4. Impulse Discharge Current: 5 kA (minimum).

2.12 WIRING DIAGRAMS

A. Electrical wiring diagrams shall be provided for the previously defined sites using the specified standards:
   1. Manufacturer shall provide detailed I/O point assignments for each enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install all equipment in accordance with ANSI C2, ANSI/NFPA 70 and the requirements specified herein.

3.2 WIRING

A. Install conductors and cables in conduit, unless indicated otherwise.

B. Complete raceway systems and remove obstructions before pulling conductors into place. Avoid damaging insulation during conductor installation. Use an approved lubricating compound as required to facilitate wiring.

3.3 SPLICES AND TERMINATIONS

A. Make up both mechanically and electrically tight.

B. Provide with a flashover or insulation value at least 100 percent in excess of wire insulation.

C. Make splices and terminations in junction boxes.

D. Make connections in No. 10 AWG and smaller conductors with insulated pressure connectors or wire nut connections.

E. Use terminal blocks of the proper voltage for interconnecting or splicing control cables, communication cables, and other conductors. Mount terminal blocks in a cabinet and label terminals properly.

3.4 TESTING

A. Performance Verification Test: Conduct performance verification tests to demonstrate that control system maintains set points, and that system is programmed for the correct sequence of operation. Conduct performance verification test one day after work is installed of continuous RTU systems operation and before final acceptance of work. Performance verification test shall demonstrate the following:

1. Field Testing: Calibrate field equipment and verify equipment and system operation before placing the system on-line. Field-testing shall include the following tests.
2. Calibration Accuracy and Operation of Inputs Test: Check for proper calibration and operation of each input instrument. Document each reading for the test report.
3. RTU Startup and Memory Test: Demonstrate that programming is not lost after a power failure, and RTU controllers automatically resume proper control after a power failure.
4. Surge Protection: Show that surge protection, meeting the requirements of this specification, has been installed on incoming power to the digital controllers and on communications lines.

3.5 FIELD TESTS

A. Demonstrate compliance of the control system with the contract documents. Furnish personnel, equipment, instrumentation, and supplies necessary to perform calibration and site testing. Ensure competent employees regularly employed in the testing and calibration of instrumentation systems perform tests.

B. Notify the OWNER of any defective products and workmanship disclosed by the tests.

C. Testing will include the field and the performance verification tests. Field tests shall demonstrate proper calibration of input devices, and the operation of specific equipment. Performance verification test shall ensure proper execution of the sequence of operation and proper tuning of control loops.

D. Test each device such that each item will function not less than five times.

E. Tests are subject to oversight and approval by the OWNER.

END OF SECTION 27 51 24

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, removing site utilities, and abandoning site utilities in place.
7. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities.
2. Section 02 41 16 "Structure Demolition" for demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Owner.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises as directed.

D. Utility Locator Service: Notify “Miss Utility” for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and tree protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation is established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner.

3.4 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
1. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site**.**

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 00 00

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SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Preparing subgrades for slabs-on-grade, pavements, and turf and grasses.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for concrete slabs-on-grade.
   4. Subbase course for asphalt paving.
   5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:
   1. Section 01 32 00 “Construction Progress Documentation” for recording pre-excavation and earth moving progress.
   2. Section 01 50 00 "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
   3. Section 31 25 00 “Erosion and Sedimentation Control”
   4. Section 32 92 00 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in Work.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner. Unauthorized excavation, as well as remedial work directed by Owner, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement, or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Controlled low-strength material, including design mixture.
   2. Warning tapes.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify "Miss Utility" for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary erosion- and sedimentation-control measures specified in Section 31 25 00 “Erosion and Sedimentation Control” are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Structural Fill: DelDOT Borrow Type G-1 or DelDOT Graded Aggregate Type “a” (CR-1), fine-grained soils from the excavation are not acceptable.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

H. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Sand: ASTM C 33; fine aggregate.

L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the 8 inches clearance each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes; and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
   1. For pipes and conduit, less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.

2. For pipes and conduit, 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

A. Notify Owner when excavations have reached required subgrade.

B. If Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrowed soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Place and compact final backfill of satisfactory soil to final subgrade elevation.

D. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers, not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight:
   1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
   2. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Pavements: Plus or minus 1/2 inch.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Install subdrainage geotextile on prepared subgrade, according to manufacturer's written instructions, overlapping sides and ends.
   2. Place drainage course 6 inches or less in compacted thickness, in a single layer.
   3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Owner reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Contractor is responsible for the disposal of surplus satisfactory soil to designated storage areas not on Owner's property.
   1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

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SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Sections:

1. Section 01 32 00 "Construction Progress Documentation".
2. Section 31 20 00 "Earth Moving" for excavating, backfilling, site grading, and for site utilities.
3. Section 31 41 00 "Shoring" for shoring of excavations.

1.3 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.

B. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified installer and professional engineer.

B. Field quality-control reports.

C. Other Informational Submittals:

1. Videotape: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-installation Conference: Conduct conference at Project Site.

1. Review methods and procedures related to dewatering including, but not limited to, the following:

a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
b. Geotechnical report.
c. Proposed site clearing and excavations.
d. Existing utilities and subsurface conditions.
e. Coordination for interruption, shutoff, capping, and continuation of utility services.
f. Construction schedule. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
g. Testing and monitoring of dewatering system.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Monitor dewatering systems continuously.

E. Promptly repair damages to adjacent facilities caused by dewatering.

F. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 31 10 00 "Site Clearing" during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 FIELD QUALITY CONTROL

A. Observation Wells: Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

END OF SECTION 32 23 19

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SECTION 31 23 33 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

B. References
   1. American Society for Testing and Materials (ASTM)
      a. ASTM D1557; Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lbs (2.49-kg) Rammer, and 12-in. (304.8 mm) Drop.
      b. ASTM D1556; Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
      c. ASTM D2321, Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
      d. ASTM D2922; Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   2. Delaware Department of Transportation (DelDOT), Standard Specifications for Road and Bridge Construction, latest edition.
      a. DelDOT Section 208, excavation and backfilling for pipe trenches.
      b. DelDOT Section 805, course aggregate.
   3. Occupational Safety and Health Administration (OSHA)
      a. Code of Federal Regulations, Title 29, Part 1926 (29 CFR Part 1926), Subpart M and Subpart P--Excavations, plus Appendices A, B, C, D, E, and F.

1.2 SUMMARY

A. Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete all the work of trench excavation and backfill within the designated areas and as required for the construction of other work as shown, specified or required by the Contract Documents.

B. Contractor shall locate or verify location of all existing active and abandoned utilities and structures in designated work areas prior to start of excavation activities. Contractor shall also protect from damage those utilities and structures which are to remain in place.

C. Contractor shall comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction. Contractor shall provide a Competent Person to implement, supervise, and inspect all work.

D. Related Sections:
   1. Section 31 20 00 "Earth Moving.
   2. Section 31 41 00 “Shoring”
   3. Section 32 92 00 “Turf and Grasses”

1.3 INFORMATIONAL SUBMITTALS

A. Certificates. Submit certificates from soil and aggregate supplier(s) that imported backfill materials shall comply with the material specifications of this section.

B. Test Reports
   1. Submit reports of the results of testing based on requirements stated in Quality Control Testing requirements, the last article under Part 3 of this Section.
   2. Submit compaction density test reports based on method of density determination as specified in Reference Standards and the method as approved by the Engineer.

1.4 QUALITY CONTROL

A. Laboratory Tests. The specified aggregate materials shall require advance examination or testing according to methods referenced, or as required by the Engineer.
   1. Testing laboratory shall furnish both Engineer and Contractor, three certified copies of recent, representative test result reports. Same reports will be considered as sufficient evidence of acceptance or rejection of materials represented.
   2. Conduct aggregate quality tests in accordance with requirements of appropriate Referenced Standard for such materials.
   3. The Engineer reserves the right to accept aggregate materials based on certification from supplier that the aggregate originates from a source approved by DelDOT and that the aggregate complies with specified DelDOT requirements.

1.5 DEFINITIONS

A. As specified in all related sections and such added definitions included herein.

B. Unclassified Excavation Below Subgrade: Same as unclassified excavation except such excavation is performed below elevations given as subgrade.

C. Miscellaneous Unclassified Excavation: Unclassified excavation required by the Engineer and not included in other items for payment.

D. Subgrade: Trench bottom prepared as specified to receive coarse-aggregate pipe bedding, concrete cradle or concrete encasement, or the bottom of excavations prepared to receive pipeline structures.

1.6 SITE CONDITIONS

A. Classification of Excavated Materials. No consideration will be given to the nature of materials encountered in trenching operations. Therefore, as unclassified trenching, no additional payment will be made for difficulties occurring in excavating and handling of materials.

B. Removal of Obstructions
   1. DO NOT OBSTRUCT FIRE HYDRANTS.
   2. Except for known utility relocations remove obstructions as described in the following paragraphs.
   3. Remove, realign or change the direction of above- or below-ground utilities and their appurtenant supports, if such is required in the opinion of the Engineer. Perform such work as extra work unless such work is done by the Owner of the obstruction without cost to the Contractor. However, uncover and sustain the obstruction at own expense prior to the final disposition of obstruction. The Contractor is not entitled to claims for damage or extra compensation due to the presence of such obstruction or delay in the removal or rearrangement of same. Additional precautions concerning obstructions as follows:
      a. Do not interfere with persons, firms, corporations or utilities employing protective measures, removing, changing or replacing their property or structures, but allow said persons, firms, corporations or utilities to take such measures as they may consider necessary or advisable under the circumstances; which shall not relieve the responsibilities of the Contract.
      b. Without extra compensation, break through and reconstruct if necessary, the invert or arch of a sewer, culvert or conduit that may be encountered if the said structure is in such a position, in the judgment of the Engineer, as not to require its removal, realignment or complete reconstruction.

C. Environmental Requirements
   1. Do not perform trenching, backfilling or compacting when weather conditions or the condition of materials are such, in the opinion of the Engineer, that work cannot be performed satisfactorily.
   2. Do not use frozen materials as backfill nor wet materials containing moisture in excess of the amount necessary for satisfactory compaction.
   3. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
   4. Plan work to provide adequate protection during storms with provisions available for preventing flood damage. Protect installed piping and other work against damage from uplift due to high ground water levels.
   5. Accommodation of Drainage. Keep gutters, sewers, drains and ditches open for surface drainage. No damming or ponding of water in gutters or other waterways will be permitted, except where stream crossings are necessary and then only to an extent which the Engineer shall consider necessary. Do not direct water flows across or over pavements except through approved pipes or properly constructed troughs of proper sizes and lengths. When so required, provide pipes or troughs of such sizes and lengths as required, and place the same as required at no expense to the Owner. Perform grading in the vicinity of trenches so that the ground surface is properly pitched to prevent water running into the trenches.

6. Pumping. Keep excavations free from water during the performance of the work under this Contract at no expense to the Owner. Build berms and other devices necessary for this purpose, and provide and operate pumps of sufficient capacity for dewatering the excavations.
    a. Provide for the disposal of the water removed from excavations in such manner as not to cause injury to the public health, to public or private property, to the work of others, to the portion of the work completed or in progress, nor to cause an impediment to the use of streets, roads and highways.
        1) All discharges to surface waters or stormwater pipelines shall be free of sediment. If discharges are sediment laden, the Contractor shall employ techniques to remove sediment prior to discharge. These techniques shall be presented at the Preconstruction Meeting for approval by Owner and Engineer.
7. When it is necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling.
8. Provide effective dust control by sprinkling water.
9. Do not dispose of water in trenches by draining through completed portions of sewer piping.

D. Protection. Assume the risks attending the presence or proximity of overhead or underground public utility and private lines, pipes, conduits, and support work for same existing structures, and property of whatever nature. Damages and expenses arising out of the Work, for direct or indirect injury to such structures or to any person or property by reason of them or by reason of injury to them, whether such structures are or are not shown on the Drawings, rests solely with the Contractor.
    1. Take necessary precautions to protect trees, shrubs, lawns and such other landscaping from damage. Restitution work for damages rests solely with the Contractor.
    2. Pipe Supports. Adequately support underground pipes or conduits exposed as a result of excavations. Provide adequate support along their entire exposed length by timber or planking. Install these supports in such manner that backfilling may be performed without dislodging such pipes or conduits. Place and carefully compact select backfill or aggregate backfill around the supports, and leave such supports in place as a guard against breakage due to backfill settlement. No additional payment will be due the Contractor for support material left in place nor for the labor of installing and maintaining supports.
    3. Temporary Protective Construction
        a. Temporary Fence Barricade. Erect and maintain substantial temporary fences or barricades surrounding excavation to warn and prevent unauthorized persons entering or unwanted intrusion in such areas.
        b. Excavation Covers. Cover open excavation when work therein is suspended or left unattended, such as at the end of a work day. For such covers, use materials of sufficient strength and weight to prevent their removal by unauthorized persons.
        c. Remove temporary protective construction at the completion of work on the Project.

E. Accommodation of Traffic. Do not obstruct streets, roads and highways. Unless the Municipality or Governing Agency authorizes in writing the complete closing of the street, road or highway, employ such measures as may be necessary to keep the street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from construction operations and materials.

F. Explosives and Blasting. Not permitted on site.

G. Removal of Rock by Means Other Than Blasting. Where removal of rock by means other than blasting is required, in accordance with the requirements of State and local laws, rules and regulations, and utility owner requirements, remove by the use of mechanical surface impact equipment, or by drilling and hydraulic rock splitting equipment, or by other methods.

H. Excavation Condition. The Contractor is solely responsible for the conditions and results of his excavation work. Remove slides and cave-ins at whatever time and under whatever circumstance they occur.

I. Excess Materials. No right of property in materials is granted the Contractor of excavated materials. Surplus excavated materials shall be stockpiled within the City of Dover in an area designated by the Owner.

J. Borrow Material. When the required quantity of backfill material exceeds the quantity of suitable on site material, provide borrow material at no increase in Contract Price. If borrow material is needed, notify the Engineer sufficiently in advance to permit the Engineer to verify such need and to view the proposed borrow pit to determine the material suitability. Borrow excavation will be subject to the Engineer's approval whose written consent shall be obtained prior to its use.

K. Change of Excavation Location
   1. Should the Engineer require a change in location of an excavation from that indicated on the Drawings due to the presence of an obstruction or from other cause, and if such changed location increases or decreases the quantity of excavation, then an adjustment will be made in lump sum price bid under which the work was performed.
   2. The adjustment will be made by increasing or decreasing the lump sum price bid in accordance with the actual increase or decrease in excavation quantities by applying the applicable unit price per cubic yard for excavation of earth or rock bid under the Schedule of Unit Prices for Additions, Deductions or Deletions in Contract Quantities.
   3. If, however, such change involves the abandonment of excavations already made, such abandoned excavation (including backfill) will also be paid for at the applicable unit price for excavation of earth or rock and backfill bid under the Schedule of Unit Prices for Additions, Deductions or Deletions in Contract Quantities.
   4. If a change of excavation location is authorized by the Engineer upon the Contractor's request, the Contractor shall not be entitled to extra compensation, and if such change of excavation location involves the abandonment of excavation already made, the abandoned excavation and backfill shall be at the Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General Backfill. On-site excavated soil or free of topsoil, vegetation, lumber, metal and refuse, organic materials and other deleterious materials which may be compressible or which cannot be properly compacted, and free of rock or similar hard objects larger than 1.5 inches in greatest dimension. Rock to soil ratio shall not exceed one part rock to three parts soil.

B. Pipe Bedding: AASHTO #57 stone.

C. Concrete Cradle or Encasement: 3000 psi concrete.

D. Underground Warning Tape
   1. Printed polyethylene tape, six inches minimum width, color coded, printed with name of utility buried below, and suitable for installation in all soil types.
      a. Text Example: “Caution: Buried Sewer Line Below”
   2. Magnetic.
   3. Use the following color scheme:
      a. Sanitary sewers, green.
      b. Storm sewers, green.
      c. Electrical conduit, red.
      d. Telephone and other communications, orange.
      e. Water piping, blue.

PART 3 - EXECUTION

3.1 PREPARATION

A. Lines and Grades of Pipe. Maintain lines and grades as follows:
   1. Contractor is responsible for all construction layout work. Contractor shall retain the services of a surveyor licensed in the State of Delaware to perform the layout work. Use Engineer’s cut sheets as guides for rough excavation, allowing for excavating to accommodate the pipe bedding, and concrete cradles or concrete encasements where indicated on the Drawings or required by the Engineer.
   2. Methods used to maintain lines and grades of pipelines will be subject to the approval of the Engineer. If use of laser beam is approved by Engineer, check beam position every fifty feet of line by survey or other approved method.

B. Perform shoring in accordance with requirements of Authorities having jurisdiction.

C. Perform soil erosion control work in accordance with contract requirements and in accordance with the drawings, and the regulations of the Kent Conservation District.

D. Material Storage

1. Stockpile satisfactory excavated materials where directed by Engineer until required for backfill placement. Stockpile different soil materials without intermixing. Place, grade, and shape stockpiles to provide proper drainage. Cover stockpiles to prevent wind-blown dust when requested by Engineer.
2. Stockpile soil materials away from edge of excavations. Do not stockpile soil materials within the drip line of existing trees.

3.2 EXCAVATING

A. General Requirement. Perform excavation and backfilling using machinery, except that hand excavation and backfilling may be required where necessary to protect existing structures, utilities or private or public properties, and except that backfilling by hand shall be done to the extent specified herein. No additional compensation will be paid for hand excavation and backfilling instead of machine excavation and backfilling, as may be necessary from whatever cause.
   1. Begin excavation in trenches at the control point having the lower invert and proceed upgrade.
   2. Remove surface materials of whatever nature over the line of trenches and other excavations, and properly separate and store removed materials.
   3. Remove subsurface materials of whatever nature down to subgrade elevation. Properly separate and store removed subsurface materials.
   4. Surplus excavated materials suitable, but not required, for backfill shall be stockpiled in the area designed by the Owner.

B. Excavated Material Storage. Perform excavated material storage, as specified herein, at no increase in Contract Price.
   1. Where more material is excavated from trenches than can be backfilled or stored on the roadway or within rights-of-way limits, leaving space for traffic and drainage, remove and store such excess material. Return this material for backfilling when required.

C. Trench Width and Depth
   1. Trench side-slopes, means of trench egress, and requirements for protective systems such as shoring, bracing, shields, etc. shall comply with OSHA requirements referenced in Paragraph 1.06C.
   2. From subgrade elevation to an elevation at least twelve inches above the top of the outside barrel of the pipe, excavate trench banks to vertical lines and not less than the minimum nor more than the maximum widths specified in Table 1. If sheeting is required, the following Table 1 dimensions apply to the inside face of sheeting approved by Engineer, check beam position every fifty feet of line by survey or other approved method.

TABLE 1 Max./Min. Trench Width From Subgrade to 12 inches Above Pipe

Diameter of Pipe	Minimum Trench Width, O.D. of Pipe at Barrel Plus	Maximum Trench Width, O.D. of Pipe at Barrel Plus
4 inches to 24 inches	12 inches	16 inches
27 inches to 36 inches	20 inches	24 inches
42 inches to 72 inches	26 inches	30 inches
Larger than 72 Inches	30 inches	36 inches

3. Where pipelines are constructed in paved or unpaved roadways, keep trench side slopes as nearly vertical as possible within trenching OSHA guidelines from a point twelve inches above the top of the outside barrel of the pipe to the top of trench. In no case shall trench width at its top exceed the outside diameter of the pipe at the barrel plus the dimensions in Table 2. When the excavation-width limits of Table 2 cannot be held, install temporary shoring; no additional compensation will be paid for temporary shoring.
4. Where pipelines are constructed in rights-of-way or easements in open country, or unimproved areas, the maximum top of trench width as specified previously may be exceeded only if the construction is kept entirely within the limits of rights-of-way or easements and can be carried on without damage to adjoining property. The angle of trench sideslope shall be in accordance with OSHA slope requirements referenced in Paragraph 1.06C.

TABLE 2 Max. Trench Width at Top

Diameter of Pipe	Maximum Width at Top of Trench, O.D. of Pipe at Barrel Plus
4 inches to 24 inches	40 inches
27 inches to 36 inches	48 inches
42 inches to 72 inches	54 inches
Larger than 72 Inches	60 inches

5. In locations other than rights-of-way or easements and where warranted by working conditions, the Engineer may waive Table 2 requirements provided there is no conflict with applicable state or local regulations.
6. No additional compensation will be paid for excavation beyond Table 2 trench width maximums, when such maximums are waived by the Engineer or when the trench walls are sloped at the Contractor's option.

D. Trench Width and Depth for Electrical Work
   1. Excavate trenches for both single and banked conduit runs to vertical lines and to not less than a minimum nor more than a maximum width required to accommodate the conduit's or conduits' width plus twelve inches.
   2. Excavate trenches for both single and banked conduit runs to elevations indicated, and where not indicated, to the depth required to provide a minimum of two feet of cover unless indicated otherwise on the Drawings.

E. Excavation Width and Depth for Manholes and In-Line Structures
   1. Make excavations for manholes to a nearly vertical plane beginning at bottom of excavation one-foot beyond manhole base outside diameter (six inches each side) to two-feet beyond manhole base outside diameter for top of excavation limit (one-foot each side). If personnel are to work within excavation, make excavation in compliance with OSHA trenching rules referenced in Paragraph 1.06C.
   2. When surface pavement of any type is encountered (vehicle or pedestrian ways), cut such pavement to a rectangular shape as opposed to circular shape of manhole. Make limits of cut not to exceed one-foot beyond top of excavation limit as specified.
   3. No additional compensation will be allowed should excavation limits or surface pavement cut limit be exceeded. Additionally, should bottom of excavation limit be exceeded, provide without additional compensation, concrete cradle or encasement for pipes entering or leaving manhole.
   4. Excavate rock for manhole installation one foot outside the exterior lines of the manhole walls and to a depth of the outside bottom.

F. Additional Excavation. The Engineer's written requirement for excavation beyond the maximum allowable trench width shall entitle the Contractor to reimbursement for the quantities of additional excavation at the unit prices bid under the Schedule of Unit Prices for Additions, Deductions, or Deletions in Contract Quantities for excavation of the differing materials as defined previously.
   1. Do not excavate below depths indicated or specified except where unstable or unsuitable material is encountered at subgrade. Excavate such material to the increased depth as may be required by the Engineer and refill to the proposed subgrade with thoroughly compacted aggregate backfill material as required by the Engineer.
   2. When excavations are carried below indicated or specified subgrades without written permission, refill excavations to proper subgrade with thoroughly compacted aggregate backfill material with no additional compensation paid.
   3. The Engineer's written requirement for Excavation Below Subgrade shall entitle the Contractor to reimbursement for the quantities of additional excavation at the unit prices bid under the Schedule of Unit Prices for Additions, Deductions or Deletions in Contract Quantities.

G. Length of Open Trench. The Engineer shall have the right to limit the amount of trench opened in advance of pipe laying and the amount of pipe laid in advance of backfilling, but in no case shall these amounts exceed 300 feet and 100 feet, respectively. Complete trench excavation at least twenty-five feet in advance of pipe laying and keep trenches free from obstructions, except that at the end of a work day or at the discontinuance of work, the pipe laying may be completed to within five feet of the end of the open trench. Additional open trench limitations are as follows:

1. The Engineer is empowered to require trench refilling over completed pipelines when in his judgment such action is necessary. No additional compensation will be paid for such trench refilling even though work must be stopped elsewhere as a result.
2. When Work is stopped on a trench, except as required by the Engineer, and the excavation is left open for an unreasonable period in advance of construction in the opinion of the Engineer, the Engineer may order trench refilling at the Contractor's expense and not allow trench reopening until ready for actual use.

3.3 BACKFILLING

A. General Requirements. Perform trench backfilling and backfilling excavations for other in- line structures by methods which will result in thorough compaction of backfill material without displacement of the grade and alignment of the pipeline and its appurtenances, will result in minimum settlement of backfilled material, and will prevent damage to pipe. Displacement of the pipeline and settlement of backfill shall be considered evidence of improper workmanship or inclusion of unsuitable backfill materials, or both, and will require re-grading and realigning the pipeline, and removing and re-compacting settled material with no additional compensation paid to Contractor.

B. Backfill Restrictions
1. Use earthen materials acceptable to Engineer and free of all undesirable materials as specified in Part 2 of this Section. Do not use in backfilling work materials such as house ashes, putrescible refuse, organic materials and such other materials considered unsatisfactory by the Engineer. Do not permit excavations to be used as dumping areas for refuse.
2. Do not use frozen backfill materials or place backfill materials on frozen subgrade or trench surfaces.
3. Should there be a deficiency of proper backfill material, provide acceptable borrow material with no additional compensation paid to Contractor.
4. Except for temporary use in backfilling, no permanent bulkheads or retaining walls will be allowed in the trenches over piping.
5. Backfill shall not be placed until pipes, pipeline, connections, or other pipeline appurtenances have been inspected in-place and approved by Engineer.

C. Subgrade Inspection. Notify Engineer when excavations have reached subgrade elevations. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities at the Contractor's expense, as directed by the Engineer. When Engineer determines that unforeseen unsatisfactory subgrade soil is present, continue excavation and replace with compacted backfill or fill material as directed.

D. Pipe Bedding (Subgrade Preparation). Provide coarse-aggregate pipe bedding as pipe foundations in trenches made in both earth and rock. Instead of coarse-aggregate pipe bedding, provide Concrete Encasement or Concrete Cradle, or other type of bedding, where and as shown on the Drawings or required by the Engineer. If maximum trench widths specified in Table 1 (above) are exceeded, provide concrete cradle or concrete encasement in such locations. Construct coarse-aggregate bedding, concrete encasement and concrete cradle as specified and in accordance with detail(s) shown on the Drawings, at no increase in Contract Price.

E. Initial Backfill. Following coarse-aggregate pipe bedding, piping and in-line structure installation, backfill trenches to a height at least one foot above the top of the outside barrel of the pipe with general backfill material placed in four inch layers. This initial backfill shall be carefully placed in trenches in such manner as not to damage or disturb the pipe.

1. Refill remainder of the trench using backfill placed in layers not exceeding six inches in thickness after compaction. Exercise care to carry backfill up evenly on opposite sides of the piping. Replace topsoil to approximate depth of existing as final refill operation and crown to such height as required by the Engineer. Maintain crowned surface to the satisfaction of the Engineer during the Maintenance Period.

F. Backfilling in Roadways. Refill remainder of the trench using backfill materials specified below. Exercise care to carry backfill up evenly on opposite sides of the piping.

1. Paved Roadways: General Backfill compacted in six-inch-thick layers to the bottom of temporary or permanent pavement section.
2. Unpaved Shoulders: General Backfill compacted in six-inch-thick layers to a point six inches below the adjacent existing surface. Refill the remaining six inches with compacted aggregate backfill.
3. Sidewalks: General Backfill compacted in six-inch-thick layers to a point eight inches below the adjacent existing surface. Refill the remaining eight inches with compacted aggregate backfill and specified replacement pavement section.
4. Unpaved Areas: General Backfill compacted in six-inch-thick layers to bottom of topsoil. Replace topsoil to approximate depth of existing topsoil as the final refill operation, and crown to such height as required by the Engineer. Maintain crowned surface to the satisfaction of the Engineer, during the Maintenance Period.

G. Underground Warning Tape. For the purposes of early warning and identification of buried pipes during future trenching or other excavation, provide continuous identification tapes in trenches. Install in accordance with printed recommendations of the tape manufacturer, and as specified herein. Bury tape at a depth of 12 inches below grade; in pavements measure 12 inches from subgrade of pavement.

1. Provide warning tape in trenches for utilities as specified in Part 2 of this Section.

H. Compacting. During the course of backfilling and compacting work, the Engineer reserves the right to make tests at various locations or depths of trenches, to determine whether the Contractor's compaction operations are meeting specified requirements. Compact trench backfill as follows:

1. Solidly tamp each layer of general backfill around the pipeline with proper tamping tools made especially for this purpose.
2. Thoroughly compact aggregate backfill with a vibratory compactor of a type and size satisfactory to the Engineer. Compacting of aggregate backfill by puddling or jetting will not be permitted.
3. Use mechanical tampers to compact backfill materials in trench backfilling operations to produce a density of backfill at the bottom of each layer of not less than:
    a. 90 percent of maximum density obtained at plus or minus two percentage points of the optimum moisture content as determined by the ASTM D-1557 method for pipeline in open land or unpaved roadways, or

b. 95 percent of maximum density obtained at plus or minus two percentage points of the optimum moisture content as determined by the ASTM D-1557 method for pipeline beneath structures or in paved roadways.

I. Cleanup

1. Remove surplus excavated material, rubbish and other construction debris and keep such removed to a point not more than two hundred feet from the head of the open trench, unless otherwise authorized by the Engineer.
2. After trenches and other excavations are backfilled and the work completed, remove surplus excavated materials, rubbish or such other materials from the work and stockpile or dispose as designated by the Owner.
3. Stockpile and leave in neat condition the surplus excavated material with proper erosion and sediment control measures as directed.
4. Furnish and place topsoil, fertilize and seed grassed areas, both within and outside rights-of-way as affected by construction. Reseed and re-fertilize areas that fail to show an acceptable uniform stand of grass. Water, mow, rake, weed and otherwise maintain grass until final acceptance of Contract.
5. Restore the area covered by both temporary and permanent rights-of-way over private property to as near the original conditions as is practical. Bring area up to original grade, place topsoil, seed; replant, or replace damaged or removed shrubbery; repair or replace walks, driveways, fences and other improvements.
6. Execute provision of topsoil, lime, fertilizer and seed in a manner consistent with practices acceptable to Kent Conservation District and Section 32 92 00 “Turf and Grasses”.
7. In case the Contractor shall fail or neglect to do so, or to make satisfactory progress in doing so, within twenty-four hours after the receipt of a written notice from the Engineer, the Owner may remove such surplus material and clear the roadways, sidewalks and other places, and the expense for such work charged to the Contractor or deducted from any moneys due or to become due him under the Contract.

J. Maintenance. The Contractor is solely responsible for injury or damage resulting from lack of trench protection and maintenance during the Maintenance Guarantee period. If trench surfaces are not satisfactorily maintained, or repairs are not begun within three days after written notice from the Engineer, such repairs may be made by the Owner and the expense for such work charged to the Contractor, or deducted from any moneys due to become due under the Contract.

3.4 QUALITY CONTROL AND ASSURANCE TESTING

A. Allow Engineer to inspect subgrade and each lift of backfill material before further backfill work is performed.

B. Contractor shall retain the services of a certified lab to perform quality control testing of backfilling operations to ensure compliance with the compaction requirements of this contract. Contractor is to provide copies of the certified lab test results to the Engineer. Perform laboratory compaction tests (ASTM D-1557), laboratory classification tests and field determinations of density (ASTM D-1556 or D-2922) as directed by the Engineer.

C. Any areas that do not meet the requirements of this Section shall be reworked by providing additional compaction effort until acceptable test results are obtained. Contractor shall not proceed with a new lift of backfill until Engineer has approved that the previous lift has attained required density.

END OF SECTION 31 23 33

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SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

B. Delaware Department of Natural Resources and Environmental Control (DNREC)
   1. Erosion and Sediment Control Handbook

1.2 SUMMARY

A. Section Includes:
   1. Erosion control materials.

B. Related Sections:
   1. Section 31 20 00 "Earth Moving" for excavation, filling and backfilling, and rough grading.

1.3 QUALITY ASSURANCE

A. All work of this section shall be completed in accordance with DNREC and Kent Conservation District regulations.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle and store products herein specified in accordance with manufacturer's requirements to prevent damage.

PART 2 - PRODUCTS

2.1 Silt Fence

A. In accordance with Delaware Erosion and Sediment Control Handbook and details provided on the drawings.

2.2 Dewatering Bag

A. In accordance with Delaware Erosion and Sediment Control Handbook and details provided on the drawings.

2.3 Geotextile

A. In accordance with Delaware Erosion and Sediment Control Handbook and details provided on the drawings.
   1. Type GS-I in Appendix A-3

B. Acceptable Manufacturers
   1. Mirafi 600X
   2. Amaco 2006
   3. Geotex 315ST

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install erosion control measures in accordance with the project drawings at locations shown on the drawings and at additional locations as warranted by field conditions.

3.2 MAINTENANCE

A. Check installed measures weekly and after each significant rainfall event.
   1. Remove unsuitable materials from site and dispose of in a lawful manner.
   2. Repair or replace measures to maintain protection of downstream areas.

END OF SECTION 31 25 00

SECTION 31 41 00 - SHORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

B. References
   1. Recommended Technical Provisions for Shoring and Sloping of Trenches and Excavations, U.S. Department of Commerce.
   2. Construction Safety and Health Regulations, U.S. Department of Labor, Occupational Safety and Health Administration (OSHA).
   3. Occupational Safety and Health Regulations--Excavations, U.S. Department of Labor, Occupational Safety and Health Administration, Code of Federal Regulations, Title 29, Part 1926 (29 CFR Part 1926), Subparts M and P–Excavations, plus Appendices A, B, C, D, E, and F.

1.2 SUMMARY

A. Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of shoring, bracing, and sheeting necessary to complete construction, protect structures, and prevent losses of ground or caving of embankments as shown, specified, or required. All such shoring and bracing shall meet applicable building and safety codes. Contractor shall provide a competent person to implement, supervise, and inspect all shoring and bracing work.

B. Contractor shall be solely responsible for proper excavation procedures and for protecting the health and safety of the Contractor's employees engaged in or adjacent to excavations.
   1. Contractor shall be responsible for selection, construction and maintenance of safe slope angles and the design and use of properly designed and installed shoring and bracing systems in accordance with OSHA and other applicable standards and requirements. As required, shoring and bracing shall be designed by Contractor's Engineer who is a registered Professional Engineer in the State of Delaware. Upon completion of associated excavation activities, remove all shoring and bracing without disturbing backfill, bedding, pipes or structures.
   2. The presence of Owner or Engineer on Site shall not relieve Contractor of its responsibility in properly designing, installing and maintaining shoring and bracing systems. Owner or Engineer shall not be the competent person on-Site.

C. A delay in construction, whether caused by an action or want of an action on the part of the Contractor or by an act of the Owner or Engineer that results in keeping any excavation open longer than would otherwise have been necessary, shall not relieve the Contractor from his responsibility of properly and adequately protecting the excavation from caving or slipping.

D. The applied lateral earth pressures imposed on the shoring and bracing and the stability of the shoring and bracing and excavation bottom are dependent not only on existing subsurface soil conditions but also the Contractor's available construction sequences, procedures, and options such as dewatering, staging of excavation, installation of bracing, flexibility of shoring and bracing, construction equipment used, and the time to complete the work. All such factors shall be considered and investigated as part of the design of any proposed shoring and bracing system.

E. Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, State or Federal authorities having jurisdiction.

F. Related Sections:
   1. Section 31 20 00 "Earth Moving".
   2. Section 31 23 33 "Trenching and Backfilling"

1.3 SUBMITTALS

A. In cases where the excavations cannot be open-cut to safe, stable working angles to meet applicable requirements, or where excavations may jeopardize adjacent site areas or the stability of nearby structures or facilities, Contractor shall submit drawings, design calculations, and substantiating data, prepared, signed, and sealed by a Professional Engineer licensed in the State of Delaware. This submittal shall show Contractor's proposed shoring and bracing system design including structural members, connections, lateral earth pressures, and construction sequences and procedures for review and approval by Owner prior to start of construction.

B. Shoring and bracing systems shall be designed such that their removal shall not jeopardize work already performed. Shoring and bracing systems shall not remain permanently in place without written approval of the Owner.

C. Any review or comments provided to Contractor by Owner or Engineer shall not relieve Contractor of its responsibility for the proper design and safe execution of said shoring and bracing systems.

D. Within trenches, shoring and bracing systems shall be designed such that the lowest horizontal brace is no closer than 12 inches above the base of excavation.

1.4 QUALITY CONTROL

A. During installation of required shoring and bracing systems and as long as the excavation remains open, Contractor's designated competent person shall monitor the shoring and bracing installation sequences and procedures to ensure that it is carried out in accordance with its design.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall meet or exceed, the minimum requirements of applicable codes and those assumed during the shoring and bracing system design submitted by Contractor.

B. Materials used for sheathing, bracing and shoring shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

C. Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system upon written permission of the Engineer. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner that will provide protection both for workers and adjacent utilities, equal to or greater than the sheeting or shoring required for the trench.

PART 3 - EXECUTION

3.1 VERIFYING EXISTING CONDITIONS

A. Prior to start of work, Contractor shall check and verify all governing dimensions and elevations including field measurements of existing and adjoining work on which his/her design is dependent.

3.2 COORDINATION WITH OTHER OPERATIONS

A. The schedule and progress of the shoring, bracing, and sheeting work shall be coordinated with the excavation and backfilling work. If lateral movements of the shoring and bracing system and surrounding soils develop and are discovered during the excavation's progress, Contractor shall implement immediate corrective measures to prevent further movements. Any disturbance and/or damage created by lateral movements of the shoring and bracing system and surrounding soils shall be repaired by Contractor at no cost to the Owner.

3.3 REMOVAL OF SHORING

A. Where Contractor elects and is permitted to leave the shoring and bracing system in-place the shoring and bracing system, all such material shall be removed to the extent that its top shall be a minimum of 5 feet below the proposed finished grades.

B. Removal of shoring and bracing systems shall be carried out in a manner such that no structures shall be disturbed or damaged during or after removal. Protection of structures during the removal of shoring and bracing systems shall be the sole responsibility of Contractor, and any disturbance or damage shall be repaired by Contractor at no expense to Owner.

3.4 SAFETY

A. Installation and removal methods for shoring and bracing systems shall meet, or exceed, the minimum design requirements and safety precautions of applicable codes, and shall be enforced by Contractor.

B. Trenches more than 4 feet deep shall be shored, sheathed, braced, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Trenches less than 4 feet in depth shall also be effectively protected when examination of the ground indicate hazardous ground movement may be expected.

C. If, in the opinion of the Engineers, the material furnished for timbering excavations is not of proper quality, size, or improperly placed, the Contractor shall, upon notice, procure and place satisfactory timbering, or place said timbering in a satisfactory manner. Upon his failure to do so work may be ordered stopped until said notice shall have been complied with and the Contractor shall not be entitled to any claim for extra compensation, for damage, or delay.

D. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, construction equipment or any other source.

E. If it is necessary to place or operate power shovels, derricks, trucks, or other heavy objects on a level above and near an excavation, the side of the excavation shall be shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

F. Trees, boulders, and other surface encumbrances located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations shall be removed or made safe before excavating is begun.

G. Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.

H. Any necessary pumping shall avoid drawing materials from behind the sheathing or shored areas.

I. In no case shall excavated material be stockpiled adjacent to the trench.

J. Where groundwater is present continuous close sheathing and shoring shall be installed. Sheathing boards should be installed with ½" spacing between boards to allow the water to seep into the trench and relieve the hydrostatic pressure. The water shall then be pumped out as required straw or other suitable material shall be used to fill the space to prevent loss of or caving of soil.

K. No person shall be permitted under loads handled by power shovels, derricks, or hoists.

L. When employees are required to be in trenches 4 feet deep or more, an adequate means of exit, such as a ladder or steps in a minimum two locations of the trench, shall be provided and located so as to require no more than 25 feet of lateral travel.

M. Where employees are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided as necessary or required.

N. Climbing on or supporting construction loads from the sheathing and shoring is prohibited.

O. The trench shall be safe from exhaust gases entering from machines and equipment working nearby.

P. Excessive deflections of sheathing and shoring members will not be permitted.

Q. Trenches shall be properly barricaded and protected at all times.

R. Timbering in excavations may be withdrawn as the backfilling is being done, except to such extent as the Engineers shall order, that said timbering be left-in-place, at least twelve (12) inches below finished grade and shall remove cut-off material.

S. Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and in unstable soil, ropes shall be used to pull out the jacks or braces above after employees have cleared the trench.

END OF SECTION 31 41 00

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SECTION 32 10 00 - BASES, BALLASTS, AND PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions (if included) and Division 01 00 00 Specification Sections, apply to this Section.

B. All work must meet DelDOT requirements in the latest edition of “Specifications for Road and Bridge Construction”:
   1. Section 304 - ASPHALT STABILIZED BASE COURSE
   2. Section 401 - HOT-MIX, HOT-LAID BITUMINOUS CONCRETE
   3. Section 804 - FINE AGGREGATE
   4. Section 805 - COARSE AGGREGATE
   5. Section 810 - ASPHALT CEMENT
   6. Section 823 - HOT-MIX, HOT-LAID BITUMINOUS CONCRETE

1.2 SUMMARY

A. Section Includes:
   1. Aggregate for Driveway and Pump Station Area
   2. Hot-mix asphalt paving (Type C Wearing Course and Type B grade aggregate base course)

B. Related Requirements:
   1. Section 31 20 00 "Earth Moving" for sub-grade preparation, fill material, unbound-aggregate sub-base and base courses, and aggregate pavement shoulders.
   2. Attached drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include technical data and tested physical and performance properties.
   2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Material Certificates: For each paving material: include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

C. Material Test Reports: For each paving material, by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DelDOT approved.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if sub-grade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Asphalt Base Course: Minimum surface temperature of 40 degrees F and rising at time of placement.

B. Asphalt Surface Course: Minimum surface temperature of 60 degrees F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: DelDOT Section 805; angular crushed stone, crushed gravel, or properly cured, crushed blast furnace slag.

C. Fine Aggregate: DelDOT Section 804; sharp edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag or combination thereof.
   1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO MP , PG 64-22

B. Tack Coat: AASHTO M 140, emulsified asphalt or AASHTO M 208, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade consistency for application.

2.3 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes as approved by DELDOT and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
   2. Base Course: DelDOT Type B grade aggregate base course.
   3. Surface Course: DelDOT Type C Hot Mix.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. All subgrade surfaces shall be sound, dry, and free of standing water, loose surface material dirt, dust, and debris.

B. Subgrade shall not be frozen.

C. All utility structures and casting shall be adjusted to proposed grade.

D. Compact subgrade.

E. All pavement butt joints shall be straight, saw cut or cold-milled to the proposed pavement thickness.

F. The Contractor shall fill low places in the base with a leveling material consisting of hot-mix bituminous concrete base course or surface course material. The locations along the base course to receive this leveling course material, the type of material to be used, and the method to be employed in each case shall be as directed.

3.2 AGGREGATE PLACEMENT

A. Place Mirafi 600X geotextile fabric, or approved equal, over subgrade.
   1. Overlap fabric at edges

B. Place aggregate, grade and compact to thickness noted on the drawings matching existing grade at transitions.

3.3 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt surface course in single lift.
   2. Spread mix at a minimum temperature of 250 degrees F.
   3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
   2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time.
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

B. Compact asphalt at joints to a density within 2 percent of specified course density. Placing of bituminous concrete shall be as nearly continuous as possible. The roller shall not pass over the unprotected end of the freshly laid mixture except when necessary to form a transverse joint. When necessary to form a transverse joint between old and new pavement or between successive days' work, the joint shall be made by placing a bulkhead or tapering the course. If the course is tapered, the edge shall be cut back to its full depth and width on a straight line to expose a vertical surface to remove the taper prior to placing the next section. It is not the intent of this section to require an existing (old) pavement to be cut back full depth transversely when the paving work being performed is an overlay tie-in unless such is designated on the drawings. With either method, all contact surfaces shall be coated with an approved tack material before placing any fresh mixture.

C. Longitudinal joints shall be rolled directly behind the laying operations. The first lane shall be true to line and grade and have a vertical face. The material being placed in the abutting lane shall be tightly compacted against the vertical face of the previously placed lane. The finishing machine shall be positioned so that the spread material overlaps the edge of the lane previously placed by one to two inches and is left sufficiently high to allow for compaction. Before rolling, the material overlapping the joint shall be carefully deposited adjacent to the joint of the unrolled lane with a lute. When the abutting lane is not placed the same day, or the joint is distorted by traffic or other means, the edge shall be carefully trimmed to line and coated uniformly with tack material. The longitudinal joint in any layer shall offset that in the layer immediately below by approximately six inches. However, the joints in the completed surfacing shall be at the lane line.

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 degrees F.
   2. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.

B. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

C. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

D. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

F. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor will engage a qualified testing agency to perform tests and inspections to verify that design specifications are achieved.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

END OF SECTION 32 10 00

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SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Fence framework, fabric, and accessories.
   2. Excavation for post bases; concrete foundation for posts, and center drop for gates.
   3. Manual gates and related hardware.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. American Concrete Institute (ACI)

C. ACI 301 – Standard Specifications for Structural Concrete

D. ASTM International (ASTM)
   1. ASTM A36 – Carbon Structural Steel
   2. ASTM A47 – Ferritic Malleable Iron Castings
   3. ASTM A123 – Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
   4. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   5. AASTM A392 – Zinc-Coated Steel Chain-Link Fence Fabric
   6. ASTM A491 – Aluminum-Coated Steel Chain-Link Fence Fabric
   7. ASTM A569 – Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality
   8. ASTM B6 – Zinc
   9. ASTM C33 – Concrete Aggregates
   10. ASTM C94 (1996) – Ready-Mixed Concrete
   11. ASTM C131 – Resistance to Degradation of Small-sized Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
   12. ASTM C150 – Portland Cement
   13. ASTM C260 – Air-Entraining Admixtures for Concrete

1.3 SUBMITTALS

A. Action Submittals
   1. Project Data: Provide data on fabric, posts, accessories, fittings and hardware.
   2. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

B. Informational Submittals
   1. Manufacturer's Installation Instructions: Indicate installation requirements.
   2. Certificates: Mill certificates indicating material conformity to yield strengths specified herein.

C. Closeout Submittals
   1. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.
   2. Keys: Provide locks that are keyed alike and 2 keys for each lock.

1.4 QUALITY CONTROL

A. Perform Work in accordance with manufacturer's instruction.

B. Submit manufacturer's erection and installation drawings and instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

C. Submit erection and installation drawings along with manufacturer's catalog data for complete fence assembly, gate assembly, hardware assembly and accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in an undamaged condition.

B. Store materials off the ground.

C. Protect materials from damage. Materials will be subject to inspection to ensure suitable condition prior to and during the work.

D. Replace damaged fence materials at no additional cost to the Owner.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 FABRIC

A. Fabric: ASTM A392, Class 1, zinc-coated steel wire with minimum coating weight of 1.2 ounces of zinc per square foot of coated surface.

B. Mesh: 2-inch diamond fabricated from 9-gage (0.148-inch) wire with top and bottom selvage twisted and barbed.

C. Fabric Height: 84 inches.

2.2 FABRIC TIES AND HOG RINGS

A. 9-gage (0.148-inch) galvanized steel conforming to ASTM A36 and A153.

2.3 TENSION WIRE

A. 7-gage (0.177 inch) conforming to ASTM A392, coating Class I. Do not provide woven wire.

B. A tension wire is required at the bottom of each fence where a bottom rail is not required.

2.4 POSTS AND ACCESSORIES-GALVANIZED STEEL

A. Galvanized in accordance with ASTM A123 and ASTM A153, or "Bethanized" per Bethlehem Steel Company specifications. Galvanize tubular pieces on inside and outside surfaces.

B. Posts
   1. Line posts:
      a. 2-inch (nominal) Schedule 40 steel pipe, weighing at least 3.65 pounds per linear foot and cut with plain ends; or
      b. 1-7/8- by 1-5/8 inch steel H-beams, weighing 2.70 pounds per linear foot; or
      c. 1.875-inch by 1.625-inch roll-formed channel sections.
   2. Terminal, corner, and pull posts:
      a. 2 ½-inch (nominal) Schedule 40 steel pipe, weighing at least 5.79 pounds per linear foot, and cut with plain ends; or
      b. 2-1/2-inch square tubing weighing 5.59 pounds per linear foot.

C. Top rails and brace rails
   1. 1-1/4 inch (nominal) Schedule 40 steel pipe, weighing at least 1.80 pounds per liner foot; or
   2. 1.625-inch by 1.25-inch roll-formed channel sections.

D. Post-top castings
   1. ASTM A47 and fit over the outside of posts.

E. Top rail couplings
   1. Outside self-centering steel sleeves having a minimum length of 6 inches.

F. Truss rods
   1. 3/8-inch outside diameter, ASTM A36 steel, weighing at least 0.40 pound per linear foot.

G. Tension bars
   1. 3/16-inch by ¾-inch ASTM A36 steel, weighing no less than 0.42 pound per linear foot.

H. Tension bands
   1. 11-gage (0.120-inch) by 1-inch ASTM A36 steel.

I. Extension arms
   1. Extension arms for line posts; fabricated from 14-gage (0.083-inch) ASTM A36 steel, or ASTM A47 malleable iron.
   2. Extension arms for terminal posts: fabricated from 12-gage (0.109-inch) ASTM A36 steel, or ASTM A47 malleable iron.

J. Fittings
   1. Provide castings of same material as post-top castings or ASTM A36 steel.

K. Carriage bolts
   1. Use 3/16-inch diameter (minimum) galvanized carriage bolts and nuts for assembly.

2.5 GATE POSTS

A. Provide Gate posts of same material as line posts with size as specified in Table 1.

B. Ensure gate posts are the full height of the fence and are equipped with galvanized ball or dome-shape tops that exclude moisture from the post.

C. Size
   1. Hinge Post: 4-inch (nominal)
   2. Latch Post: 3-1/2 inch (nominal).

Table 1. Pipe Sizes for Swing Gate Posts

Width of opening	**Nominal pipe sizes (in.)**
Single, to 6 ft.	2 ½
Double, to 12 ft.	2 ½
Single, over 6 ft. to 13 ft.	3 ½
Double, over 12 ft. to 26 ft.	3 ½
Single, over 13 ft. to 18 ft.	6
Double, over 26 ft. to 36 ft.	6

2.6 GATE FRAMES

A. 1-1/2 inch (nominal) Schedule 40 steel pipe.

B. Join frame with galvanized heavy malleable iron or pressed steel corner fittings securely riveted or welded.

C. Install fabric matching the fencing on the frame using tension bars and bands.

D. Properly brace gates to provide rigid construction of ample strength, free from sag and twist.

E. Provide each gate complete with necessary hardware, including keepers and latches, to permit a 180-degree arc.

F. Provide latches that allow padlocking of gate.

2.7 CONCRETE

A. ASTM C94, Alternate No. 3, compressive strength no less than 3,000 psi at 28 days.

B. Slump: between 3 inches and 5 inches.

C. Ensure concrete contains amount of Portland cement required for size of aggregate sued, as noted in Table 3.8.5.1b, ACI 301.

D. Less Portland cement may be used if supplier can demonstrate to the satisfaction of the Owner that the proposed portions will produce concrete of acceptable durability and surface hardness, and will meet the strength requirements specified.

E. Provide air entrained concrete with an air content of 5 percent, ± ½ percent.

F. Portland cement
   1. ASTM C150, Type I or II.
   2. Do not use air-entrained Portland cement. Instead, add air-entraining admixture conforming to ASTM C260 (mixed in strict accordance with the manufacturer's directions) to the mix at the batch plant.

G. Aggregate
   1. ASTM C33. Coarse aggregate conforming to Gradation No. 57.
   2. Abrasion loss for coarse aggregate: Do not exceed 40 percent when tested in accordance with ASTM C131.

PART 3 - EXECUTION

3.1 ERECTION OF FENCE

A. Height of fence with 84-inch fabric.

3.2 POSTS

A. Set line posts no more than 10 feet on centers and to a depth of 36 inches below finished grade.

B. Set end, corner, pull, and gate posts at locations shown on the Drawings and where otherwise required, to a depth of 40 inches below finished grade.

C. Set posts in concrete, 6 inches deeper than the bottom of the post, and not less than 9 inches in diameter. Set end, corner, pull, and gate posts in concrete no less than 12 inches in diameter.

D. Finish top of each concrete base with a 1-inch crown from post to edge of base at finished grade.

E. Connect fence posts with a top rail that runs continuously through the openings provided in post-top fittings.

F. Provide each fence with a top rail. Couple the top rail with self-centering couplings and fasten the ends to the fittings provided with the gate and terminal posts.

G. Provide bracing at terminations, corners, gate posts, abrupt changes in grade, intermediate pull posts (every 500 feet), and at change in direction of fence line of 30 degrees or more.

3.3 FABRIC

A. Fasten fabric to the vertical sides of gate frames, gateposts, and terminal posts with a tension bar inserted through the fabric.

B. Fasten and hold tension bars in place against posts using pre-formed tension bands placed not more than 15 inches on centers.

C. Place fabric on outside of line posts, and fasten to line posts and tension wires (and top rail when specified) using fabric ties or hog rings at no more than 15 inches on centers for line posts and no more than 24 inches on centers for top rail and tension wires.

D. Where rolls of fabric are joined, properly tension using double block pullers.

E. Match ends of fabric and join by a spiral-connecting link.

F. Ensure the fabric for both fences and gates reach within 2 inches of hard ground or pavement. On soft ground, ensure the fence fabric reaches below the surface deep enough to compensate for shifting soil or sand.

G. Clear the area on each side of the fence of vegetation, including trees and tall grass, for a minimum distance of 10 feet.

END OF SECTION

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

B. State of Delaware
   1. Title 3 Delaware Code, Chapter 15

C. Delaware Department of Transportation
   1. Standard Specifications for Road and Bridge Construction, latest edition.
   2. Erosion & Sediment Control Field Guide

1.2 SUMMARY

A. Section Includes:
   1. Seeding.
   2. Erosion-control material(s).

B. Related Sections:
   1. Section 31 20 00 "Earth Moving" for excavation, filling and backfilling, and rough grading.

1.3 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

1.5 INFORMATIONAL SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed mono-stand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
   1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
   2. Experience: Three years' experience in turf installation in addition to requirements in Section 01 40 00 "Quality Requirements."
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   4. Pesticide Applicator: State licensed, commercial.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
   1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
   2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. Report suitability of tested soil for turf growth.
      a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

1.7 DELIVERY, STORAGE, AND HANDLING

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

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.8 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. Spring Planting: March 1 to May 15.
   2. Fall Planting: August 15 to October 31.
   3. Temporary stabilization required during other periods.

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

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

Table 1 - DelDOT Seeding Chart

Type	Species	Max. Weed Seed (%)	Purity (%)	Germination (%)	Seeding Rate (lb/acre)
PGS-DG (<1V:3H)	Turf Type Fall Fescue (Lolium arundinaceum, formerly; Festuca arundinacea)	0.5	98	90	200
PGS-SUB	Perennial Ryegrass (Lolium perene)	0.4	90	90	20
	Kentucky Bluegrass (Poa pratensis)	0.4	90	80	30
	Redtop (Argrostis alba) (PGS-DG ONLY)	0.75	95	90	5
	Annual Ryegrass - Option5 (Lolium multiflorum)	0.15	95	90	10
PGS-DG (>1V:3H)	Hard Fescue Mixture (Festuca longifolia and Festuca trachyphylla)	0.15	98	85	140
	Creeping Red Fescue (Poa pratensis)	0.15	98	85	85
	Redtop (Argrostis alba)	0.75	95	90	5
	Annual Ryegrass (Lolium multiflorum)	0.15	95	90	10
PGS-WG[3]	Redtop (Argrostis alba)				
	Creeping Red Fescue (Poa pratensis)				
	Sheep Fescue[2] (Festuca ovina				
	Rough-Stalked Bluegrass (Pao trivialis)				
TGS-DG	Annual Ryegrass - Optional (Lolium multiflorum)	0.15	95	90	40
TGS-WG[4]	Annual Barnyard Grass/Duck Millet (Echinocloa spp.)	1.00	90	90	40

1. Title 3 Delaware Code, Chapter 15, Seeds and its associated regulations identify several species of seed designated as Noxious Weeds by the Delaware Department of Agriculture and therefore may not be part of the allowable percentage of weed seeds in any quantity.

2. Festuca ovina shall be an improved variety of Sheep Fescue as approved by the Department. Selection should be based on performance within the Mid-Atlantic region as determined by the most current National Turfgrass Evaluation Program Progress Report.
3. Permanent Seeding - Wet Ground should be used on saturated or seasonally flooded areas as dictated by the wetland limits on the Plans.
4. Wet, bare ground, leaf litter covered or partially vegetated retention ponds, traps, or basins, or all intermittently flooded sites in general may be seeded with Temporary Seeding - Wet Ground. No wood fiber mulch shall be added to the hydroseeder. Unless indicated on the Plans, Echinocloa spp. is equivalent to E. muricata, E. crusgalli, or E. walteri. No mulching, fertilizer or limestone shall be applied with this seeding.
5. The Contractor has the option of adding at his or her expense, up to 10 lbs. Annual Ryegrass (Lolium multiflorum) to the PGS-DG (≤1V:3H) and PGS-SUB seed mixes.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing not less than 85% calcium and magnesium carbonates. Dolomitic lime or magnesium lime shall contain at least 10% magnesium oxide. The limestone shall be ground to meet the following gradation:

Sieve Size	Percent Passing
No. 10 (2.00 mm)	100
No. 20 (850 µm)	90
No. 100 (150 µm)	50

2.3 ORGANIC SOIL AMENDMENTS

A. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

B. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

2.4 FERTILIZERS

A. Commercial Fertilizer:
1. Commercial fertilizer shall be furnished in containers plainly marked with the chemical analysis of the product or, if provided in bulk, a certificate guaranteeing the fertilizer analysis must accompany each delivery to the Project. No fertilizer shall be used which has not been marketed in accordance with the State and Federal laws.
2. The urea formaldehyde specified above shall meet the following requirements:
    a. The water insoluble nitrogen shall be at least 60% of the total nitrogen.
    b. The activity index of the water insoluble nitrogen shall be either:
        1) not less than 40% by the Association of Official Analytical Chemists International (AOAC International) method for urea formaldehyde products, or

2) not less than 50% by the AOAC International alkaline permanganate method, or
3) 80% by the AOAC International neutral permanganate method

B. Fertilizer shall conform to the following mix requirements:
1. Permanent Grass Seeding - Dry Ground, Wet Ground, and Subdivisions; and Temporary Grass Seeding - Dry Ground.
a. 70 lb/ac nitrogen (N); 50% by weight of the nitrogen content shall be available from urea formaldehyde.
b. 42 lb/ac available phosphate; phosphorous pentoxide (P2O5) shall be the sum of the water-soluble and the citrato-soluble phosphate.
c. 28 lb/ac water soluble potash; potassium oxide (K2O)Composition:
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory, when required.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Mix lime applied at the rate of 3000 lb/acre.
   2. Apply fertilizer, wood cellulose and other seeding agents.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
   1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
   2. Loosen surface soil to a depth of at least 6 inches. Apply fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches of soil. Till soil to a homogeneous mixture of fine texture.
   3. Remove stones larger than 2 inches in any dimension and sticks, roots, trash, and other extraneous matter.
   4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.
   2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at the rate indicated in Table 1 - DelDOT Seeding Chart.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre or 70 to 90 pounds per 1000 square feet to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.5 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Engineer:
   1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 70 percent of the seeded area. Any area identified without a uniform density of 70 percent specified perennial grass cover shall be repaired at the Contractor's expense.

3.6 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

END OF SECTION 32 92 00

SECTION 33 31 13

PUBLIC SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Non-pressure and pressure couplings.
3. Expansion joints and deflection fittings.
4. Cleanouts.
5. Encasement for piping.
6. Manholes.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Expansion joints and deflection fittings.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

C. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than 2 days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner’s written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.2 PVC TYPE PSM SEWER PIPING:

A. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasket joints.

B. Fittings: ASTM D 3034, PVC with bell ends.

C. Gaskets: ASTM F 477, elastomeric seals.

2.3 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2. For Concrete Pipes: ASTM C 1628, rubber.
3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements and must be approved by the Department of Public Works prior to installation. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fernco Inc.
    b. Dallas Specialty & Mfg. Co.
    c. Logan Clay Pipe.
    d. Mission Rubber Company; a division of MCP Industries, Inc.
    e. NDS.
    f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and stainless steel tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements and must be approved by the Department of Public Works prior to installation. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cascade Waterworks Mfg.
    b. Dallas Specialty & Mfg. Co.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements and must be approved by the Department of Public Works prior to installation. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fernco Inc.
    b. Logan Clay Pipe.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

F. Nonpressure-Type, Rigid Couplings:

1. Manufacturers: Subject to compliance with requirements and must be approved by the Department of Public Works prior to installation. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky.

2. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.4 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron, Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements and must be approved by the Department of Public Works prior to installation. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. EBAA Iron, Inc.
b. Romac Industries, Inc.
c. Star Pipe Products.

2. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Manufacturers: Subject to compliance with requirements and must be approved by the Department of Public Works prior to installation. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dresser, Inc.
b. EBAA Iron, Inc.
c. JCM Industries, Inc.
d. Smith-Blair, Inc.; a Sensus company.

2. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.

2.5 CONCRETE STRUCTURES

A. Precast Concrete Wet well

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: As indicated on the plan.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
7. Manufacturer:
   a. Atlantic Concrete Products
   b. Gillespie Precast

B. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.
10. Grade Adjustment: Maximum of 11-inches using “red sewer” brick and mortar above manhole cone.
11. Manufacturer:
    a. Atlantic Concrete Products
    b. Gillespie Precast

C. Manhole Frames and Covers:

1. Description: Ferrous; sized in accordance with the detail provided on the plan. Include indented top design with lettering cast into cover, using wording equivalent to "CITY OF DOVER SANITARY SEWER."
2. Material: ASTM A 48, Class 30 gray iron unless otherwise indicated.
3. Manufacturer:
   a. EJ USA

2.6 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

   a. Minimum of 0.1 foot through manhole.

2. Benches: Concrete, sloped to drain into channel.

   a. Slope: 2 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.7 WALL TO PIPE CONNECTION SEAL

A. Modular Mechanical Type Pipe Seal and wall sleeve.
   1. Pressure plates shall be molded of glass reinforced nylon. Hardware shall be mild steel with a 60,000 psi minimum tensile strength and 2-part Zinc Dichromate coating per ASTM B-633 and Organic Coating, tested in accordance with ASTM B-117 to pass a 1,500-hour salt spray test (or 316 Stainless Steel).
   2. Coloration shall be throughout elastomer for positive field inspection. Each link shall have permanent identification of the size and manufacturer's name molded into the pressure plate and sealing element.
   3. The Contractor will submit to verify the modular seals are domestically manufactured at a plant with a current ISO-9001:2000 registration.
   4. PVC wall sleeve sized for pipe size and material and the appropriate seal.
      a. A waterstop ring shall be provided for cast-in-place wall sleeves.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure, drainage piping according to the following:

   1. Install piping pitched down in direction of flow, at minimum slope of 0.50 percent unless otherwise indicated.
   2. Install ductile-iron, gravity sewer piping according to ASTM A 746.
   3. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

F. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
   1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
   2. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
   3. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

B. Join force-main, pressure piping according to the following:

   1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
   2. Join PVC pressure piping according to AWWA M23 for gasket joints.
   3. Join PVC water-service piping according to ASTM D 2855.
   4. Join dissimilar pipe materials with pressure-type couplings.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

   1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

      a. Shielded flexible couplings for pipes of same or slightly different OD.
      b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
      c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

   2. Use pressure pipe couplings for force-main joints.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Install FRP manholes according to manufacturer's written instructions.

D. Form continuous concrete channels and benches between inlets and outlet.

E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements or in lawn areas. Set tops in other areas at elevation indicated on the drawings.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 CONNECTIONS

3.7 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.

B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:

1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches below final grade. Fill with flowable concrete.

C. Backfill to grade according to Section 31 20 00 "Earth Moving."

3.8 IDENTIFICATION

A. Comply with requirements in Section 31200 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.
    e. Test and inspect joints for leaks.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

7. Manholes: Perform hydraulic test according to ASTM C 969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 33 31 13

SECTION 33 32 19 - PUBLIC UTILITY WASTEWATER PUMPING STATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. The contractor shall furnish and install one factory built, automatic pumping station as manufactured by Smith & Loveless, Inc., Lenexa, Kansas. The station shall be complete with all needed equipment; factory installed on a welded steel base with fiberglass cover and separate entrance to the wet well.
2. The principal items of equipment shall include two vertical, close-coupled, motor driven, vacuum primed, non-clog pumps; valves; internal piping; central control panel with circuit breakers (208V/3-phase main disconnect and branch breakers); 208/120Vac step-down transformer; variable frequency drives (VFD), automatic pumping level controls; heater; ventilating blower; priming pumps with SONIC START® pump prime detection system and appurtenances; and all internal wiring.

B. Named Manufacturer

1. The owner has standardized on the named equipment in order to optimize their operation, facilitate maintenance and safety programs, provide for interchangeability of costly equipment items, reduce stocking levels required for necessary spare parts and provide increased flexibility in the utilization of their pumping equipment. Equipment substitutions, since incompatible with the district's standardization program, will not be considered.
2. The specifications and drawings detail Smith & Loveless equipment and represent the minimum standard of quality for both equipment and materials of construction. The contractor shall prepare his bid based on the particular equipment and materials specified for determining the low bid.

C. Related Sections:

1. Section 05 55 00 "Metal Fabrications".
2. Section 33 34 00 “Sanitary Sewer Sewerage Force Mains”
3. Section 40 05 13 “Process Piping, Valves, and Fittings”.
4. Section 40 91 23 “Flow Process Measurement Devices”.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Show fabrication and installation details for each packaged sewage pumping station. Detail equipment assemblies and indicate dimensions; shipping, installed, and operating weights; loads; required clearances; method of field assembly; components; electrical characteristics; and location and size of each field connection.
   1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of sewage pump, signed by product manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
   1. Include in emergency, operation, and maintenance manuals for equipment.
   2. Include parts lists of components and complete service procedures and troubleshooting guide.

1.6 WARRANTY

A. The manufacturer of the station shall warranty for one (1) year from date of startup, not to exceed eighteen (18) months from date of shipment, that the structure and all equipment provided will be free from defects in material and workmanship. Warranties and guarantees of the suppliers of various components in lieu of a single source responsibility by the Manufacturer will not be accepted. The Manufacturer shall assume primary responsibility for the warranty of the station and all components.

B. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Manufacture shall repair or replace, at his discretion, such defective part. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as the steel structure, main pumps, main pump motors and main piping manifold. After start-up service has been performed, the labor to replace accessory items, such as the blower, priming pumps, alternator, etc., shall be the responsibility of others.

C. The motor, motor adapter, volute, impeller, frontheads, fiberglass enclosure and steel base shall be covered by a 10-year pro-rated warranty. The fiberglass enclosure shall be warranted against failure of the fiberglass components. The steel base shall be warranted against structural failure and perforation due to corrosion. The mechanical seal, microprocessor controller, panel display unit and submersible level transducer shall be covered by a 5-year pro-rated warranty. The pro-rated warranties shall be computed on a monthly basis starting at shipment, and shall cover replacement parts only.

D. The repair or replacement of those items normally consumed in service, such as seals, grease, light bulbs, etc., shall be considered as part of routine maintenance and upkeep.

E. It is not intended that the Manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material, workmanship or delays in delivery, replacement or otherwise.

F. Warranties do not release the contractor from any other contractual warranties, guarantees, or bonds.

PART 2 - PRODUCTS

2.1 OPERATING CONDITIONS

A. Each pump shall be capable of delivering 200 GPM of raw water or wastewater against a total dynamic head of 25 feet. The maximum allowable speed shall be 1170 RPM. The minimum rated horsepower of each pump motor shall be 5. The minimum pump efficiency at the design point shall be 52%. Due to energy conservation requirements, the specified minimum efficiency shall be enforced. The maximum static suction lift shall be 19'.

B. All openings and passages shall be large enough to permit the passage of a sphere 3" (76 mm) in diameter and the pump shall have a flanged suction and discharge connection no smaller than 4" (100 mm). The anticipated operating head range is from 17 feet minimum to 25 feet maximum. The pump motors shall not be overloaded beyond their nameplate rating at the design conditions nor at any head in the operating range.

2.2 STATION CONSTRUCTION

A. The supporting floor plate shall be minimum [½" (13 mm) thick carbon steel with reinforcing, as required, to prevent deflection and ensure an absolutely rigid support. Steel plate shall meet or exceed ASTM A-36 specifications.

B. The pump station shall be enclosed by a hinged fiberglass cover made of molded reinforced Orthophthalic polyester resins with a minimum of 30% glass fibers with a minimum average length of 1-1/4". The outside of the enclosure shall be coated with a polyester protective in-mold coating for superior resistance to weathering, ultraviolet radiation, yellowing and chalking. The completed fiberglass enclosure shall be resistant to mold, mildew, fungus and corrosive liquids and gasses normally found in pump station environments. The dimensions of the enclosure shown on the drawings shall be considered a minimum, for internal component clearances and accessibility, and nothing smaller will be acceptable. The cover shall have a suitable drip-lip around the edge and shall be provided with a hasp and staple connection to the floor plate to allow the pump chamber to be locked with a padlock.

C. The cover shall be attached with a multi segment stainless steel hinge, constructed of 7 gauge (minimum) type 304 stainless steel with a 3/8" diameter stainless steel pin and supporting at least 75% of the width of one end. Stainless steel bolts with tamperproof heads and a full width 3/8" thick anodized aluminum backing plate shall anchor the hinge to the fiberglass cover.

D. Dual high-pressure gas struts shall be provided to counteract the dead weight of the cover assembly and limit the maximum lifting force required for opening to less than 20 pounds. The cover shall be self-latching upon opening, with a manually operated release for closing. Duplex heavy gauge safety chains shall be provided to prevent over-extension. All hardware and components of the cover assembly that are exposed to the weather shall be constructed of corrosion-resistant materials.

E. Heavy extruded aluminum, adjustable ventilating louvers shall be provided on each end of the fiberglass cover, which are capable of being closed during cold weather operation.

F. A one-piece manway cover of 1/4" (6.3 mm) aluminum treadplate, with stainless steel piano hinges and hardware, located exterior to the fiberglass pump chamber shall be provided, complete with padlocking provisions. A one-piece manway shall be required to facilitate visual checking of the float switch settings. The manway shall be an integral part of the station and provide access to the wet well. The minimum open area of the manway access into the wet well shall be at least 4.2 square feet (0.39 m^2).

G. The manway cover shall have a three color 7" x 10" (minimum) corrosion-resistant sign permanently affixed to it, reading "DANGER – Before Entering, Test for Explosive Gases. Test for Oxygen Deficiency. Supply Fresh Air to Work Area".

H. The aluminum manway cover section shall be secured with tamperproof fasteners to prevent unauthorized removal.

I. Enclosures utilized to house the valve train and/or controls, which are defined under OSHA Article 29CFR, Parts 1910 as a Confined Space shall not be acceptable.

J. To allow on-site maintenance of the pumps, a stanchion with lifting arm shall be provided to lift each pump. The lifting arm shall have a hook over the center of the motor to support a hoist (provided by others) for removal of the motors, impellers and pumps from the station.

K. The pump casings and discharge piping shall be mounted in relation to the floor plate as detailed in the construction drawings. The suction and discharge connections, where they pass through the floor shall be sealed by gaskets, rather than being welded, to allow for adjustment and replacement.

2.3 WELDING

A. All steel structural members shall be joined by electric arc welding with welds of adequate section for the joint involved. Structural welding shall be performed in accordance with AWS standards and procedures.

2.4 PROTECTION AGAINST CORROSION

A. All structural steel surfaces shall be factory blasted with steel grit, in an environmentally controlled booth, to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Surface preparation shall comply with SSPC-SP6 specifications. Sandblasting is specifically prohibited.

B. Immediately following cleaning, a single 6-8 mil (0.15-0.20 mm) dry film thickness coating of VERSAPOX®, a self-priming Cycloaliphatic Amine Epoxy shall be factory applied to the base. After curing, a 2-3 mil (0.05-0.08 mm)DFT top coating of XTRATHANE™, a moisture-cured Aliphatic Polyurethane protective finish, for abrasion resistance and weather protection, shall be applied to the top of the base and as a finish coating for all other structural, pump and piping assemblies. The bottom of the station base, exposed to the wet well, shall be further coated with an additional 6-8 mil (0.15 – 0.20 mm) coating of XTRAGUARD™ epoxy for chemical and abrasion resistance. These coatings shall be as formulated by Smith & Loveless specifically for this type of application and service.

C. Stainless steel, aluminum and other corrosion resistant surfaces shall not be coated. Carbon steel surfaces not otherwise protected shall be coated with a suitable non-hardening rust preventative compound. Auxiliary components, such as the electrical enclosure, ventilating blower and vacuum pumps, shall be furnished with the original manufacturers coating.

D. Finish coating shall be accomplished prior to shipment of the station from the factory and shall comply fully with the intent of these specifications. A touchup kit shall be provided by the pump station manufacturer for repair of any mars or scratches occurring during shipping and installation. This kit shall contain detailed instructions for use and shall be the same material as the original coating.

2.5 MAIN PUMPS

A. The pumps shall be 4” vertical, centrifugal non-clog type of heavy cast-iron construction, especially designed for the use of mechanical seals and vacuum priming. In order to minimize seal wear caused by linear movement of the shaft, the shaft bearing nearest the pump impeller shall be locked in place so that endplay is limited to the clearance within the bearing. To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump, the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of 1-7/8” for motor frame sizes 213 through 286; 2-1/8” for motor frame sizes 324 and 326; and 3” for frame 364 and larger. The dimension from the lowest bearing to the top of the impeller shall not exceed 6”. The motor shaft shall be directly connected to the impeller without the use of drive belts or couplings, which require alignment and maintenance, and which increase power consumption due to their inherent energy losses.

B. Pumps with less than a standard 4” suction or 4” discharge connection, or with less than a 3” spherical solids handling capacity will be rejected for this application.

C. The oversized shaft incorporating oversized bearings and heavier bearing frame construction provides for extended mechanical seal, bearing and overall pump/motor life. Since the larger shaft with the specified minimum overhang is the key to heavier, more rigid construction throughout, no deviation from the specified shaft diameter or tolerances will be allowed.

D. The bearing nearest the impeller shall be designed for the combined thrust and radial load. The upper bearing shall be free to move in a linear direction with the thermal expansion of the shaft and shall carry only radial loads.

E. The shaft shall be solid stainless steel through the mechanical seal to eliminate corrosion and abrasive rust particles. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified minimum diameter.

F. The pump shall have an integral adapter providing a large water reservoir above the impeller to provide for positive exclusion of air from the impeller. The seal shall be inside this area to assure lubrication. Pumps which do not use hollow priming adapters for positive lubrication of the seal will not be acceptable. Self-priming pumps are specifically unacceptable due to the need for suction check valves, air vent piping and the possibility of overheating and damaging the pump or producing steam or high temperatures in the pump, which may be a hazard to the operator, when the pump is run dry. The pump controls must be set so that the main pumps cannot be turned on unless they are filled with liquid, and the pump is completely primed.

G. The pump shall be constructed so as to permit priming from the lower pressure area behind the impeller. Priming from high-pressure connections, which tends to cause solids to enter and clog the priming system, will not be acceptable. As an additional measure to prevent plugging, all passages in the priming system which contain liquid shall be at least equivalent to a 2-1/2" (64 mm) opening. The priming bowl shall be transparent, enabling the operator to monitor the priming level.

H. The pump shall be arranged so that the rotating element can easily be removed from the casing without disconnecting the electrical wiring or disassembling the motor, impeller, backhead or seal, so that any foreign object may be removed from the pump or suction line. Enclosed impellers must be used to avoid the necessity of wear plates and the associated costs of replacement and maintenance of wear plate clearances with semi-open impellers.

I. The pump shaft shall be sealed against leakage by a single mechanical seal constructed so as to be automatically drained and primed each time the pump is drained and primed. Water, which lubricates the mechanical seal, shall be automatically drained from around the seal if the pump loses prime in order to allow both the pump and the seal to be drained, thereby preventing freezing and breakage of the seal during power outages in sub-freezing temperatures.

J. The seal shall be of carbon and ceramic materials with the mating surfaces lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless steel spring. The entire seal assembly shall be held in place by a bronze seal housing to prevent excessive heat buildup. Use of cast-iron or other ferrous material for the seal housing which will rust and damage the seal, shortening its life, will not be acceptable.

K. The pump volute shall be furnished with fronthead mounting adapters, bolted to the station floor for rigidity, and gasketed for a gas-tight seal.

2.6 IMPELLER

A. X-Peller® Super Clog-Resistant Mono-Port

1. The pump impeller shall be of the enclosed mono-port type made of close-grained cast-iron and shall be in dynamic balance when pumping wastewater. Two port impellers are specifically disallowed. The dynamic balance shall be obtained without the use of balance weights or liquid filled chambers. The impeller shall be designed to allow for the trimming of the impeller to meet design condition changes without altering the balance. The eye of the impeller as well as the port shall be large enough to permit the passage of a sphere 3" in diameter in accordance with nationally recognized codes. To further prevent clogging, the impeller port shall have a minimum area of 10.6 in2. The impeller shall be keyed with a stainless steel key and secured to the motor shaft by a stainless steel cap-screw equipped with a Nylock or other suitable self-locking device. The impeller shall not be screwed or pinned to the motor pump shaft and shall be readily removable without the use of special tools. To prevent the buildup of stringy materials, grit and other foreign particles around the pump shaft, all impellers less than full diameter shall be trimmed inside the impeller shrouds. The shrouds shall remain full diameter so that close minimum clearance from shrouds to volute is maintained. Both the end of the shaft and the bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft.

2.7 MOTORS

A. The pump motors shall be vertical, solid shaft, NEMA P-base, squirrel-cage induction type, suitable for 3 phase, 60 cycle, 240-volt electric current. They shall have Class F insulation. Insulation temperature shall, however, be limited to Class B. The motors shall have normal starting torque and low-starting current, as specified by NEMA Design B characteristics. They shall be open drip-proof design with forced air circulation by integral fan. Openings for ventilation shall be uniformly spaced around the motor frame. Leads shall be terminated in a cast connection box and shall be clearly identified.

B. The motors shall have 1.15 service factor. The service factor shall be reserved for the owner's protection. The motors shall not be overloaded beyond their nameplate rating, at the design conditions, nor at any head in the operating range as specified under Operating Conditions.

C. The motor-pump shaft shall be centered, in relation to the motor base, within .005". The shaft runout shall not exceed .003".

D. The motor shaft shall equal or exceed the diameter specified under main pumps, at all points from immediately below the top bearing to the top of the impeller hub.

E. A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant.

F. The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor.

G. The pump motors shall be Premium Efficiency type, per NEMA MG-1 table 12-12, Inverter Ready per NEMA Part 31.4.4.2, with cast-iron frames, and be UL Recognized and CSA Approved. The motor windings shall be 200 C Inverter Spike-Resistant magnet wire and the rotors shall have an epoxy coating for corrosion protection.

2.8 CONTROLS

A. The control equipment shall be mounted in a NEMA Type 4 steel enclosure with two hinged, lockable doors and a steel barrier partition down the middle. One side of the divider shall house the three-phase circuits (motor starters and circuit protectors, etc.), and the other shall house the single-phase control circuits and low voltage components. The microprocessor and low voltage controls shall be accessible without exposing the three-phase high voltage supply, and the pump station controller shall be operable without opening the enclosure door. The control panel shall be supported on adjustable, extruded aluminum mounting legs, secured to the station baseplate. The slotted legs shall also serve as mounting points for auxiliary items, such as the vacuum priming subassembly.

B. All components within the control panel shall be UL listed or recognized, and the complete station control panel itself shall be labeled as a UL 508A General Use Industrial Control Panel. The electrical equipment in the panel shall be protected by a surge protective device.

C. To facilitate wire tracing and servicing, the control wiring shall be run in enclosed wireways, with removable covers, rather than tied up in bundles.

D. Control relays up to 6-amp capacity shall be the modular, plug-in type, with integral LED indicating lights to show activation. Larger control relays and vacuum pump contactors shall be enclosed to be “finger safe”.

E. A duplex GFI protected convenience outlet shall be provided in the station for operation of 120-volt AC devices.

F. Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short-circuit protection of all auxiliary circuits, and motor circuit protectors with lockout capability shall be provided for each pump motor. Only instantaneous trip magnetic type motor circuit protectors, matched to the motor inrush current, shall be used for the motor circuits, for added protection from low-level faults. Thermal magnetic circuit breakers will not be allowed for pump motor service.

G. When installation is applicable to the designated pump station, three-phase, 200V class variable frequency drives sized for the selected pumps shall be provided for each pump motor to give positive protection against phase unbalance, thermal overload, phase loss and ground fault. Each single-phase auxiliary motor shall be equipped with an over-current protection device in addition to the branch circuit breaker, or shall be impedance protected. All switches shall be labeled and a coded wiring diagram shall be provided.

H. Individual NEMA 4 oil-tight Hand-Off-Automatic selector switches shall be provided for each pump. The switches shall be 3-position rotary-type with spring return on the Hand position, and mounted on the top of the station control panel for easy access from either side.

I. To control the operation of the pumps with variations of liquid level in the wet well, and monitor the station control, environmental and alarm functions, a specially preprogrammed, dedicated microprocessor-based control system shall be provided. The controller shall interface with the wet well level transducer, panel display unit, motor starters, environmental system, accessories and alarm functions through isolated digital and analog input and output ports as required. The digital controls shall operate on 24 volts or less, to eliminate shock hazard. The 24-volt power supply shall be overload protected to be "crowbar safe" and will return to operation when a short is removed. Program integrity shall be maintained by battery-backed RAM.

J. A NEMA 4 rated display unit shall be mounted through the front of the panel to provide operator input to and visual output from the microprocessor controller. This interface shall be a 7"(17 mm) wide screen graphic interface with DSTN 65K-color Liquid Crystal Display with backlighting and resistive-type touch screen, for data input and programming. The display shall have a "sleep" feature to prolong screen life. A minimum of 11 (eleven) menu screens shall be available for display and management of pump and station control functions including, but not limited to:

Standard Features
Graphical Pump Running Indication
Lead Pump Indication
General Alarm Indication
Individual Alarm Messages for Each Alarm Function (w/ Time and Date)
Alarm Logging, Coded for "Time" active or "Return Time" time cleared - Last 500 Events
Alarm Silencing
Digital Indication of Air Temperature
Digital and Graphical Indication of Wet Well Level
Graphical Indication of Prime or Pump Failure
Digital Indication of Elapsed Run Time for Each Pump
Digital Indication of Elapsed Run Time for Parallel Pump Operation
Digital Indication of Level Control and Alarm Settings
Date & Time Indication, with Set Time Functionality
Heater/Blower Running Indication
"Help" Screens
Wet Well Level Simulation
Prime Mode Selection (**CONSTANT PRIME**™/ On-Demand Prime)
I/O Status for the Controller's Digital and Analog Inputs and Outputs
Maintenance Log (Service Required, and Individual Pump Notification Messages)
Reset Function:
- Running Time Meters
- Alarms
Set Points:
- Wet Well Levels (Factory Default and Field Specific)
- Alarm Levels
- Heater Operation
- Vent Fan Operation
Alternation Modes:
- Sequenced or Timed Pump Alternation
- User-Defined Time Intervals
- Lead Pump / Lag Pump Designation

Optional:
Pump Overload Trip Alarm
Power Failure
Simultaneous Start Time Delay
Phase Monitor (Incoming Power)
Digital Flow Rate Indication
Station Intrusion Alarm
High-High, Low and Low-Low Level Alarms
STATIONCOMM™ Remote Text Communication
Vacuum Release
Motor Amperage Display

Field Programming Functions:
Select English or Spanish language display mode
Reset wet well On, Off and alarm levels or return to default settings
Reset heater or vent fan thermostat set points or return to default settings
Select sequenced or timed pump alternation and select alternation time interval
Select any pump to remain as lead pump
Silence audible alarm
Reset running time meters
Set date/time
Wet well level simulation from touch screen, overriding submersible pressure transducer signal
Prime mode selection (On-demand or CONSTANT PRIME®)

K. The control system shall be designed to allow alternation of the pumps by either a time clock or alternation at the end of each pumping cycle. Selection of the alternation method and setting of the interval for timed alternation shall be easily done without opening the panel. The panel display shall indicate which pump is currently the lead pump.

L. The panel display shall be capable of indicating the total running time, in hours and tenths of an hour, of each pump individually, as well as the total time that both pumps have been running in parallel. Provision shall be made so that it is possible to reset the timers to zero, if necessary.

M. A resistance temperature device (RTD) shall be provided to monitor the ambient temperature in the pump station, and to control the operation of the ventilation blower and the 500-watt station heater. The RTD shall also provide a continuous signal of the panel ambient temperature, and the temperature shall be indicated on the panel display unit in degrees Fahrenheit.

N. The liquid level in the wet well shall be monitored by a submersible hydrostatic pressure transducer with stainless steel sensor diaphragm, providing a 4-20 mA signal to the pump control unit. The body of the transducer shall be made of 316 stainless steel. The transducer shall have dual arrestor technology for lightning and surge protection. The pressure transducer shall have a permanent hermetically sealed connection to a polyurethane cable, which shall support the transducer 12” (300 mm) from the bottom of the wet well, and shall pass through a cord grip seal in the station base. The pressure transducer shall be a Sigma Controls Model 6100 (0-5.0 psi).

O. The digital pump controller shall take the signal from the level transducer and provide a continuous readout of the wet well level in feet and tenths of a foot, through the panel display unit. It shall also be the means of setting the pump on and off points and alarm levels. As a

minimum, the controller shall be capable of digitally setting “On” levels for lead and lag pumps, an “Off” level, and alarm levels. Provisions shall be made for the pumps to operate in parallel should the level in the wet well continue to rise above the starting level for the low-level pump. A high water alarm setting shall also be provided for remote or local alarm indication.

P. Five (5) displacement switches shall be provided to automatically operate the pump in back-up mode, in case of failure of the digital control system or the submersible level transducer. The back-up system shall be entirely independent of the digital system. A 30’ (9 m) color-coded cord shall be provided with each switch. The cord shall have a corrosion-resistant vinyl jacket and be multi-stranded in order to prevent fatigue. The displacement switch cords and the cable for the submersible pressure transducer shall enter the wet well through cord grip seals mounted to a removable, gasketed floor plate. The floor plate shall allow the displacement switches and transducer to be adjusted or removed and replaced without having to enter or reach into the wet well.

2.9 HIGH LEVEL ALARM

A. An adjustable displacement switch shall be provided to sense a high water level condition. The switch shall hang into the wet well and shall activate a contact to indicate the high water condition.

2.10 PUMP OPERATION

A. Starting from a low wet well and neither pump operating, the pump operation sequence shall be as follows:
   1. When the wet well rises to a preset lead pump "ON" level, an electrical signal provides power to the controller causing the lead pump to start.
   2. If the flow into the wet well increases beyond the capacity of the lead pump operating alone at maximum speed, a high level electrical signal shall start the lag pump.
   3. Both pumps operating, then pump the wet well down to the pumps "OFF" level, stopping both pumps and completing the pumping cycle. This process will repeat itself as the wet well liquid level rises.
   4. The pump-motors shall be alternated by the station controller between “Lead” and “Lag” to distribute the wear.

2.11 RUNNING TIME METER

A. A running time meter shall be supplied for each pump to show the number of hours of operation. The meter shall be enclosed in a dust and moisture-proof molded plastic case. The flush-mounted dial shall register in hours and tenths of hours up to 99,999.9 hours before repeating. The meter shall be suitable for operation from a 115-volt, 60-cycle supply.

2.12 PUMP FAILURE TO PRIME OR FAILURE TO PUMP ALARM (CHECK VALVE SWITCH TYPE)

A. To sense failure to deliver normal flow for any reason, including failure to prime, each pump shall be provided with a sealed sensor switch mounted in a protective ABS enclosure. The enclosure shall be mounted with an adjustable universal mounting bracket to the external arm of each discharge check valve. The mounting bracket shall

allow the adjustment of the sensor switch with a single locking pivot adjustment. A red LED indicating light shall be provided on each switch unit to facilitate accurate setting of the switch for proper operation. The sensor switch shall monitor the movement of the check valve arm and thereby detect failure of the pump to deliver normal operating flow when called on to run. An auxiliary time delay relay shall be provided to prevent an alarm signal during the pump priming and startup period.

2.13 VACUUM-PRIMING SYSTEM

A. A vacuum priming system shall be furnished to prime the main pumps. The system shall be as shown on the vacuum priming schematic and shall include two vacuum pumps, providing 100 percent standby. Vacuum pumps shall have corrosion-resistant internal components. The vacuum priming system shall be complete with large port vacuum control solenoid valves, SONIC START® prime level sensor, float-operated check valves to protect the vacuum pumps, and all necessary shut-off valves as shown on the piping schematic. The float-operated check valves shall have a transparent body for visual inspection. All hoses and tubing used in the priming system shall be at least 3/8" nominal diameter.

B. The solenoid valves used in the vacuum priming system shall be of the high flow, direct acting brass body type, with threaded ports, NBR seals and 300 Series stainless steel plunger, rod, plate and springs. The minimum orifice diameter shall be 5/16". The solenoid valves shall be UL Listed, with Class F coil rating and of suitable voltage and thermal capacity for the application.

C. Liquid level in the pump priming chamber shall be monitored by a SONIC START® resonant frequency liquid level probe. The probe shall be equipped with a piezoelectric drive and sensitive circuits to detect frequency shifts when the probe is covered by liquid. The probe shall be completely sealed and have a 316L stainless steel housing for corrosion resistance. It shall be provided with a wiring connector molded of Polyphenylsulfone, an amorphous high performance thermoplastic for impact and chemical resistance. The probe shall have a plug-in connector to facilitate easy removal.

D. The SONIC START® probe shall be provided with light emitting diodes. This diagnostic tool shall indicate connectivity, prime status or a fault condition. Systems utilizing an electrode, mechanical means such as a float, or that require any type of electrical or moving parts inside the priming chamber, which may accumulate debris, short out, bind or fail will not be acceptable.

E. The priming system shall automatically provide positive lubrication of the mechanical seal each time a main pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which the pumped liquid must pass shall be smaller than the equivalent of a 2-1/2" opening.

F. The vacuum priming system shall have two field selectable modes of operation. In the "On-Demand" mode, the priming system will operate only after a pump is called on to run, and if it is not primed. Once primed, the pump will be allowed to run. In the "Constant Prime" mode, both pumps are kept primed continuously, and ready to start immediately when called for.

2.14 VARIABLE FREQUENCY DRIVES

A. Pump start and stop will be controlled by 3-phase, 208V class variable frequency drives sized for the selected pumps.
   1. Sinusoidal PWM Control
   2. 208V (+10%, -15%), 3-PHASE, 60 Hz
   3. Adjustable acceleration and deceleration times.
   4. Built-in dynamic breaking.
   5. Cooling fan.
   6. Circuit Protection shall be provided by 600-volt magnetic motor circuit protectors. Breakers shall be manually operated with a quick-make, quick-break, trip, free toggle mechanism.

B. Service Condition
   1. Ambient Temperature: -10 to 40°C (14 to 104°F)
   2. Storage Temperature: -20 to 60°C (4 to 140°F)
   3. Relative Humidity: 0 to 95% Non-Condensing
   4. Vibration: Acceleration at 0.6 G maximum (10-55 Hz). Amplitude at 0.1mm maximum (50-100 Hz).
   5. Altitude: 0 to 3300 Ft (0 to 1000 M)
   6. In the event of a sustained power loss, the control shall shut down safely without component failure. Upon return of utility power, the system shall be capable of automatically returning to normal operation. In the event of a momentary power loss, the control shall shut down safely without component failure. Upon return of power, the system shall automatically return to normal operation. The drive shall be capable of starting into a rotating motor in either direction without damage to connected equipment.

C. Quality Assurance
   1. The manufacturer of the VFD shall have had at least 5 years of experience in furnishing similar size and type VFD systems. Upon request provide a list of installations of such systems giving size, type and date of installation. The manufacturer shall meet the quality and program requirements of ISO 9001.
   2. The complete VFD assembly shall be listed and labeled by Underwriters Laboratories Inc. for the purpose for which it is used .

D. Factory Tests
   1. Upon completion of manufacture and assembly, the drives shall be subjected to a complete factory test to demonstrate compliance with specified features and characteristics. The purchaser at his option shall be able to witness factory testing of his unit, with factory coordination.
   2. The testing procedure shall be the manufacturer's standard procedure to assure maintenance free service. The buyer shall be given a 5 day notice prior to the start of factory testing for the buyer's representative to witness the testing.
   3. All equipment, devices, instrumentation, and personnel required to perform the factory tests shall be supplied by the manufacturer. Upon satisfactory completion of the test, the seller shall upon request submit two (2) certified copies of the test report to the buyer. Component failure during testing will require repeating any test associated with the failure or modified components to demonstrate proper operation.

2.15 ENVIRONMENTAL EQUIPMENT

A. A ventilating blower capable of delivering 250 CFM at 0.1" static water pressure shall be provided in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned on and off automatically by a preset thermostat. A heavy extruded aluminum louvered grille with adjustable openings shall cover the discharge of the blower. A similar grille shall be provided in the other end of the station enclosure for air intake. A 500-watt electric heater controlled by a preset thermostat shall be furnished. The heater shall be rigidly mounted in the station to prevent removal.

2.16 MAIN PIPING

A. The pump suction shall be drilled and tapped for a 125-pound American Standard flange for easy connection of the suction riser. The discharge line from each pump shall be fitted with a clapper-type check valve and eccentric plug valve. Size, location and quantity of check valves and plug valves shall be as shown on the construction drawing. The check valve shall be of the spring-loaded type with external lever arm and an easily replaced resilient seat for added assurance against vacuum leaks. Check valves shall have stainless steel shaft with replaceable bronze shaft bushings and shall be sealed with an adjustable Teflon seal. Ball-type check valves are specifically unacceptable for this application. An operating wrench shall be provided for the plug valves.

B. Protrusions through the floor plate shall be gas-tight where necessary to effect sealing between the equipment chamber and the wet well. Bolted and sealed joints shall be provided at the pump casings or suction pipes in order to prevent corrosive, noxious fumes from entering the station. Welded joints that do not allow adjustment or replacement will not be considered for this application. The pump station manufacturer shall extend the suction and discharge connections below the floor plate at the factory so that field connections can be made without disturbing the gas-tight seals.

C. The manufacturer of the pump station shall provide a compression-type sleeve coupling for installation in the common discharge pipe.

D. The pump and pump station specifications and the following checklist must be met in total. There are many reasons for incorporating a good pump specification. For example, the stainless steel shaft with tapered impeller attachment is provided to minimize corrosion, extend seal life, and provide ease of impeller removal and seal replacement without use of a wheel puller. All items specified are for long life, durability and maintainability of the pumping equipment. Deviations from the pump specification will not be allowed.

2.17 FACTORY TESTS

A. All components of the pump station shall be given an operational test at the pump station manufacturer's facility to check for excessive vibration or leaks in the piping or seals, and to correct operation of the automatic control and vacuum priming systems and all auxiliary equipment. Installed pumps shall take suction from a deep wet well, simulating actual service conditions. The control panel shall undergo both a dry logic test and a full operational test with all systems operating.

B. Factory test instrumentation must include flow measuring with indicator; compound suction gauge; Bourdon tube-type discharge pressure gauge; electrical meters to measure amperes, volts, kilowatts and power factor; speed indicator; and a Vibrometer capable of measuring both amplitude and frequency.

2.18 SPARE PARTS

A. A complete replacement pump shaft seal assembly shall be furnished with each pump station. The spare seal shall be packed in a suitable container and shall include complete installation instructions. A spare volute gasket and seal gasket shall be provided.

B. An instructional video presentation on the pump mechanical seal system in DVD format shall be included. The DVD shall contain a presentation on the following subjects: purpose and location of the mechanical seal, signs of a defective mechanical seal, how to remove the mechanical seal, troubleshooting seal failure causes, seal components, required tools, how to reinstall the seal and how to place the pump back into service. The video shall include footage of an actual seal replacement.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. After installing packaged sewage pumping station and after electrical circuitry has been energized, test for compliance with requirements. Furnish water required for pump tests.
   2. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   5. Test all alarm conditions.

C. Repair or remove and replace packaged sewage pumping station if it does not pass tests and inspections and retest as specified above.

3.2 INSTALLATION AND OPERATING INSTRUCTION

A. Installation of the pump chamber shall be done in accordance with the written instructions provided by the manufacturer.

B. Operation and maintenance manuals shall be furnished, which cover service procedures for all of the pumping station.

3.3 STARTUP

A. The manufacturer shall provide the services of a factory-trained representative for a maximum period of one (1) day on-site to perform initial startup of the pump station and to instruct the owner's operating personnel in the operation and maintenance of the equipment.

1. Complete installation and startup checks according to manufacturer’s written instructions.
2. Adjust pump, accessory, and control settings, and safety and alarm devices.

END OF SECTION 33 32 19

SECTION 33 34 00 - SANITARY UTILITY SEWERAGE FORCE MAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

B. References
   1. American Society for Testing and Material Standards
   2. American Water Works Association Standards
   3. American National Standards Institute
   4. DE Standard Specifications for Road and Bridge Construction, latest edition.
   5. 10 State Standards - Recommended Standards for Wastewater Facilities.

1.2 SUMMARY

A. The construction of the force main, as shown on the contract drawings and in accordance with these specifications.

B. Work shall include cutting and removal of existing pavement; trench excavation; dewatering trench; location and protection of existing utilities; permanent and temporary sheeting and bracing as required to protect the work and adjacent structures; furnishing, installing and testing of all pipes, fittings, plugs, and other materials required to construct the sewers and force main, and connection to existing and new piping, backfilling, accessories, appurtenances and miscellaneous work. The work shall also include the making of all connections to pipelines and appurtenances; furnishing and installation of all valves, piping, flexible joints, pipe expansion joints, wall sleeves, wall pipe, appurtenances, manholes and structures; installation of concrete thrust blocks and supports; all as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 31 20 00 “Earth Moving”

B. Section 05 50 00 “Metal Fabrication”

1.4 SYSTEM DESCRIPTION

A. Force mains shall be constructed in strict accordance with the Rules and Regulations of the Delaware Department of Natural Resources and Environmental Control (DNREC) and the 10 State Standards - Recommended Standards for Wastewater Facilities. Materials used in the construction of force mains shall be as follows:
   1. Force mains shall be constructed of ductile iron pipe.

B. Beveled pipes, elbows, wyes, tees, and other special pipes shall conform to the specifications for straight pipe, insofar as such specifications are applicable. Where special design or construction is necessary for such pipes, the design and construction shall be subject to the approval of the Engineer.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for all equipment and products of this section. Piping system shall include pipes, valves, valve operators, connections, fittings, fasteners, seals, and all other components as shown on plans, described in specifications, and/or as necessary to make a complete piping system.

B. Shop Drawings: Submit shop drawings for all piping systems, showing piping materials, size, locations, and centerlines (for internal pipe) or inverts (for external pipe). Include details of underground structures, connections, supports, and cleanouts. Show interface and spatial relationship between piping and proximate structures.

C. Record Drawings: At project closeout, submit record drawings of installed piping and products, in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE

A. Ductile iron pipe shall be centrifugally cast pipe conforming to the American National Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids, ANSI/AWWA Designation A21.51/C-151, latest revision. The pipe sizes shall be as shown on the contract drawings with a thickness class of 52 unless otherwise shown on plans. All pipe fittings shall have joints with body thickness and radii of curvature conforming to latest ANSI/AWWA Designation A21.10/C110.

B. Joints shall employ a single, elongated gasket of such size and shape as to provide an adequate compressive force against the spigot and socket after assembly to effect a positive seal under all combinations of joint and gasket tolerances. Gaskets shall be vulcanized natural or vulcanized synthetic rubber, resistant to common ingredients of sewage, oils, and groundwater. Gaskets shall be free of porous areas, foreign material, and visible defects.

C. The lubricant shall be suitable for lubricating the parts of the joint assembly. The lubricant shall be nontoxic and shall not support the growth of bacteria and shall have no deteriorating effects on the gasket material.

D. Push-on joint and mechanical joints shall conform to AWWA C111 (ANSI A21.11), latest revision with a thickness class of 52 unless otherwise noted. Joints shall be U.S. Pipe and Foundry Co.'s "Tyton" Joint; Griffin Pipe Products Co.'s "Super Bell-Tite" Joint; or equivalent.

E. Cement lining shall be provided unless otherwise indicated. Linings shall conform to AWWA C104-71 (ANSI A21.4 - 1971) with bituminous seal coat. Cement lining shall be 1/8" thick for all pipes 12" diameter and smaller and 3/16" thick for all pipes 14" diameter and larger.

F. Flanged ductile iron pipe shall have ductile iron flanges conforming to ANSI B16.1 Class 125 specifications designed for use with AWWA C110 (ANSI A21.10) flanged fittings, with pipe barrel conforming to AWWA C151-65 and AWWA C151a-68 (ANSI A21.51 - 1965 and A21.51a - 1968), or latest revisions. Ductile iron pipe shall be flanged in the foundry. The flanges shall be of the long hub type, shall be screwed on the pipe barrel and power tightened by machine, and faced and drilled after tightening. No ductile iron pipe of class thickness less than Class 53, shall be threaded and flanged.

G. Victaulic couplings shall conform to specifications ANSI/AWWA C 606, as shall the pipe used in conjunction with these couplings. The housing shall be of ductile iron conforming to ASTM A-536 or malleable iron conforming to ASTM A-47. The gasket shall be of halogenated butyl material and be resistant to sludge, sewage, saltwater, and sodium hypochlorite (less than 1% concentration).

H. All buried ductile iron piping in the appurtenances shall receive outside bituminous coating in accordance with AWWA C106-70.

I. Compression-Sleeve Coupling: Coupling shall be designed to couple plain end piping by compression of a ring gasket at each end of the adjoining pipe sections. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets. The middle and the follower rings shall be true circular sections free from irregularities, flat spots, and surface defects; the design shall be such as to provide for confinement and compression of the gaskets.

J. Compression sleeve couplings shall conform to the latest edition of ANSI/AWWA Designation 21.107/C-110. Bolts shall be corrosion resistant and conform to ANSI/AWWA Designation 21.11/C-111, latest edition. The inside surface shall be cement lined and the outside surface shall be coated with hot coal tar coating. Mechanical joint solid sleeves shall be U.S. Pipe Mechanical Joint Solid Sleeves Model No. U-528, or equivalent. Dresser style No. 153 cast iron coupling shall be considered equal.

K. Ductile Iron Fittings: All ductile iron fittings shall be Class 250 suitable for use with the pipe specified above conforming to the latest edition of American National Standard for Gray Iron and Ductile Iron Fittings, 3 in. through 48 in. for Water and Other Liquids. ANSI/AWWA Designation A21.10/C-110. Fittings shall be externally coated with a uniform thickness of hot applied coal tar coating and the inside shall be cement lined and only mechanical joint fittings shall be used in pressure main lines. End plugs shall be setscrew type, as manufactured by the United States Pipe and Foundry Company, or equivalent. Bolts and gaskets shall conform to the latest edition of ANSI/AWWA Designation A21.11/C-111.

L. Mechanical Joint Retainer Glands: Standard mechanical joint retainer glands are designed to provide a method for restraining mechanical joint pipe and fittings against possible joint separation, rupture or blow-out caused by internal water pressures. Mechanical joint retainer glands must meet the specifications of AWWA C-111 (ANSI A21.11) American Standard for rubber gasket joints. Glands shall be ductile iron and set screws shall be heat treated AISC 4140 steel.

2.2 VALVES

A. The Contractor shall furnish and install all valves as necessary to fulfill the intent of the drawings and specifications. See Section 40 05 13 “Process Valves and Fittings.”

2.3 LINE CAPS

A. Ductile iron caps shall be installed as shown on the plans or as directed by the engineer. The caps shall be mechanical joint fittings and be fully protected with adequate thrust blocking. The caps shall conform to all requirements outlined under ANSI/AWWA C110/A21.10 for caps and plugs.

B. The Contractor is to conduct cutting and capping of pressurized line during the night when usage is lowest. Contractor is to coordinate with the Owner for the cut-in times and location of adjacent valves.

2.4 CONCRETE THRUST BLOCKS

A. Class of concrete for thrust blocks shall be DelDOT Class B and shall have a minimum twenty-eight (28) day comprehensive strength of 2,500 lbs. per square inch. All materials shall conform to the applicable provisions of the latest edition of Section 914 of the DelDOT Standard Specifications for Road and Bridge Construction.

2.5 PIPING SPECIALTIES

A. Flexible couplings
   1. Middle Ring or Sleeve: Steel per ASTM AA 283, grade A, fabricated in true circular section and free of surface defects.
   2. Follower Rings or Flanges: Steel per ASTM A 47, grade 32510, fabricated in true circular section and free of surface defects, and tested and sized after welding by cold expanding a minimum of one percent.
   3. Bolts: Steel bolt per ASTM A 183 and ANSI B1.1, double radius head or button track head with rolled threads.
   4. Nuts: Steel Nuts per ANSI B18.2.2 American Standard Heavy Dimension Series
   5. Gaskets: Resilient type wedge shaped of synthetic base compound designed for sewage and leachate.
   6. Shop Paint: Primer compatible with field coat for piping.
   7. Acceptable Manufacturers:
      a. Dresser Manufacturing
      b. Smith-Blair
      c. Baker Coupling Co.
      d. Or approved equal.

B. Cam-Lock Quick-Connect Coupling
   1. 150psi in accordance with ANSI B16.5
   2. Stainless steel construction.

3. Buna-N seal
4. Threaded permanent end connection
5. Size as noted on Drawings
6. Acceptable Manufacturers:
    a. OPW Engineered Systems
    b. Or approved equal.

2.6 METER VAULT

A. Precast Concrete

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
4. Riser Sections: 5-inch minimum thickness, of length to provide depth indicated.
5. Top Section: Flat-slab-top type with cast-in-place access door.
6. Steps: Cast-in-place reinforced steps.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Load Rating: H20 minimum
9. Manufacturer:
    a. Atlantic Concrete Products
    b. Gillespie Precast

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

A. Where pipe crossings occur, the lower pipe shall be laid first and all backfill compacted to the level of the higher pipe before the higher pipe is laid. At the discretion of the Engineer, backfill material under such conditions may be earth, broken stone or 2500 lb. concrete.

B. The extent of excavation shall conform to the dimensions provided in the construction details. If the Contractor exceeds these dimensions, it shall replace the specified pipe with a pipe of greater crushing strength, or install pipe in a higher class bedding, or both, as directed by the Engineer at no increase in cost to the Owner. The extent of excavation open at any time shall not exceed 50 lineal feet per pipe crew.

C. If, in the opinion of the Engineer, the material at or below the grade to which the excavation would normally be carried is unsuitable for foundation, it shall be removed to such widths and depths as directed and be replaced with coarse aggregate as specified under Section 31 23 33.

D. If the bottom of any excavation is taken beyond the limits indicated on the drawings and details or in accordance with the preceding specifications, it shall be backfilled at the

Contractor's expense with compacted granular material or crushed stone to the pipe subgrade designated on the plans. No additional payment will be made for excavation and/or backfill below the grade shown on the plan.

E. All suitable excavated materials shall be temporarily stored on-site in such a manner as to not interfere with traffic or to cause overloading of the sides of the trench.

F. If, in the opinion of the Engineer, the material from a portion of the pipe trench is unsuitable for backfill, it shall be removed and disposed of at an off-site location.

G. All pipe shall be laid on a solid, dry foundation. Pipe shall be laid true to the lines and grades shown on the Contract Drawings with the bell ends upstream. Each section of pipe shall rest upon the pipe bed the full length of its barrel and for a minimum of one-half its diameter with recesses excavated to accommodate bells and joints. Any pipe which has its grade or joints disturbed after laying shall be taken up and re-laid at the Contractor's expense. The Contractor shall close the ends of all unconnected pipe with a waterproof stopper. Bedding shall be in conformance with the standard detail and the provisions of Section 31 23 33.

H. All pipes and joints shall be installed in accordance with the manufacturer's requirements. When the requirements contained in this specification exceed the manufacturer's specifications, the specifications contained herein shall govern.

I. All pipe shall be joined in strict accordance with the manufacturer's specifications. Voids under joints shall be filled with proper bedding material compacted thoroughly in accordance with Section 31 23 33 “Trenching and Backfilling.”

J. Piping and appurtenances shall be cleaned of foreign matter before being lowered into the trench and shall be kept clean during the laying operations by plugging or other approved means. Cutting of pipe shall be done in a neat and workmanlike manner with an approved type of mechanical cutter without damage to the pipe or lining so as to leave a smooth end at right angle to the axis of the pipe.

K. The vertical separation at a crossing of sewer and water shall be at least 18" with water on top. Where this is not possible the sewer shall be encased in concrete for a distance of at least 10 feet on either side of the crossing and in conformance with concrete encasement detail.

L. Joints of piping, couplings, fittings and specials, whether push-on type, flange, or mechanical type, shall be made up in accordance with the manufacturer's printed recommendations.

M. At areas where ductile iron pipe runs parallel to cathodically protected utility lines on the same side of the road or where ductile iron pipe and utility lines cross, the ductile iron pipe shall be protected by encasing it with polyethylene plastic pipe encasement. The polyethylene shall be applied loosely but continuously around the entire circumference of the pipe to the required limits with joints in plastic made by overlapping a minimum of 1 foot and securing with 2" wide polyethylene adhesive tape. Care shall be taken in the installation and backfilling operation to prevent tearing the plastic and exposing the metal pipe.

N. All gaskets and mating surfaces shall be thoroughly cleaned and lubricated in accordance with the manufacturer's specifications. The pipe shall be aligned with the previously installed pipe

and, with gasket in place, put together. After pipes are put together, the joint shall be inspected to verify that gasket is properly positioned and that the joint has been properly made and is tight.

O. If, while making the joint, the gasket becomes loose or misplaced, the pipe shall be removed and the joint remade watertight.

P. Unless otherwise approved by the Engineer, the Contractor shall backfill and compact all trenches at the end of each working day with suitable material from the trench excavation or temporary stockpile.

Q. All trenches shall be paved with bituminous stabilized based in accordance with these specifications within 24-hours of completion of backfill and compaction, unless approved otherwise by Engineer. Backfill shall be brought to elevations that allow construction of paving specified elsewhere in these specifications.

R. If, in the opinion of the Engineer, the excavated material is unsuitable, and material from temporary stockpile material is unavailable, select off-site material shall be provided as described under Section 31 20 00 “Earth Moving.”

S. Upon completion of construction, all dirt and other foreign material shall be removed from pipelines and their appurtenances.

T. Existing storm drains in roadways which are disturbed during construction shall be repaired. A brick collar shall be built around the joint and floated with a cement layer.

3.2 LAYING AND JOINTING - GENERAL

A. All pieces shall be carefully examined for defects, and no piece known to be defective shall be laid. Any defective piece discovered after laying, shall be removed and replaced in a satisfactory manner, regardless of any prior approvals.

B. All pipe and castings shall be thoroughly cleaned before being lowered into the trench, or before jointing. The exposed ends of all uncompleted lines shall be closed with tight wooden plugs adequately set and thoroughly secured. Pipe shall be laid in a manner to assure that valve stems and boxes will be set plumb.

C. Special care shall be exercised at the outside face of structures and manholes to support piping bridging the excavation for such structures or manholes. The pipe shall be supported by compacted gravel bedding or Class D concrete or Class C concrete piers as directed by the Engineer. The cost for these supports shall be deemed included in the lump sum and/or unit price bid for the work.

D. Where required for proper location of laterals, valve fittings, or other castings, or for any other purpose or where ordered, pipe or fittings shall be cut with approved pipe cutter. Cutting shall be carefully done by experienced men, in such a manner as to leave a smooth end normal to the axis of the pipe.

E. Concrete thrust blocks shall be provided on all pressure buried pipelines, all tees, bends, dead-ends, and where required by the Engineer. Thrust block placement and size shall be as indicated on the detail "Thrust Blocks Table." Class of concrete for thrust blocks shall be as shown on the detail in plans and shall have a minimum 28-day compressive strength of 4,000 lbs. per square inch. All materials shall conform to the applicable provisions of the latest edition of Section 812 of the DelDOT Standard Specifications for Road and Bridge Construction.

3.3 INSPECTION AND REJECTION OF PIPE

A. The quality of all materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval of the Engineer. Such inspection may be made at the place of manufacture or on the work site after delivery, or at both places, and the pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements even though sample pipes may have been accepted as satisfactory at the place of manufacture.

B. The Contractor shall submit to the Engineer, for its approval, material certificates from this manufacturer indicating that the pipe and fittings meet the specifications set forth herein.

C. Any pipe or fitting which has been found to be damaged after delivery will be rejected and, if such pipe has already been laid in the conduit line, it shall be repaired in a manner acceptable to the Engineer or, at the Engineer's option, removed and replaced and made good solely at the Contractor's expense. The ends of the pipe shall be free of dents and gouges which will affect the tightness of the joint. ASTM and ANSI/AWWA specifications require rejection of any pipes or fittings containing cracks, holes, foreign inclusions, or other injurious defects.

3.4 TESTING

A. General: The Contractor shall provide all labor, materials, equipment, gauges, air, water, caps, plugs, taps, temporary bracing, and all else necessary to pressure test all piping systems installed under this Contract. Temporary bracing shall be dismantled and removed upon completion of the pressure test by the Contractor.

B. The Contractor shall provide for hydraulic pressure test of the force main to be observed by the Owner as follows:
   1. Hydraulic pressure testing shall conform to AWWA Standard C-600.
   2. A hydrostatic test pressure shall be maintained in the pipeline for a minimum period of two (2) hours. At the end of the test period, if the test pressure has remained constant, the pipeline shall have passed the test. If the pipe does not hold pressure, the Contractor shall locate the leak, permanently repair the section of piping where the leak is occurring to the satisfaction of the Engineer, and retest the pipe line as specified above. This process shall be repeated until the pipeline has successfully passed the pressure test.
   3. Contractor shall make certain that all air is expelled from a pipe line before it is tested. All caps, plugs, and fittings shall be adequately braced and anchored to withstand the test pressures.

4. Hydrostatic test pressure shall be 150 psi or 1.5 times the working pressure measured at the highest elevation in the pipeline under test, whichever is greater.
5. The leakage test may be performed concurrently with the pressure test. If no pressure drop is seen during pressure test, the leakage test may be waived by the engineer.
6. If leakage is encountered during the hydrostatic test, the Contractor shall begin this leakage test which shall be accomplished by increasing the hydrostatic pressure to a specified value and maintaining of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled.
7. The hydrostatic pressure for the leakage test shall be 150 psi.
8. Flanged, victaulic, and welded pipe lines shall have no leakage at the test pressure. The leakage for mechanical joint, and push-on joint pipe lines shall not exceed the allowable leakage computed by the following formula:

$$L = \frac{N D (P)1/2}{7400}$$

where:

L is the allowable leakage in gallons per hour.

N is the number of joints in the length of the pipeline being tested.

D is the nominal diameter of the pipe in inches.

P is the average test pressure during the leakage test in pounds per square inch gauge.

END OF SECTION 33 34 00

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SECTION 40 05 13 - PROCESS PIPING, VALVES, AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 00 00 Specification Sections, apply to this Section.

B. References
   1. American Society for Testing and Material Standards
   2. American Water Works Association Standards
   3. American National Standards Institute
   4. 10 State Standards - Recommended Standards for Wastewater Facilities.

1.2 SUMMARY

A. The work included under this item of the Specifications shall include all materials, equipment and labor for furnishing, installing and testing the piping work herein described. The work also includes the making of all connections to pipelines and appurtenances; furnishing and installation of all valves, piping, flexible joints, pipe expansion joints, wall sleeves, wall pipe, appurtenances, manholes and structures; installation of concrete thrust blocks and supports; furnishing and installation of pipe insulation where required; and furnishing and installation of all pipe hangers and hanger supports, all as specified herein and as shown on the Contract Drawings.

1.3 RELATED SECTIONS

A. Section 05 50 00 “Metal Fabrications”

B. Section 31 20 00 “Earthwork”

C. Section 33 34 00 “Sanitary Utility Sewerage Force Mains”

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for piping system materials and products. Piping system shall include pipes, valves, valve operators, connections, fittings, fasteners, seals, and all other components as shown on plans, described in specifications, and/or as necessary to make a complete piping system.

B. Shop Drawings: Submit shop drawings for all piping systems, showing piping materials, size, locations, and centerlines (for internal pipe) or inverts (for external pipe). Include details of underground structures, connections, supports, and cleanouts. Show interface and spatial relationship between piping and proximate structures.

C. Record Drawings: At project closeout, submit record drawings of installed piping and products, in accordance with requirements of Division 1.

D. Maintenance Data: Submit maintenance data and parts lists for piping system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 HANGERS AND SUPPORTS

A. As a part of the piping work the Contractor shall securely support all piping, valves and pipeline appurtenances. Included in this classification are saddle stands, steel and cast iron stanchions, hangers, pipe roll supports, structural plates, fastenings, expansion anchors or other anchors and appurtenances.

B. Hangers and supports shall be adequate to maintain the piping, valves and equipment in proper position and alignment, and to prevent sway under all operating conditions. They shall have springs where required. Hangers and supports shall be of standard design where possible and be suited for the service required. All supporting devices shall be designed in accordance with the best practice and shall be approved by the Engineer prior to installation. The Contractor shall submit shop drawings indicating size, type, number and location on the Drawings of all hangers for the Engineer's approval. The lack of mention or of location on the Drawings of all hangers shall not preclude their necessity should field conditions dictate their use, or should they be required by the Engineer. Where practical, hangers and supports shall be screw adjustable after installation.

C. Unless otherwise specified, noted, or approved, hangers and supports for pipe shall be of the following type of construction:
1. Pipe Rings: Malleable iron fitted with an adjusting nut of the interlocking type, threaded to take a rod.
2. Pipe Roll: Provided with threaded nuts or with sockets to take threaded rods.
3. Pipe Clamps: Heavy steel, each equipped with socket clamp washers to take a rod.

D. Hangers, supports, anchors, and concrete inserts shall be the standard types as manufactured by the Crane Company, I.T.T. Grinnell Company, Inc., Fee and Mason Company, Carpenter and Paterson, Inc., or equivalent.

E. Hangers and supports shall conform to the requirements specified herein and to the latest revisions of the following standards except where noted otherwise:

Structural	ASTM Designation A36
Rivets	ASTM Designation A141
Steel Castings	ASTM Designation A27 (Grade 65-35, full annealed)
Wrought Iron	ASTM Designation A189 and A42
Steel Pipe	ASTM Designation A53 (Schedule 40)
Iron Castings	ASTM Designation A48 (Class No. 35)
Cast Iron Pipe Stanchions	ASA Class 125

Malleable Iron Castings	ASTM Designation A47
Threaded Rod - Bolts, Stud Bolts, and Nuts	ASTM Designation A307
Chains	ASTM Designation A56
Spring Hangers	ASTM Standard B31.1

F. Overhead hangers shall be supported by vertical threaded rods, fastened to the various types of construction in the following manner:

1. Attachment to Concrete

a. All hangers attached to concrete shall be by malleable iron concrete inserts. Inserts shall be as manufactured by Hohmann & Barward, Inc., Hauppauge, New York, or equivalent. Maximum loading on inserts shall be as follows:

Maximum Working Load (lbs.)	Insert Number
1500	"Universal"- All size nut
2000	380-D
4000	380-E

b. Expansion bolts for hangers will not be permitted unless approved by the Engineer.

c. The Contractor shall submit for the Engineer's approval completed detailed shop drawings showing sizes and locations of all hanger supports and inserts well in advance of the placement of any concrete.

G. Irrespective of the type of hanger rod, the sizes shall be determined by the pipe to be supported. Single rods supporting runs of pipe shall be sized in accordance with the following schedule, except as otherwise noted:

Size of Pipe (Inches)	Diameter of Rod (Inches)	Maximum Load (Pounds)
3/4 to 2, inclusive	3/8	1,500
2-1/2 to 3-1/2, inclusive	1/2	2,000
4 to 5, inclusive	5/8	3,000
6	3/4	4,500
8 to 12, inclusive	7/8	6,500
14 and 16	1	8,500
18	1-1/8	10,500
20	1-1/4	13,500
24	1-1/2	19,500

H. The foregoing schedule is based on ANSI B36.10 Schedule 80 pipe filled with water. Pipe larger than 24" diameter shall be supported by double rod hangers sized and spaced such that the maximum rod loads above are not exceeded unless otherwise shown or noted. The maximum loads are based on AISC requirements for threaded fasteners of A307 steel.

I. Pipe Supports: Pipe supports from the various structures shall be as follows:
   1. From Walls or Columns:
      a. Welded steel brackets
      b. Adjustable stands of the roll type stanchions
   2. From Floors or Piers:
      a. Pipe rolls or chairs with bases
      b. Saddle stands or
   3. From Inserts Embedded in Concrete Slabs:
      a. Pipe rolls suspended from threaded rod hangers
      b. Pipe rings, clamps & straps suspended from threaded pipe hangers

J. Brackets shall be made of welded carbon steel and shall be designed for three maximum loads classified as follows:

Light	750 lbs.
Medium	1,500 lbs.
Heavy	3,000 lbs.

K. When medium or heavy brackets are bolted to walls, backing plates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. Where the use of backing plates is not practical, the brackets shall be fastened to the wall in an approved manner. Pipe rolls or chairs shall be of cast iron type. They shall be of the adjustable type.

2.2 SADDLE STAND/SUPPORTS

A. Saddle stand/supports shall be of the adjustable type. Each stand/support shall consist of a length of galvanized steel pipe fitted at the base with a standard screw threaded cast iron flange and at the top with an adjustable saddle or roll. The base flange shall be bolted to floor or foundation, and grouted.

2.3 STANCHIONS

A. Stanchions shall be of similar construction to the saddle stand. They shall be fitted at the top with a cast iron pipe saddle support or with a pipe stanchion saddle consisting of a yoke and nuts.

2.4 COLUMN SUPPORTS

A. Column supports of cast iron or steel pipe type or of an approved design, built-up structural steel type shall be installed, where required.

2.5 NON-SHRINK, NON-METALLIC GROUT

A. Non-shrink, non-metallic grout shall be used under all floor type supports or bedding plates. Grout shall be Five Star Grout, or equivalent.

2.6 ANCHORS

A. Anchors shall be furnished and installed when specified, shown, or required for holding the pipe and equipment in position or alignment. All anchors shall be designed for rigid fastening to the structures either directly or through brackets. The design of all anchors shall be subject to the Engineer's approval.

B. Anchors for piping shall be of the cast iron chair type with galvanized steel straps, except where anchors form an integral part of pipe fittings, or where an anchor of special design is required.

C. Anchors for pump bases shall be as designated elsewhere in the specifications.

2.7 CONCRETE INSERTS

A. All individual concrete inserts shall be stainless steel and shall be installed in the concrete structures where required for fastening supporting devices. They shall be designed to permit the rods to be adjusted laterally and to automatically lock the rod nut or heads. Inserts shall be recessed near the upper flange to receive reinforcing rods. To facilitate installation, nail slots shall be provided in the exposed flanges of the insert. Inserts shall be designed to safely carry the maximum load that can be imposed by the rod which they engage.

2.8 POLYVINYL CHLORIDE (PVC) PIPE

A. Polyvinyl chloride (PVC) pipe shall be Schedule 80 PVC conforming to the latest requirements of ASTM D-1785 for polyvinyl chloride plastic pipe.

2.9 LINK SEAL

A. Unless otherwise directed by the Engineer, wherever the proposed piping penetrates through the existing or new concrete wall or structures, the adequately sized fire resistant "Link Seal" shall be furnished and installed as shown on the drawings or as may be directed by the Engineer. The material for fire resistant link seal shall be PYRO-PAC and shall stand three hour fire when exposed to temperatures up to 1900^{o}F. The link seal shall be as manufactured by Thunderline Corporation, Wayne, MI, or equivalent. The installation of Link Seal shall be in accordance with the manufacturer's recommendations and detail drawing.

2.10 FLEXIBLE COUPLINGS

A. Flexible coupling shall be utilized to join pipes at locations indicated on the Drawings and shall be as manufactured by Dresser Industries, Inc., or equivalent. All cast iron flexible couplings shall be coated in accordance with Section 09 90 00 and supplied with 316 stainless steel bolts to protect against corrosion. Flexible coupling sizes are nominally noted on plans, however, Contractor shall confirm actual pipe sizes to be used with coupling and order coupling accordingly.

B. Victaulic couplings shall conform to specifications ANSI/AWWA C 606, as shall the pipe used in conjunction with these couplings. The housing shall be of ductile iron conforming to ASTM A-536 or malleable iron conforming to ASTM A-47. The gasket shall be of halogenated butyl material and be resistant to sludge, sewage, saltwater, and sodium hypochlorite (less than 1% concentration).

2.11 DUCTILE IRON PIPE (SEE SECTION 33 34 00)

2.12 GATE VALVES

A. Gate Valves: Gate valves 3”-12” shall be resilient seat, iron body, non-rising bronze stem with modified wedge disk suitable for a working pressure of 200 psi and shop tested at 400 psi. Gate valves shall be Catalog #A-2360 as manufactured by Mueller or equivalent. The valves shall meet or exceed AWWA C509 Standard, latest edition.

B. The ends of the valves shall correspond in type and dimensions with those of the pipe. All valves shall be arranged to open in counter-clockwise direction and operating nuts shall be 2” square. The valve shall be tested to a pressure of not less than 400 lbs. per square inch. All buried valves shall be furnished with standard weight cast iron valve boxes. Boxes shall be of the Mueller Co. Telescope Screw Type or equivalent with round or oval base and deep cover to prevent tipping. Sections shall not be less than 4-1/4” in diameter. Lengths shall be suitable for locations intended. Two 2” square nut operating wrenches of suitable lengths shall be provided.

2.13 QUICK COUPLINGS

A. Quick couplings shall be male, Ever-Tite Coupling Co., Part A, or equal. Each coupling shall be provided with a dust cap, cable-restrained, or chained to the male fitting. One Part D coupling, female with female thread, shall be provided loose at each male coupling. Both fittings and cap shall be made of brass.

2.14 CHECK VALVES

A. The air cushioned swing check valve shall be constructed per ANSI/AWWA C508 with heavy cast iron body with integral flanges and stainless steel body seat. A ductile iron disc arm shall be positively attached to a stainless steel shaft supported in bronze bushings located completely above the waterway. A cast iron disc shall be attached to the arm at a single point and contain a renewable resilient disc seat retained by a stainless steel follower ring and screws.

B. The shaft shall pass through a stuffing box and be sealed by flow friction packing with an adjustable packing gland. O-ring shaft seals are not acceptable.

C. The valve shall be full-ported at a disc travel of no more than 25^{o} and close tightly when the inlet pressure decreases below the outlet pressure. An external, adjustable, bronze air cushion chamber, side mounted directly on the valve body and connected to the valve shaft, shall provide non-slam operation.

D. Maximum rated working pressure shall be 250 psig.

E. The valve shall be Figure 250-DS (ANSI Class 125#) as manufactured by GA Industries, Mars, PA or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All pipes and joints shall be installed in accordance with the manufacturer's requirements. When the requirements contained in this specification exceed the manufacturer's specifications, the specifications contained herein shall govern.

3.2 GENERAL NOTES TO PIPING

A. All interior (non-buried) ductile iron and steel pipe shall be painted and shall therefore be supplied without outside bituminous coating. All buried ductile iron piping in appurtenances shall receive outside bituminous coating in accordance with AWWA C106-70.

B. Any damage to new or existing structures or piping occurring through settlement, water or earth pressure, or other causes due to inadequate bracing or through negligence or fault by the Contractor in any other manner, shall be repaired by the Contractor at its own expense.

C. At the completion of the pipe installation and prior to backfill, the Contractor shall assist the Engineer in the preparation of As-Built Drawings showing the location of the pipe with reference to the job base lines, grade, and elevations at the entrance of the structures. Specials such as valves, tees, etc., shall be shown and accurately located.

3.3 PIPE TESTING

A. Pipe testing shall conform to all applicable provisions of Section 33 34 00 “Sanitary Utility Sewerage Force Mains”.

END OF SECTION 40 05 13

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SECTION 40 91 23 - FLOW PROCESS MEASUREMENT DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the requirements for an electromagnetic flowmeter and associated appurtenances.

1.2 SUBMITTALS

A. Submit for approval Shop Drawings and product data for all equipment in accordance with Section 01 25 00 “Substitution Procedures”.

B. Submit operations and maintenance manuals as specified in Section 01 78 23 “Operation and Maintenance Data”. Final O&M manuals shall be submitted as part of the Complete Pump Station System O&M Manual document.

C. In addition to the normal Installation, Operation, and Maintenance manuals required by the contract, a spare manual will be shipped with the unit in order to allow for proper operation of the equipment prior to the release of all final Installation, Operation, and Maintenance manuals.

D. Submit a certificate of factory calibration, field verification results, and manufacturer’s certification.

1.3 QUALITY ASSURANCE

A. All flow meters and associated appurtenances furnished under this Section shall be of a design and manufacture that has been used in similar applications and it shall be demonstrated to the satisfaction of the Owner that the quality is equal to the equipment made by that manufacturer specifically named herein.

B. Manufacturer of flow meter equipment shall have a minimum of five (5) years installation experience and a minimum of seventy-five (75) units in operation.

C. Qualifications of manufacturer: Products used in the work specified shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production.

D. Basis of acceptance: The manufacturer's recommended installation procedures, when approved by the Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

E. Flow sensor shall be calibrated and all of the calibration information and factory settings matching the sensor shall be stored in a memory unit. The memory unit shall store sensor calibration data and signal converter settings for the lifetime of the product.

F. The Manufacturer shall provide an appropriately trained field representative to certify the installation of all equipment. Equipment manufacturer shall warrant all equipment shall be free from defects in material and workmanship; and that it will replace or repair, FOB Factory, any part or parts returned to it, which examination shows to have failed under normal use and service by the user within twelve (12) months from the date of Substantial Completion Acceptance.

1.4 ACCEPTABLE MANUFACTURER(S)

A. Manufacturer of flow meters shall be:
   1. Siemens Energy & Automation, Inc.
   2. Or approved equal.

PART 2 - PRODUCTS

2.1 ELECTROMAGNETIC FLOW METER

A. The electromagnetic flow meter shall consist of a flow sensor based on Faraday's Law of Electromagnetic Induction as manufacturer by Siemens, or approved equal.

B. Sensor
   1. Operating principle: Utilizing Faraday's Law of Electromagnetic Induction, the flow of liquid through the sensor induces an electrical voltage that is proportional to the velocity of the flow.
   2. Operating Temp: -20 to +158° F.
   3. Submergence: The sensor shall be pedestal sealed against accidental submersion to 3 feet for 30 minutes standard, or permanently submerged to 30 feet when the terminal box is backfilled with a non-setting, transparent potting material.

C. Design Data
   1. Meter Type: Electromagnetic Flowmeter – In-Line
   2. Pipe Size: 6-inch
   3. Flow Range: 0 – 1,500 GPM

D. Acceptable Manufacturer:
   1. Siemens, Sitrans F M MAG 5100W

2.2 RECORDER

A. Digital recorder compatible with the supplied flow meter.
   1. 200 msec sampling rate for all channels
   2. Minimum 70 MB internal data buffer
   3. Ethernet TCP/IP Interface
   4. Data logging via USB interface
   5. Touch screen navigation

B. Acceptable Manufacturer:
   1. Siemens, SIREC D200

PART 3 - EXECUTION

3.1 INSTALLATION AND FIELD QUALITY CONTROL

A. The contractor shall install all equipment in strict accordance with the manufacturer's recommendations and the requirements of this section. The Equipment Supplier shall make all necessary adjustment to equipment in order to provide complete and satisfactory operation upon completion of the Contract.

B. Upon completion of the installation, the Contractor and the Equipment Supplier shall carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation. Equipment Supplier shall submit written certification of the proper installation of the equipment. Each piece of equipment shall be checked for proper operation.

C. Equipment manufacturer shall warrant all equipment shall be free from defects in material and workmanship; and that it will replace or repair, FOB Factory, any part or parts returned to it which examination shows to have failed under normal use and service by the user within twelve (12) months from the date of **Substantial Completion Acceptance**.

3.2 FIELD VERIFICATION

A. Field verification shall use a stand-alone unit to measure a number of selected parameters in the flow sensor, which affects the integrity of the flow measurement, shall be available through a factory verification service.

B. The meter manufacturer shall provide a Field Service Representative to perform Field Verification of the Flow meter which shall consist of the following test routines:
   1. Insulation test of the entire flow meter system and cables.
   2. Test of sensor magnetic properties for magnetic meters.

C. A certificate of verification shall be issued if the flow meter passes all of the tests with-in 1% of the original factory test parameters.

3.3 INSTALLATION

1. The manufacturer of the electromagnetic flow meter shall guarantee for one year of operation that the equipment shall be free from defects in design, workmanship, or materials.
2. In the event a component fails to perform as specified, or is proven defective in service during the guarantee period, the manufacturer shall promptly repair or replace the defective part at no cost to the owner.

3.4 EQUIPMENT MANUFACTURER'S SERVICE REPRESENTATIVE

A. The equipment manufacturer shall provide a service representative properly trained in inspection and operation of the mechanism to approve the installation, certify that the meter is performing properly. 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.

B. Ensuring that all necessary components, including electrical and controls, required for testing shall be the responsibility of the Contractor. No additional compensation shall be made by the Owner for additional trips required due to the lack of coordination or completion of support items by the Contractor.

END OF SECTION 40 91 23

APPENDIX A

STATE OF DELAWARE PREVAILING WAGE RATES
DAVIS BACON WAGE RATES

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

Mailing Address:
4425 North Market St., 3rd FL
Wilmington, DE 19802

Located at:
4425 North Market St., 3rd FL
Wilmington, DE 19802

PREVAILING WAGES FOR **HEAVY CONSTRUCTION** EFFECTIVE MARCH 15, 2017

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	22.10	19.44	42.27
BOILERMAKERS	77.62	32.12	58.92
BRICKLAYERS	47.02	23.20	24.91
CARPENTERS	53.81	53.81	42.77
CEMENT FINISHERS	43.59	24.35	18.14
ELECTRICAL LINE WORKERS	73.65	28.24	64.65
ELECTRICIANS	66.85	66.85	66.85
GLAZIERS	20.42	17.73	12.00
INSULATORS	55.48	55.48	55.48
IRON WORKERS	60.95	60.95	58.31
LABORERS	44.70	44.70	44.70
MILLWRIGHTS	69.18	69.18	55.75
PAINTERS	79.76	79.76	79.76
PILEDRIVERS	75.27	39.35	30.63
PLASTERERS	19.23	16.70	11.29
PLUMBERS/PIPEFITTERS/STEAMFITTERS	82.03	77.84	17.89
POWER EQUIPMENT OPERATORS	67.29	62.96	67.29
SHEET METAL WORKERS	30.73	19.06	17.90
SPRINKLER FITTERS	33.11	12.54	10.38
TRUCK DRIVERS	31.96	20.62	22.27

CERTIFIED: 9/25/17 BY: _____
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 761-8200

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: WW1905 Silver Lake Pump Station replacement , Kent County

PREVAILING WAGE DEBARMENT LIST

The following contractors have been debarred for violations of the prevailing wage law 29Del.C. §6960 or other applicable State statutes.

Therefore, no public construction contract in this State shall be bid on, awarded to, or received by contractors and individuals on this list for a period of (3) three years from the date of the judgment or as deemed by a court of competent jurisdiction.

Contractor	Address	Date of Debarment
Mullen Brothers, Inc. and Daniel Mullen, individually	3375 Garnett Road, Boothwyn, PA 19060	Indefinite/ Civil Contempt
MMR Associates DBA Peninsula Glass and Michael Rooney, individually	679 Horse Pond Road, Dover, DE 19901	1/20/2015
Site Work Safety Supplies, Inc. and Peter Coker, individually	4020 Seven Hickories Road Dover, DE 19904	1/12/2016
Green Granite and Jason Green, individually	604 Heatherbrooke Court Avondale, PA 19311	Indefinite/ Civil Contempt
Pro Image Landscaping, Inc. and Owner(s) individually	23 Commerce Street Wilmington, DE 19801 and/or 2 Cameo Road Claymont, DE 19703	Indefinite/19 Del.C. §108 & 10 Del.C. 542(c)
Liberty Mechanical, LLC and Owner(s), individually	2032 Duncan Road Wilmington, DE 19801	Indefinite/ 19 Del.C. 2374(f)
Integrated Mechanical and Fire Systems Inc. and Allison Sheldon, individually	4601 Governor Printz Boulevard Wilmington, DE 19809	Indefinite/19 Del.C. §108 & 10 Del.C. 542(c)

Updated: May 11, 2017

General Decision Number: DE180016 02/09/2018 DE16

Superseded General Decision Number: DE20170016

State: Delaware

Construction Type: Heavy

County: Kent County in Delaware.

HEAVY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.35 for calendar year 2018 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, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.35 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 calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2018
1	02/09/2018

* CARP0173-010 05/01/2017

	Rates	Fringes
CARPENTER (Includes Form Work)	$ 31.62	22.94

ELEC0126-003 05/29/2017

	Rates	Fringes
LINE CONSTRUCTION (Lineman)	$ 44.21	25.25%+11.00

ENGI0542-008 05/01/2017

	Rates	Fringes
POWER EQUIPMENT OPERATOR (Backhoe/Excavator/Trackhoe, Crane, Forklift, and Scraper)	$ 39.08	24.88+A

FOOTNOTE: A. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, and Election Day (provided the employee works the scheduled work day following the holiday.)

LABO0199-007 05/01/2016

	Rates	Fringes
LABORER		
Backfiller, Pipelayer, and		

Tamper (Hand Held).....	$ 24.80	19.30
Trencher Hand Guided.....	$ 24.55	19.30

SUDE2014-007 01/20/2016

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	$ 25.78	0.58
ELECTRICIAN.....	$ 34.96	23.87
LABORER: Common or General.....	$ 19.09	0.00
OPERATOR: Bulldozer.....	$ 28.12	7.56
OPERATOR: Loader.....	$ 25.55	7.56
TRUCK DRIVER: Dump Truck.....	$ 22.60	7.56

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

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 www.dol.gov/whd/govcontracts.

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 Regional Office for the area in which the survey was conducted because those Regional Offices have 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 DECISION