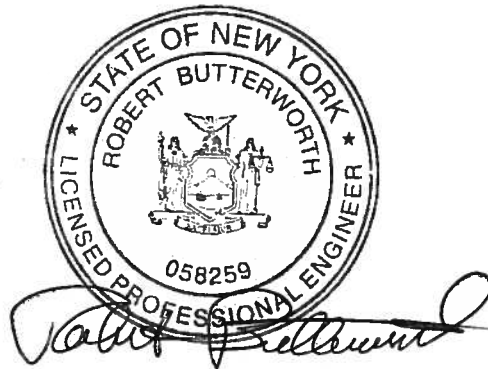

**Contract Documents
for
Pump Station Upgrade Program
Walden Woods, Jefferson Valley and
Jefferson Park
Contract No. 1 – General
Contract No. 2 – Electrical**



GHD CONSULTING SERVICES INC.

One Remington Park Drive
Cazenovia, New York



It is a violation of the New York State Education Law for any person unless he is acting under the direction of a licensed professional engineer, to alter an item on this specification in any way. If an item is altered, the altering engineer shall affix to the item his seal and the notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration.

2017

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**INVITATION TO BID
PUMP STATION UPGRADE PROGRAM
WALDEN WOODS PS, JEFFERSON VALLEY PS AND JEFFERSON PARK PS
TOWN OF YORKTOWN, NEW YORK**

Sealed proposals will be received by the **Town Clerk** of the Town of Yorktown, Westchester County, **New York, at the Town Hall, 363 Underhill Avenue, Yorktown Heights, New York, until 11:00 A.M., on Tuesday, February 13th, 2018 for the Pump Station Upgrade Program, Walden Woods PS, Jefferson Valley PS and Jefferson Park PS, Bid #16-5 Rev.**

Bids will be received for the following:

Contract No. 1 – General
Contract No. 2 – Electrical

A pre-bid inspection will be held at 10 a.m. on January 24, 2018 at the Yorktown Sewer Plant, 2200 Greenwood Street, Yorktown Heights, New York. Representatives of the Owner will be present to discuss the Project. Bidders are required to attend and sign the attendance sheet.

The work is part of the Pump Station Upgrade Program project and consists of constructing, complete with all equipment and accessories, one submersible pump station with above-grade enclosure (Walden Woods and Jefferson Park) and rehabilitation of the Jefferson Valley Pump Station in accordance with the Bidding Documents heretofore prepared by GHD Consulting Services.

Plans, Specifications and standard proposals for the work proposed may be obtained at the office of the Town Clerk at said Town Hall upon cash or certified check in the amount of **ONE HUNDRED DOLLARS (\$100.00)**. Said fee will **not** be refunded and will be used to defray costs of printing plans and specifications.

Bids shall be made on the separate Bid Proposal Forms and must be accompanied by a Bid Bond acceptable to the Town or a Certified Cashier's Check drawn on a solvent bank in the amount of not less than 10% of total amount of the Bid. Checks should be made payable to the Town of Yorktown, New York, and are to be held by the Town of Yorktown as a guarantee for the proper execution and delivery of Contract and Bonds to secure the faithful performance thereafter. In default of such execution and delivery of Contract and Bonds, the amount of the deposit represented by the check shall be forfeited to and retained by the Town of Yorktown as liquidated damages.

The bidder assumes the risk of any delay in the mail or in the handling of mail by the employees of the Town of Yorktown. Whether sent by mail or means of personal delivery, the bidder assumes the responsibility for having bids in on the time and the place specified above.

The Town of Yorktown reserves the right to waive any informalities in the bids, to reject any or all bids and reserves the right to accept that bid which it deems most favorable to the interests of the Town of Yorktown. No bidder may withdraw his bid within sixty (60) days after the actual date of the opening thereof.

If mailed, sealed proposals must be addressed in care of the Town Clerk at the above address.

Bid documents may also be obtained on the Town of Yorktown's website at www.yorktownny.org and www.EmpireStateBidSystem.com.

The Contract Documents may also be examined at the following locations:

GHD Consulting Services Inc.
One Remington Park Drive

Office of Town Clerk
363 Underhill Avenue

Cazenovia, NY 13035

Yorktown Heights, NY 10598

All questions shall be submitted to the Town Clerk, 363 Underhill Avenue, Yorktown Heights, NY 10598 or by email at dquast@yorktownny.org. The subject heading for all e-mails shall be: **Town of Yorktown Pump Station Upgrade Program Walden Woods, Jefferson Valley and Jefferson Park.**

Questions must be submitted in writing to the Town Clerk not less than seven (7) business days before the bid opening date.

Bidders shall review and acknowledge all Addenda on the Bid Forms.

DIANA L. QUAST
Town Clerk
Town of Yorktown

Dated: December 2017

SECTION 00100

INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

- 1.01. Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. Issuing Office - The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
 - B. Prefixes to Referenced Paragraph Numbers are as follows:
 - General Conditions; "GC-____."
 - Supplementary Conditions; "SC-____."

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01. Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the advertisement or invitation to bid may be obtained from the Issuing Office.
- 2.02. Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03. Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

- 3.01. To demonstrate Bidder's qualifications to perform the Work, within five calendar days of Owner's and/or Engineer's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be identified herein or requested by Owner and/or Engineer.
- A. Evidence of Bidder's authority to do business in New York State and Westchester County.
- 3.02. Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

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

- 4.01. Subsurface and Physical Conditions
- A. The Supplementary Conditions identify:
 - 1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site.

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2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except underground facilities).
- B. Copies of reports and drawings referenced in Paragraph 4.01.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents. Bidder is responsible for any interpretation or conclusion Bidder draws from any data, interpretations, opinions or information contained in such reports or shown or indicated in such drawings.
- 4.02. Underground Facilities
- A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner or others.
- 4.03. Hazardous Environmental Condition
- A. The Supplementary Conditions identify any reports and drawings known to Owner relating to a Hazardous Environmental Condition identified at the Site.
 - B. Copies of such reports and drawings referenced in Paragraph 4.03A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents. Bidder is responsible for any interpretation or conclusion Bidder draws from any data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
- 4.04. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 4.06 of the General Conditions.
- 4.05. On written request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.
- 4.06. Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is planned to be performed at the Site by others (such as utilities, other prime contractors, and Owner) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work if they exist.
- A. Paragraph 6.13.C of the General Conditions indicates that if an Owner safety program exists, it will be noted in the Supplementary Conditions.

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- 4.07. It is the responsibility of each Bidder before submitting a Bid to:
- A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;
 - B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
 - C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
 - D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 4.02 of the Supplementary Conditions, and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Paragraph 4.06 of the Supplementary Conditions;
 - E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;
 - F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
 - G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - H. correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
 - I. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
 - J. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has

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discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01. A pre-Bid conference will be held as indicated in the Invitation to Bid.

ARTICLE 6 - SITE AND OTHER AREAS

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

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01. All questions about the meaning or intent of the Bidding Documents are to be submitted to the Town Clerk in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda emailed or delivered to all parties recorded by the Town Clerk as having received the Bidding Documents. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Questions received after the deadline stated at the Pre-Bid Meeting or as modified in subsequent Addenda will not be answered.

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

7.03. The Bidder shall have seven business days prior to the Bid opening date to request clarification.

7.04. Any written response to a request for information or interpretation and/or clarification of the Bid Documents shall be issued by the Town Clerk and will be incorporated into and made a part of the Bid Documents and will be made available in the same manner and method as the Bid Documents. The Town Clerk's decision shall be final and binding on all parties. The failure of any Bidder to receive such Addenda will not relieve the Contractor of any obligation to comply with the terms and conditions of the Addenda.

ARTICLE 8 - BID SECURITY

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

8.02. The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 calendar days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award and the Bid Security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the

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earlier of seven calendar days after the Effective Date of the Agreement or 61 calendar days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

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

ARTICLE 9 - CONTRACT TIMES

- 9.01. The number of calendar days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.
- 9.02. The times for Substantial Completion and readiness for final payment are to be set forth by Bidder in the Bid and will be entered into the Agreement (or incorporated therein by reference to the specific language of the Bid). Substantial Completion is desired within 270 days. The times will be taken into consideration by Owner during the evaluation of Bids, and it will be necessary for the apparent Successful Bidder to satisfy Owner that it will be able to achieve Substantial Completion and be ready for final payment within the times designated in the Bid.

ARTICLE 10 - LIQUIDATED DAMAGES

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

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

- 11.01. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement.
- 11.02. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or those substitute or "or-equal" materials and equipment approved by Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Engineer as a substitute or "or-equal" unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 calendar days prior to the date for receipt of Bids. Each such request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS AND OTHERS

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

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after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

- 12.02. If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.
- 12.03. Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

- 13.01. The Bid Form is included with the Bidding Documents. Additional copies may be obtained from Engineer.
- 13.02. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid Item, alternative, adjustment unit price item, and unit price item listed therein. In the case of optional alternatives, the words "No Bid," "No Change," or "Not Applicable" may be entered.
- 13.03. A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.
- 13.04. A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.05. A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 13.06. A Bid by an individual shall show the Bidder's name and official address.
- 13.07. A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid form. The official address of the joint venture must be shown.
- 13.08. All names shall be printed in ink below the signatures.
- 13.09. The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

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- 13.10. Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.11. The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state Contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01. Lump Sum

- A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.
- B. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the Base Bid if Owner selects the alternate. In the comparison of Bids, alternates will be applied in the same order as listed in the Bid Form.
- C. Bidders shall submit a Bid on individual sections or any combination of sections as set forth in the Bid Form.
1. Bidders may submit a Bid for any of the separate sections or any combination of sections as provided in the Bid Form. Submission of a Bid on any section signifies Bidder's willingness to enter into a Contract for that section alone at the price offered.
 2. Bidders offering a Bid on one or more sections shall be capable of completing the Work within the time period stated in the Agreement.

14.02. Unit Price

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.
- B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.03. Allowances

- A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 11.02.B of the General Conditions.

14.04. Completion Time Comparisons

- A. Bid prices will be compared after adjusting for differences in the time designated by Bidders for Substantial Completion. The adjusting amount will be determined at the rate set forth in

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the Contract Documents for liquidated damages for failing to achieve Substantial Completion for each day before or after the desired date appearing in Article 9 above.

ARTICLE 15 - SUBMITTAL OF BID

- 15.01. With each copy of the Bidding Documents, a Bidder is furnished one copy of the Bid Form, and, if required, the Bid Bond Form. The copy of the Bid Form is to be completed and submitted with the Bid security and all required attachments to the Bid stated in the Bid Form.
- A. Required Bid Security in the form of a Bid Bond.
 - B. Statement of Surety's Intent.
 - C. Bidder's Qualification Statement.
 - D. List of Proposed Subcontractors.
 - E. List of Proposed Suppliers.
 - F. List of Project References.
 - G. Evidence of authority to do business in the state of the Project; or written covenant to obtain such license within the time for acceptance of Bids.
 - H. Non-Collusive Bidding Certification.
 - I. Certification of Equal Employment Opportunity.
- 15.02. A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "PUMP STATION UPGRADE PROGRAM BID ENCLOSED."

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

- 16.01. A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02. If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

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

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ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19 - EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01. Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.
- 19.02. More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.03. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04. In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.05. Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.
- 19.06. If the Contract is to be awarded, Owner will award the Contract to the Bidder who is in the best interests of the Project.
- 19.07. Within seven calendar days of receipt of the Notice of Award, the Contractor shall submit a completed W-9 Form to the Town Clerk in addition to any other documents required by the Town. Failure to supply a completed W-9 Form or other documents will invalidate the Bid.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

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

ARTICLE 21 - SIGNING OF AGREEMENT

- 21.01. When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 calendar days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the

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Agreement and attached documents to Owner. Within 10 business days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22 - COPIES OF CONTRACT DOCUMENTS

22.01. Owner will furnish copies of Contract Documents to Contractor as follows:

- Two sets of full-size drawings.
- Two sets of bound Contract Documents.

ARTICLE 23 - SALES AND USE TAXES

23.01. Owner is exempt from state sales and use taxes on materials and equipment to be incorporated in the Work. (Exemption No. 13-6007341). Said taxes shall not be included in the Bid. Refer to Paragraph 6.10 of the Supplementary Conditions for additional information.

ARTICLE 24 - RETAINAGE

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

END OF SECTION

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BID FORM

CONTRACTOR'S BID
FOR
CONSTRUCTION OF CONTRACT NO. _____
PUMP STATION UPGRADE PROGRAM
WALDEN WOODS, JEFFERSON VALLEY AND JEFFERSON PARK
TOWN OF YORKTOWN, NEW YORK

ARTICLE 1 - BID RECIPIENT

1.01. THIS BID IS SUBMITTED TO:

Town Clerk
Town of Yorktown
363 Underhill Avenue
Yorktown Heights, NY 10598

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

ARTICLE 2 - BIDDER'S ACKNOWLEDGEMENTS

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

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01. In submitting this Bid, Bidder represents that:

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

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

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

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

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified

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BID FORM

in SC-4.02 as containing reliable “technical data”, and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable “technical data.”

- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder’s safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 - BIDDER’S CERTIFICATION

4.01. Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Article:
 - 1. “corrupt practice” means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
 - 2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at

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BID FORM

artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 - BASIS OF BID

- 5.01. Bidder will perform the Work in accordance with the Contract Documents for the prices shown in the Bid Schedule that follow.
- 5.02. Bidder acknowledges that Bidder's price(s) constitute Bidder's sole compensation for performing all Work required by the Contract Documents, and if a particular part of the Work is not listed specifically in the Bid Item Descriptions, Bidder has included that part of the Work in the Bid Item Description which it most logically belongs.
 - A. Schedule A: Lump Sum Bid Items: Lump sum items included all Work in the Contract Documents.

Item No.	Description	Total Price
A-1	General Construction	\$
A-2	Electrical Construction	\$
Subtotal (Sum of Items A-1 through A-2)		\$

- B. Schedule E: Additive Alternates:
 1. Owner reserves the right to select alternates in any order or combination.
 2. Schedule E: Additive Alternates
 - a. Additive Alternates represent the additional cost to the Owner to incorporate additional work not included in the Total Bid Price.
 - b. Construction of the Jefferson Park pump
 - c. [Item E-2: Clearly define scope of alternate here].]

Item No.	Description	Total Price
E-1	General Construction – Jefferson Park	\$
E-2	Electrical Construction – Jefferson Park	\$
Subtotal (Sum of Items E-1 through E-3)		\$

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BID FORM

C. Schedule F: Allowances:

1. Bidder for the General Construction bid item agrees to provide a \$30,000 allowance as part of the Work in accordance with General Conditions Article 11.02.
2. Engineer will consult with Contractor for consideration and selection of products and select products in consultation with Owner and transmit decision to Contractor. On notification of selection by Engineer, Contractor shall execute purchase agreement with designated Supplier, arrange for and process Shop Drawings and Samples, arrange for delivery, and promptly inspect products upon delivery for completeness, damage, and defects.

ITEM No.	DESCRIPTION	TOTAL PRICE
F-1	General Construction – Allowance	\$
Subtotal		\$

D. Schedule G: Total Bid Price:

1. Determination of the apparent low Bidder shall be based on the Schedule A bid price determined as follows.
2. All mathematical errors will be corrected. In case of a discrepancy between unit prices bid and extended totals, unit prices will govern. In case of discrepancy between the correct sum of individual bid items and the (incorrectly) calculated sum, the correct sum of individual bid items will govern.

Item No.	Total Price
Schedule A Total (Lump Sum Bid Items)	\$
Schedule E Total (Additive Alternates)	\$
Schedule F Total (Allowances)	\$
Total Bid Price	\$

SCHEDULE A BID PRICE (in words)

TOTAL BID PRICE (in words)

In the event of a discrepancy between the numerical Bid amount and the written Bid amount, the written amount will govern. All items not bid shall be indicated as "Not Bid".

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BID FORM

ARTICLE 6 - NOT USED

ARTICLE 7 - TIME OF COMPLETION

- 7.01. Bidder agrees that the Work will be substantially completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 7.02. Bidder agrees that the Work will be substantially complete within 270 calendar days after the date that the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 300 calendar days after the date when the Contract Times commence to run.
- 7.03. Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 8 - ATTACHMENTS TO THIS BID

- 8.01. The following documents are submitted with and made a condition of this Bid:
- A. Required Bid Security in the form of a Bid Bond.
 - B. Statement of Surety's Intent.
 - C. Bidder's Qualification Statement.
 - D. List of Proposed Subcontractors
 - E. List of Proposed Suppliers.
 - F. List of Project References.
 - G. Evidence of authority to do business in the state of the Project; or written covenant to obtain such license within the time for acceptance of Bids;
 - H. Non-Collusive Bidding Certification.
 - I. Certification of Equal Employment Opportunity.

ARTICLE 9 - DEFINED TERMS

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

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BID FORM

ARTICLE 10 - BID SUBMITTAL

If Bidder is:

An Individual

Name (typed or printed): _____

By _____
(Individual's Name)

Doing business as: _____

A Partnership

Partnership Name: _____ (SEAL)

By _____
(Signature of general partner--attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

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

By _____
(Signature--attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Attest: _____ (CORPORATE SEAL)
(Signature of Corporate Secretary)

Date of Qualification to do business in State where Project is located is: _____

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BID FORM

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By _____
(Signature of joint venturer partner--attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By _____
(Signature--attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

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

Bidder's Business Address _____

Phone No. _____ Fax No. _____

Email _____

SUBMITTED on _____, 20_____

State Contractor License No. _____ (if applicable).

END OF SECTION

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BID BOND

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

BIDDER *(Name and Address)*:

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

OWNER *(Name and Address)*:

BID

Bid Due Date:

Description *(Project Name and Include Location)*:

BOND

Bond Number:

Date *(Not earlier than Bid due date)*:

Penal sum _____ \$ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER

SURETY

Bidder's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Above addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2 All Bids are rejected by Owner, or
 - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

BID SECURITY

(ATTACH BID SECURITY TO THIS PAGE IF CERTIFIED CHECK.)

STATEMENT OF SURETY'S INTENT

(To be completed if Bid Security is to be Certified or Bank Cashier's Check)

To: _____
(Owner)

We have reviewed the Bid of _____
(Contractor)

of _____
(Address)

for _____
(Project)

Bids for which will be received on _____
(Bid Opening Date)

and wish to advise that should this Bid of the Contractor be accepted and the Contract awarded to him, it is our present intention to become surety on the performance bond and labor and material bond required by the Contract.

Any arrangement for the bonds required by the Contract is a matter between the Contractor and ourselves and we assume no liability to you or third parties if for any reason we do not execute the requisite bonds.

We are duly authorized to do business in the State of _____.

Attest:

Surety's Authorized Signature(s)

Attach Power of Attorney

(Corporate seal if any. If no seal, write "No Seal" across this place and sign.)

(This form must be completed prior to the submission of the bid.)

BIDDER'S QUALIFICATION STATEMENT

To induce the making of this Contract, the Bidder represents to the Owner the following, as evidence of Bidder's Qualifications to perform the work herein specified:

1. How many years has your organization been in business under the name in which you propose to execute this Contract?
 ___ Years

2. What projects of character similar to that proposed has your present organization completed? Give the information indicated by the following tabulations:

NAME, ADDRESS, AND PHONE NO. OF OWNER FOR WHOM WORK WAS DONE	DESCRIPTION OF WORK	APPROXIMATE AMOUNT OF CONTRACT	APPROXIMATE DATE WORK WAS DONE

3. Has your present organization ever failed to complete any work awarded to it? If so, state when, where and why.

4. Do you have, or can you procure the necessary personnel, equipment, facilities and financial resources to immediately undertake and satisfactorily complete the work contemplated in this Contract?

5. (Other requirements as pertinent)

LIST OF PROPOSED SUBCONTRACTORS

This document is an Attachment to the Bid Form and is a legally binding part thereof;

Each Bidder shall complete this "List of Proposed Subcontractors" in its entirety. Failure to do so shall render the Bid Form non-responsive and be grounds for its rejection by Owner. If Bidder intends to self perform the type of work indicates, write "Self Perform" under Subcontractor Name.

Type of Work	Subcontractor Name & Address	Certified Disadvantage Business Enterprise? or applicable terminology	Subcontract Amount	State Contractor License Number
Mechanical				
Electrical				
Dewatering				
Civil/Site				
Masonry				
Painting				
Roofing				
HVAC				
Plumbing				
Concrete				

Total Subcontracted Amount: \$ _____

Percent of Total Contract: _____%

LIST OF PROPOSED SUPPLIERS

LIST OF PROJECT REFERENCES

**EVIDENCE OF BIDDER'S ABILITY TO
OBTAIN STATE CONTRACTOR'S LICENSE**

NON-COLLUSIVE BIDDING CERTIFICATION

Section 103-d of the General Municipal Law requires the following statement subscribed by the bidder as true under the penalties of perjury: Non-Collusive Bidding Certification.

(a) By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in a case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief:

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

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

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

Section 103-d of the General Municipal Law, as amended by Chapter 675 L 1966, in addition to requiring the above certification, provides as follows:

(b) A bid shall not be considered for award nor shall any award be made where (1), (2) and (3) above have not been complied with; provided however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where (1), (2) and (3) above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

The fact that a bidder (a) has published price lists, rates or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items or has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of subparagraph one (a).

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, and where such bid contains the certification referred to in subdivision one of this section, shall be deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bids and the inclusion therein of the certificate as to non-collusion as the act and deed of the corporation.

Dated: _____, 20____

Signed: _____ Name
_____ Title
_____ Company
_____ Address

Corporate Seal

**CERTIFICATION BY BIDDER REGARDING
EQUAL EMPLOYMENT OPPORTUNITY**

Name of Bidder _____

Project No. _____

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246, Part II, Section 203(b), (30 F.R. 12319-25). Each bidder shall state in his bid proposal whether he has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether he has filed all compliance reports due under applicable filing requirements.

CONTRACTOR'S CERTIFICATION

Contractor's Name: _____

Address: _____

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.
YES _____ NO _____
2. Compliance reports were required to be filed in connection with such contract or subcontract.
YES _____ NO _____

If YES, state what reports were filed and with what agency.

3. Bidder has filed all compliance reports due under applicable instructions, including SF-100.
YES _____ NO _____
4. If answer to item 3 is "NO", please explain in detail on reverse side of this certification.

Certification - The information above is true and complete to the best of my knowledge and belief. A willfully false statement is punishable by law. (U.S. Code, Title 18, Section 1001.)

(NAME AND TITLE OF SIGNER – PLEASE TYPE)

(SIGNATURE)

(DATE)

Federally Assisted Projects

AGREEMENT

THIS AGREEMENT is by and between TOWN OF YORKTOWN (Owner) and _____
(Contractor).

Owner and Contractor, hereby agree as follows:

ARTICLE 1 - NOT USED

ARTICLE 2 - THE PROJECT

2.01. The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: Town of Yorktown Pump Station Upgrade Program - Walden Woods, Jefferson Valley and Jefferson Park.

ARTICLE 3 - ENGINEER

3.01. The Project has been designed by GHD Consulting Services Inc. (Engineer), which is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01. Time of the Essence

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

4.02. Days to Achieve Substantial Completion and Final Payment

A. The Work shall be substantially completed within 270 calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within 300 calendar days after the date when the Contract Times commence to run.

4.03. Liquidated Damages

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$2,000 for each business day that expires after the time specified in Paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$2,000 for each business day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

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CONTRACT PRICE

- 4.04. Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the amounts determined pursuant to the following:
- A. For all Work other than Unit Price Work, a lump sum of \$_____.
 - B. For all Work, at the prices stated in Bid Form, attached hereto as an exhibit.

ARTICLE 5 - PAYMENT PROCEDURES

5.01. Submittal and Processing of Payments

- A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

5.02. Progress Payments; Retainage

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 15th day of each month during performance of the Work as provided in the following subparagraph. All such payments will be measured by the Schedule of Values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided in the General Requirements.

- 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.

- a. 95% of the Work completed (with the balance being retained) and 95% of the value of undamaged materials and equipment not incorporated in the Work but delivered, suitably stored, and accompanied by documentation satisfactory to Owner in accordance with Paragraph 14.02 of the General Conditions and Supplementary Conditions, less in each case the aggregate of payments previously made, and less such amounts which may be lawfully deducted.

- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100% of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 100% of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

5.03. Final Payment

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

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ARTICLE 6 - NOT USED

ARTICLE 7 - CONTRACTOR'S REPRESENTATIONS

- 7.01. In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) , if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing reliable "technical data", and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data".
 - E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, or performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; (3 Contractor's safety precautions and programs.
 - F. Based on the information and observations referred to in the previous paragraph , Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
 - G. Contractor is aware of the general nature of work to be performed by others at the Site that relates to the Work as indicated in the Contract Documents.
 - H. Contractor has given Engineer written notice of all conflicts errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
 - I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

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ARTICLE 8 - CONTRACT DOCUMENTS

8.01. Contents

- A. The Contract Documents consist of the following:
1. Invitation to Bid (pages 1 to 2).
 2. Instructions to Bidders (pages 1 to 10).
 3. Bid Form (pages 1 to 4, inclusive).
 4. This Agreement (pages 1 to 7, inclusive).
 5. Performance Bond (pages 1 to 3, inclusive).
 6. Payment Bond (pages 1 to 3, inclusive).
 7. General Conditions (pages 1 to 63, inclusive).
 8. Supplementary Conditions (pages 1 to 18, inclusive).
 9. Specifications as listed in the table of contents of the Project Manual.
 10. New York State Prevailing Wage Schedule.
 11. Drawings consisting of 40 sheets with each sheet bearing the following general title:
"Town of Yorktown Pump Station Upgrade Program - Walden Woods, Jefferson Valley and Jefferson Park."
 12. Addenda (Nos. ____ to _____, inclusive).
 13. Exhibits to this Agreement (enumerated as follows):
 - a. Bid Form (pages ____ to ____, inclusive).
 - b. Documentation submitted by Contractor prior to Notice of Award (pages ____ to ____, inclusive).
 14. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Notice to Proceed (pages ____ to ____, inclusive).
 - b. Work Change Directives.
 - c. Change Orders.
- B. There are no Contract Documents other than those listed herein.
- C. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

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ARTICLE 9 - MISCELLANEOUS

9.01. Terms

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

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9.02. Assignment Prohibited

- A. The Contractor shall not assign, transfer, convey, or otherwise dispose of the contract or any part of it or any monies due and payable under the contract, without prior written approval of the Town. If such approvals are granted by the Town, they shall in no way relieve the Contractor from any obligations under the terms of the contract.

9.03. Successors and Assigns

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

9.04. Severability

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

9.05. Contractor's Certifications

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

9.06. Wages to be Paid and Supplements to be Provided

- A. The Contractor shall, at its own cost and expense, comply with all provisions of the Labor Law (i.e., prevailing rate of wages and supplements), Lien Law, Workmen's Compensation Law, and all other laws and ordinances affecting the contract or order, either federal, state, or local.

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- B. Records to be Kept on Site - The Contractor and subcontractors at any tier shall certify their payrolls and keep them on site and available, in addition to the following informative records:
1. Record of hours worked by each workman, laborer, and mechanic on each day.
 2. Record of days worked each week by each workman, laborer, and mechanic.
 3. Schedule of occupation or occupations at which each workman, laborer, and mechanic on the project is employed during each work day and week.
 4. Schedule of hourly wage rates paid to each workman, laborer, and mechanic for each occupation.
 5. A statement or declaration signed by each workman, laborer, and mechanic attesting that they have been provided with a written notice informing them of the prevailing wage rates and supplements requirement for the contract.

(continued)

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____, 20____, (which is the Effective Date of the Agreement).

Owner _____ Contractor _____

By _____ By _____

Title: _____ Title: _____

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

Attest _____ Attest _____

Title _____ Title _____

Address for giving notices:

Address for giving notices:

License No. _____
(where applicable)

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

END OF SECTION

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EXHIBIT A

**NOTICE OF AWARD
NOTICE TO PROCEED**

Notice of Award

Date: _____

Project: _____

Owner: _____

Owner's Contract No.: _____

Contract: _____

Engineer's Project No.: _____

Bidder: _____

Bidder's Address: *[send Notice of Award Certified Mail, Return Receipt Requested]*

You are notified that your Bid dated _____ for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for _____.

[Indicate total Work, alternates, or sections of Work awarded.]

The Contract Price of your Contract is _____ Dollars \$_____).

[Insert appropriate data if unit prices are used. Change language for cost-plus contracts.]

_____ copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

_____ sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within [15] days of the date you receive this Notice of Award.

1. Deliver to the Owner [_____] fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), General Conditions (Paragraph 5.01), and Supplementary Conditions (Paragraph SC-5.01).
3. Other conditions precedent: _____

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

Owner

By: _____
Authorized Signature

Title

Copy to Engineer

Notice to Proceed

Date: _____

Project: _____

Owner: _____

Owner's Contract No.: _____

Contract: _____

Engineer's Project No.: _____

Contractor: _____

Contractor's Address: *[send Certified Mail, Return Receipt Requested]*

You are notified that the Contract Times under the above Contract will commence to run on _____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is _____, and the date of readiness for final payment is _____ [(or) the number of days to achieve Substantial Completion is _____, and the number of days to achieve readiness for final payment is ____].

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must provide documentation in accordance with the following:

1. General Conditions paragraph 2.05.A.1 and Specification Section 01310.
2. General Conditions paragraph 2.05.A.2, Schedule of Submittals.
3. General Conditions paragraph 2.05.A.3, Schedule of Values.

Owner

Given by:

Authorized Signature

Title

Date

Copy to Engineer

EJCDC C-550 Notice to Proceed

Prepared by the Engineers Joint Contract Documents Committee and endorsed by the Construction Specifications Institute.

Page 1 of 1

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EXHIBIT B

**PERFORMANCE BOND
AND PAYMENT BOND**

PERFORMANCE BOND

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

CONTRACTOR (*Name and Address*): SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:
Amount:
Description (*Name and Location*):

BOND

Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.
2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.
3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
 - 3.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
 - 3.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and
 - 3.3 Owner has agreed to pay the Balance of the Contract Price to:
 1. Surety in accordance with the terms of the Contract; or
 2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.
4. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:
 - 4.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
 - 4.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
 - 4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
 - 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
 2. Deny liability in whole or in part and notify Owner citing reasons therefor.
5. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.
6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner

of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

- 6.1 The responsibilities of Contractor for correction of defective Work and completion of the Contract;
- 6.2 Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
- 6.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

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

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

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

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

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

12. Definitions.

- 12.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
- 12.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
- 12.3 Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
- 12.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other party)*:

PAYMENT BOND

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

CONTRACTOR (*Name and Address*):

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

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2 Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. When a Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:
 - 6.1 Send an answer to that Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
 - 6.2 Pay or arrange for payment of any undisputed amounts.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

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

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

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

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

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

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

15. Definitions

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

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

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

FOR INFORMATION ONLY – *(Name, Address, and Telephone)*

Surety Agency or Broker:

Owner’s Representative *(Engineer or other)*:

EXHIBIT C

CERTIFICATES OF INSURANCE

EXHIBIT D

IDENTIFICATION OF DRAWINGS

EXHIBIT D

IDENTIFICATION OF DRAWINGS

The Contract Drawings show the character and scope of the work to be performed and have been prepared or approved by Engineer. The Drawings, all of which constitute an integral part of the Contract Documents as approved for construction on the date so designated on said drawings, carry the Engineer's identifying Job No. 8618742 and are listed below by sheet number and title:

<u>Drawing No.</u>	<u>Drawing Title</u>
G001	Cover Sheet
G002	General Notes, Legend, Abbreviations List, Drawing List
G003	Pump Station Site Location Map
C001	Miscellaneous Details
C002	Erosion Control Details
A001	General Architectural Information and Details
S001	Structural Design Criteria, General Notes, Abbreviations and Legend
S002	Standard Details
E001	Electrical Abbreviations, Symbols, Details and Notes
E002	Electrical Standard Details
I001	Pump Station Backup Float Diagram and Instrumentation Details

Walden Woods Pump Station

WW-D001	Walden Woods Pump Station Existing Site and Demolition Plan
WW-C003	Walden Woods Pump Station Site and Erosion Control Plan
WW-C004	Walden Woods Pump Station Planting Plan
WW-S003	Walden Woods Pump Station Plan and Sections
WW-M001	Walden Woods Pump Station Wet Well Plan and Section
WW-E003	Walden Woods Pump Station Electrical Site Plan and One-Line Diagram

Jefferson Valley Pump Station

JV-D002	Jefferson Valley Pump Station Existing Site and Demolition Plan
JV-D003	Jefferson Valley Pump Station Existing Demolition Plans
JV-D004	Jefferson Valley Pump Station Existing Demolition Sections
JV-C005	Jefferson Valley Pump Station Site and Erosion Control Plan
JV-A002	Jefferson Valley Pump Station - Plans and Elevations
JV-A003	Jefferson Valley Pump Station - Sections and Details
JV-S004	Jefferson Valley Pump Station Plans
JV-S005	Jefferson Valley Pump Station Sections

EXHIBIT D (continued)

JV-M002	Jefferson Valley Pump Station Lower and Upper Plans
JV-M003	Jefferson Valley Pump Station Sections
JV-M004	Jefferson Valley Pump Station Abbreviations, Symbols, Details and Notes
JV-E004	Jefferson Valley Pump Station Electrical Demo and Site Plan
JV-E005	Jefferson Valley Pump Station Electrical Demolition Plans
JV-E006	Jefferson Valley Pump Station Electrical Plan and Details
JV-E007	Jefferson Valley Pump Station One-Line Diagram and Schedules
JV-I001	Jefferson Valley Pump Station Backup Float Control Diagram and Instrumentation Details
JV-H001	Jefferson Valley Pump Station HVAC Plans, Abbreviations, Symbols, Details and Notes

Jefferson Park Pump Station

JP-D005	Jefferson Park Pump Station (Add Alternate No. 1) Existing Site and Demolition Plan
JP-C006	Jefferson Park Pump Station (Add Alternate No. 1) Site and Erosion Control Plan
JP-C007	Jefferson Park Pump Station (Add Alternate No. 1) Grading and Planting Plan
JP-S006	Jefferson Park Pump Station (Add Alternate No. 1) Plan and Sections
JP-M005	Jefferson Park Pump Station (Add Alternate No. 1) Wet Well Plan and Sections
JP-E008	Jefferson Park Pump Station (Add Alternate No. 1) Electrical Site Plan and One-Line Diagram

EXHIBIT E

PERMITS, SOIL BORING REPORTS AND ASBESTOS REPORTS



PERMIT
Under the Environmental Conservation Law (ECL)

GENERAL PERMIT GP-0-13-001
Freshwater Wetland Adjacent Area General Permit

Permittee and Facility Information

Permit Issued To:

Applicant Listed on
Request for Authorization

Facility:

Location Listed on
Request for Authorization

Applicable DEC Region(s): ALL

General Permit Authorized Activity: The following activities within the 100 foot Adjacent Area of State Regulated Freshwater Wetlands:

Activities in currently disturbed areas that do not have natural vegetation, that are located a minimum of 50 feet from the NYSDEC staff determined wetland boundary. Currently disturbed areas include landscaped lawn or garden areas at existing facilities; existing parking or paved areas and existing structures.

Authorized activities include:

- demolition and removal of existing accessory/appurtenant structures;
- construction of driveways or parking areas limited to 1000 sq. ft. within the adjacent area;
- additions to existing structures limited to 1000 sq. ft. basal area within the adjacent area;
- installation of garages, decks, porches, sheds, pools, utility lines and other accessory/appurtenant structures of less than 1000 sq. ft. basal area within the adjacent area;
- in-kind, in-place replacement of existing accessory/appurtenant structures, roads and associated utilities.

The authorized activities are to include appropriate stormwater runoff controls.

This permit does not authorize the following activities:

- any wetland disturbance, including placement of fills, grading, cutting or clearing of natural vegetation, or landscaping;
- any disturbance within 50 feet of the wetland boundary;
- any activity that disturbs greater than 1/4 of an acre in total for the entire project, within and beyond the adjacent area;
- construction of new, expanded or replacement septic systems;
- storage of hazardous substances;
- demolition of an existing primary structure;
- any activity that directly impacts buildings or historic districts listed in the NYS and/or National Register of Historic Places.



Permit Authorizations

Freshwater Wetlands - Under Article 24

Effective Date: 05/29/2013 Expiration Date: 04/30/2018

NYSDEC Approval

By acceptance of this permit, the permittee agrees that the permit is contingent upon strict compliance with the ECL, all applicable regulations, and all conditions included as part of this permit.

General Permit Authorized by

Permit Administrator: STUART M FOX , Deputy Chief Permit Administrator

Address: NYSDEC HEADQUARTERS
625 BROADWAY
ALBANY, NY 12233

Authorized Signature: _____

Stuart M. Fox

Date: 05/29/2013

Permit Components

NATURAL RESOURCE PERMIT CONDITIONS

GENERAL CONDITIONS, APPLY TO ALL AUTHORIZED PERMITS

NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

NATURAL RESOURCE PERMIT CONDITIONS - Apply to the Following Permits: FRESHWATER WETLANDS

1. Request for Authorization Prior to the use of this General Permit for a project, the Applicant must submit a Request for Authorization with the required attachments to the Regional Permit Administrator at the appropriate NYSDEC Regional Office. The attachments and NYSDEC office addresses are listed in the Instructions for the Request for Authorization.

Upon review of the project, NYSDEC will determine if the project can be issued under this General Permit. To qualify for this General Permit, the project must first avoid and then minimize any potential avoidable impacts in accordance with regulations, 6 NYCRR Part 663, Freshwater Wetland Permit Requirements. No work is authorized until the Permittee receives the signed Project Authorization from NYSDEC. NYSDEC may add specific additional requirements or plan notes to the Project Authorization.



NYSDEC retains the right to exclude a proposed activity from authorization under this General Permit, and to require the Applicant to obtain an individual permit.

2. Conformance With Plans All activities authorized by this permit must be in strict conformance with the approved plans submitted by the applicant or applicant's agent as part of the permit application. Such approved plans were prepared by the applicant.

3. Human or Archaeological Remains If any human remains or archaeological remains are encountered during excavation, the permittee must immediately cease, or cause to cease, all work in the area of the remains and notify the Regional Permit Administrator at the appropriate NYSDEC Regional Office. Work shall not resume until written permission to do so has been received from the Department.

4. Install, Maintain Erosion Controls Necessary erosion control measures, i.e., straw bales, silt fencing, etc., are to be placed on the downslope edge of any disturbed area. This sediment barrier is to be put in place before any disturbance of the ground occurs and is to be maintained in good and functional condition until thick vegetative cover is established.

5. Contain Stockpile and Disturbed Areas All disturbed areas where soil will be temporarily exposed or stockpiled for longer than one week shall be contained by a continuous line of staked hay bales/silt curtain (or other department-approved method) placed between the fill and wetland or protected buffer area. Tarps are authorized to supplement these approved methods for stockpiles. Temporary mulching shall be used for all other areas of exposed soils.

6. Maintain Erosion Controls These erosion control devices shall be maintained until all disturbed land is fully vegetated to prevent any silt or sediment from entering the freshwater wetland or its adjacent area. Silt fencing, hay bales and any accumulated silt or sediment shall be completely removed for disposal at an appropriate upland site.

7. Clean Fill Only All fill material utilized for this project shall consist of uncontaminated earthen materials only. Acceptable fill materials include gravel, rock, overburden, topsoil and similar natural mineral resources.

8. Invasive Species (Non-native Vegetation) To prevent the unintentional introduction or spread of invasive species, the permittee must ensure that all construction equipment be cleaned of mud, seeds, vegetation and other debris before entering any approved construction areas within the state regulated freshwater wetland or its 100 foot adjacent area.

9. No Construction Debris in Wetland or Adjacent Area Any debris or excess material from construction of this project shall be completely removed from the adjacent area (upland) and removed to an approved upland area for disposal. No debris is permitted in wetlands and/or protected buffer areas.

10. Concrete Leachate During construction, no wet or fresh concrete or leachate shall be allowed to escape into any wetlands or within 50 feet of the wetland boundary or waters of New York State, nor shall washings from ready-mixed concrete trucks, mixers, or other devices be allowed to enter any wetland or waters. Only watertight or waterproof forms shall be used. Wet concrete shall not be poured to displace water within the forms.

11. Pool Discharges There shall be no discharge from pools within 100 feet of the wetland.



12. Failure to Meet Permit Conditions Failure of the permittee to meet all the conditions of this permit is a violation of this permit and grounds for an order to immediately cease the permitted activity at the project site.

13. Precautions Against Contamination of Waters All necessary precautions shall be taken to preclude contamination of any wetland or waterway by suspended solids, sediments, fuels, solvents, lubricants, epoxy coatings, paints, concrete, leachate or any other environmentally deleterious materials associated with the project.

14. State Not Liable for Damage The State of New York shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the State for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

15. State May Require Site Restoration If upon the expiration or revocation of this permit, the project hereby authorized has not been completed, the applicant shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may lawfully require, remove all or any portion of the uncompleted structure or fill and restore the site to its former condition. No claim shall be made against the State of New York on account of any such removal or alteration.

16. State May Order Removal or Alteration of Work If future operations by the State of New York require an alteration in the position of the structure or work herein authorized, or if, in the opinion of the Department of Environmental Conservation it shall cause unreasonable obstruction to the free navigation of said waters or flood flows or endanger the health, safety or welfare of the people of the State, or cause loss or destruction of the natural resources of the State, the owner may be ordered by the Department to remove or alter the structural work, obstructions, or hazards caused thereby without expense to the State, and if, upon the expiration or revocation of this permit, the structure, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owners, shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable and flood capacity of the watercourse. No claim shall be made against the State of New York on account of any such removal or alteration.

GENERAL CONDITIONS - Apply to ALL Authorized Permits:

1. Facility Inspection by The Department The permitted site or facility, including relevant records, is subject to inspection at reasonable hours and intervals by an authorized representative of the Department of Environmental Conservation (the Department) to determine whether the permittee is complying with this permit and the ECL. Such representative may order the work suspended pursuant to ECL 71- 0301 and SAPA 401(3).

The permittee shall provide a person to accompany the Department's representative during an inspection to the permit area when requested by the Department.



A copy of this permit, including all referenced maps, drawings and special conditions, must be available for inspection by the Department at all times at the project site or facility. Failure to produce a copy of the permit upon request by a Department representative is a violation of this permit.

2. Relationship of this Permit to Other Department Orders and Determinations Unless expressly provided for by the Department, issuance of this permit does not modify, supersede or rescind any order or determination previously issued by the Department or any of the terms, conditions or requirements contained in such order or determination.

3. Applications For Permit Renewals, Modifications or Transfers The permittee must submit a separate written application to the Department for permit renewal, modification or transfer of this permit. Such application must include any forms or supplemental information the Department requires. Any renewal, modification or transfer granted by the Department must be in writing. Submission of applications for permit renewal, modification or transfer are to be submitted to:

Regional Permit Administrator
at the NYSDEC Regional/Sub-Office for
the county where the project is located

4. Submission of Renewal Application The permittee must submit a renewal application at least 30 days before permit expiration for the following permit authorizations: Freshwater Wetlands.

5. Permit Modifications, Suspensions and Revocations by the Department The Department reserves the right to exercise all available authority to modify, suspend or revoke this permit. The grounds for modification, suspension or revocation include:

- a. materially false or inaccurate statements in the permit application or supporting papers;
- b. failure by the permittee to comply with any terms or conditions of the permit;
- c. exceeding the scope of the project as described in the permit application;
- d. newly discovered material information or a material change in environmental conditions, relevant technology or applicable law or regulations since the issuance of the existing permit;
- e. noncompliance with previously issued permit conditions, orders of the commissioner, any provisions of the Environmental Conservation Law or regulations of the Department related to the permitted activity.

6. Permit Transfer Permits are transferrable unless specifically prohibited by statute, regulation or another permit condition. Applications for permit transfer should be submitted prior to actual transfer of ownership.



NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Item A: Permittee Accepts Legal Responsibility and Agrees to Indemnification

The permittee, excepting state or federal agencies, expressly agrees to indemnify and hold harmless the Department of Environmental Conservation of the State of New York, its representatives, employees, and agents ("DEC") for all claims, suits, actions, and damages, to the extent attributable to the permittee's acts or omissions in connection with the permittee's undertaking of activities in connection with, or operation and maintenance of, the facility or facilities authorized by the permit whether in compliance or not in compliance with the terms and conditions of the permit. This indemnification does not extend to any claims, suits, actions, or damages to the extent attributable to DEC's own negligent or intentional acts or omissions, or to any claims, suits, or actions naming the DEC and arising under Article 78 of the New York Civil Practice Laws and Rules or any citizen suit or civil rights provision under federal or state laws.

Item B: Permittee's Contractors to Comply with Permit

The permittee is responsible for informing its independent contractors, employees, agents and assigns of their responsibility to comply with this permit, including all special conditions while acting as the permittee's agent with respect to the permitted activities, and such persons shall be subject to the same sanctions for violations of the Environmental Conservation Law as those prescribed for the permittee.

Item C: Permittee Responsible for Obtaining Other Required Permits

The permittee is responsible for obtaining any other permits, approvals, lands, easements and rights-of-way that may be required to carry out the activities that are authorized by this permit.

Item D: No Right to Trespass or Interfere with Riparian Rights

This permit does not convey to the permittee any right to trespass upon the lands or interfere with the riparian rights of others in order to perform the permitted work nor does it authorize the impairment of any rights, title, or interest in real or personal property held or vested in a person not a party to the permit.

Item E: SEQR Unlisted Action, No Lead Agency, No Significant Impact Under the State Environmental Quality Review Act (SEQR), the project associated with this permit is classified as an Unlisted Action and the Department of Environmental Conservation has determined that it will not have a significant effect on the environment. Other involved agencies may reach an independent determination of environmental significance for this project.



New York State Department of Environmental Conservation
PART 1 - REQUEST FOR AUTHORIZATION for GP-0-13-001, Freshwater Wetland Adjacent Area General Permit
Environmental Conservation Law Article 24 Freshwater Wetlands

5/13

1. Name of Applicant

Michael Quinn, PE - Town of Yorktown		Telephone	914-962-1568		Email	mquinn@yorktownny.org	
Mailing Address		Post Office City	State	Zip			
363 Underhill Avenue		Yorktown Heights	NY	10598			
Applicant must be (check all that apply): <input type="checkbox"/> Owner <input type="checkbox"/> Operator <input type="checkbox"/> Lessee Taxpayer ID (if applicant is NOT an individual):							

2. Name of Property Owner (if different than Applicant)

Mailing Address		Telephone	Post Office City		State	Zip

3. Contact / Agent Name

Cosimo Pagano, PE - GHD		Telephone	315-679-5800		Email	cosimo.pagano@ghd.com	
Mailing Address		Post Office City	State	Zip			
1 Remington Park Drive		Cazenovia	NY	13035			

4. Project / Facility Name

Walden Woods Pump Station	Property Tax Map Section / Block / Lot Number	Section 27.07, Block 01, Lot 25
Project Location - street address, if applicable, or provide directions and distances to roads, bridges and bodies of water:		
Approximately 100-feet southwest of the Douglas Drive and Whittier Court intersection in the Town of Yorktown. The site is located adjacent to the road to the Southeast.		

Town / Village / City	Yorktown Heights	Stream/Waterbody Name	Not Applicable
County	Westchester	Name of USGS Quadrangle Map	Mohegan Lake Quadrangle

Location Coordinates: Enter NYTMs in kilometers OR Latitude/Longitude in degrees, minutes, seconds

NYTM-E	41.313642	NYTM-N	-73.776977	Latitude		Longitude	
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5. Type of Wetland Adjacent Area Project - 50' or more from the wetland boundary, and 1/4 acre or less of total disturbance:

- Demolition and removal of existing appurtenant structures
- Construction of driveways or parking areas, limited to 1,000 sq. ft.
- Additions to existing structures, limited to 1,000 sq. ft.
- Installation of garages, decks, porches, sheds, pools, utility lines and other appurtenant structures, limited to 1,000 sq. ft.
- In-kind, in-place replacement of existing appurtenant structures, roads, and associated utilities

Specific Project Description

Improvements to the Walden pump station includes replacement of existing wetwell, installation of a submersible grinder pump station and above grade enclosure to house critical components for operations (valves, control panels, etc.), electrical and HVAC improvements.

Proposed Start Date:	11-01-2016	Estimated Completion Date:	11-01-2017
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6. Certification. I have read this permit and will construct this project in compliance with the terms and conditions of the permit and the Environmental Conservation Law and applicable regulations. I understand that any false or inaccurate statements made in the application for this permit are punishable as a Class A misdemeanor. As a condition of this permit, I accept full legal responsibility for all damage, direct or indirect, of whatever nature, and by whomever suffered, arising out of the project described herein and agree to indemnify and save harmless the state from suits, actions, damages, and costs of every name and description resulting from this project.

If applicant is not the owner, both must sign the application. If you are submitting this application electronically, you may print your name and check the box that certifies you are the responsible applicant or property owner in lieu of providing an original signature.

Signature of Applicant	
Signature of Owner	Same as applicant
Signature of Agent / Contact	

- By checking this box, I certify that I am the responsible Applicant.
- By checking this box, I certify that I am the responsible Owner.

Printed Name	Michael Quinn, PE	Date	8/5/16
Printed Name		Date	
Printed Name	Cosimo Pagano, PE	Date	8/8/16

No work is authorized until the permittee receives the signed Part 2 - PROJECT AUTHORIZATION BY NYSDEC.



**PART 2 - PROJECT AUTHORIZATION BY NYSDEC
for GP-0-13-001 Freshwater Wetland Adjacent Area General Permit**

For NYSDEC Use Only

Use of General Permit GP-0-13-001, Freshwater Wetland Adjacent Area General Permit for the project described on Part 1 - Request for Authorization is AUTHORIZED as follows:

Effective Date of Authorization:

Expiration Date of Authorization:

Additional Information:

Use of General Permit GP-0-13-001, Freshwater Wetland Adjacent Area General Permit for the project described on Part 1 - Request for Authorization is NOT AUTHORIZED, you must apply for an individual permit.

Additional Information:

NYSDEC Authorization

Authorized Signature

Date

Printed Name

DEC Permit ID

Title

Address NYS Department of Environmental Conservation

cc



New York State Department of Environmental Conservation
PART 1 - REQUEST FOR AUTHORIZATION for GP-0-13-001, Freshwater Wetland Adjacent Area General Permit
 Environmental Conservation Law Article 24 Freshwater Wetlands

1. Name of Applicant

Michael Quinn, PE - Town of Yorktown	Telephone 914-962-1568	Email mquinn@yorktownny.org
Mailing Address 363 Underhill Avenue	Post Office City Yorktown Heights	State NY
		Zip 10598
Applicant must be (check all that apply): <input type="checkbox"/> Owner <input type="checkbox"/> Operator <input type="checkbox"/> Lessee		
Taxpayer ID (if applicant is NOT an individual):		

2. Name of Property Owner (if different than Applicant)

	Telephone	Email
Mailing Address	Post Office City	State
		Zip

3. Contact / Agent Name

Cosimo Pagano, PE - GHD	Telephone 315-679-5800	Email cosimo.pagano@ghd.com
Mailing Address 1 Remington Park Drive	Post Office City Cazenovia	State NY
		Zip 13035

4. Project / Facility Name

Jefferson Park Pump Station	Property Tax Map Section / Block / Lot Number Section 17.06, Block 01, Lot 08
-----------------------------	--

Project Location - street address, if applicable, or provide directions and distances to roads, bridges and bodies of water:

Approximately 200-feet west of the Juniper Drive and Curry Street intersection in the Town of Yorktown. The site is located adjacent to the road to the South.

Town / Village / City Yorktown Heights	Stream/Waterbody Name Not Applicable
County Westchester	Name of USGS Quadrangle Map Mohegan Lake Quadrangle

Location Coordinates: Enter NYTMs in kilometers OR Latitude/Longitude in degrees, minutes, seconds

NYTM-E 41.318898	NYTM-N -73.778529	Latitude	Longitude
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5. Type of Wetland Adjacent Area Project - 50' or more from the wetland boundary, and 1/4 acre or less of total disturbance:

- Demolition and removal of existing appurtenant structures
- Construction of driveways or parking areas, limited to 1,000 sq. ft.
- Additions to existing structures, limited to 1,000 sq. ft.
- Installation of garages, decks, porches, sheds, pools, utility lines and other appurtenant structures, limited to 1,000 sq. ft.
- In-kind, in-place replacement of existing appurtenant structures, roads, and associated utilities

Specific Project Description

Improvements to the Jefferson Park pump station includes replacement of existing wetwell, installation of a submersible grinder pump station and above grade enclosure to house critical components for operations (valves, control panels, etc.), electrical and HVAC improvements.

Proposed Start Date: 11-01-2016	Estimated Completion Date: 11-01-2017
------------------------------------	--

6. Certification. I have read this permit and will construct this project in compliance with the terms and conditions of the permit and the Environmental Conservation Law and applicable regulations. I understand that any false or inaccurate statements made in the application for this permit are punishable as a Class A misdemeanor. As a condition of this permit, I accept full legal responsibility for all damage, direct or indirect, of whatever nature, and by whomever suffered, arising out of the project described herein and agree to indemnify and save harmless the state from suits, actions, damages, and costs of every name and description resulting from this project.

If applicant is not the owner, both must sign the application. If you are submitting this application electronically, you may print your name and check the box that certifies you are the responsible applicant or property owner in lieu of providing an original signature.

Signature of Applicant 	<input checked="" type="checkbox"/> By checking this box, I certify that I am the responsible Applicant.	Printed Name Michael Quinn, PE	Date 8/5/16
Signature of Owner Same as applicant	<input type="checkbox"/> By checking this box, I certify that I am the responsible Owner.	Printed Name	Date
Signature of Agent / Contact 		Printed Name Cosimo Pagano, PE	Date 8/8/16

Reset Form

No work is authorized until the permittee receives the signed Part 2 - PROJECT AUTHORIZATION BY NYSDEC.



**PART 2 - PROJECT AUTHORIZATION BY NYSDEC
for GP-0-13-001 Freshwater Wetland Adjacent Area General Permit**

For NYSDEC Use Only

Use of General Permit GP-0-13-001, Freshwater Wetland Adjacent Area General Permit for the project described on Part 1 - Request for Authorization is AUTHORIZED as follows:

Effective Date of Authorization:

Expiration Date of Authorization:

Additional Information:

Use of General Permit GP-0-13-001, Freshwater Wetland Adjacent Area General Permit for the project described on Part 1 - Request for Authorization is NOT AUTHORIZED, you must apply for an individual permit.

Additional Information:

NYSDEC Authorization

Authorized Signature

Date

Printed Name

DEC Permit ID

Title

Address

cc



PERMIT
Under the Environmental Conservation Law (ECL)

Permittee and Facility Information

Permit Issued To:
TOWN OF YORKTOWN
TOWN HALL
363 UNDERHILL AVE
YORKTOWN HEIGHTS, NY 10598
(914) 962-6565

Facility:
TOWN OF YORKTOWN - PUMP STATION
JEFFERSON VALLEY PUMP STATION
Yorktown Heights, NY 10598

Facility Location: in YORKTOWN in WESTCHESTER COUNTY

Facility Principal Reference Point: NYTM-E: 602.226 NYTM-N: 4574.88
Latitude: 41°19'08.1" Longitude: 73°46'43.0"

Authorized Activity: This permit authorizes disturbances to the 100 foot adjacent area of NYS Freshwater Wetland A-13 (Class 1). The disturbances are in association to work on the existing Jefferson Valley (sanitary wastewater) Pump Station. The proposed facility improvements include the following: removal of existing access structures and pump station equipment; installation of a new fence; installation of new sewer lines within the facility's existing perimeter; and installation of new pump station equipment and associated structures.

All work must be conducted in strict accordance with the plans referenced in Natural Resource Condition No. 1 of this Permit.

No wetland Fill is authorized.

Permit Authorizations

Freshwater Wetlands - Under Article 24

Permit ID 3-5554-00325/00001

New Permit

Effective Date: 12/5/2016

Expiration Date: 12/31/2018

NYSDEC Approval

By acceptance of this permit, the permittee agrees that the permit is contingent upon strict compliance with the ECL, all applicable regulations, and all conditions included as part of this permit.

Permit Administrator: JOHN W PETRONELLA, Deputy Regional Permit Administrator
Address: NYSDEC Region 3 Headquarters
21 S Putt Corners Rd
New Paltz, NY 12561



Authorized Signature: _____

Date 12 / 7 / 2016

Permit Components

NATURAL RESOURCE PERMIT CONDITIONS

GENERAL CONDITIONS, APPLY TO ALL AUTHORIZED PERMITS

NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

**NATURAL RESOURCE PERMIT CONDITIONS - Apply to the Following
Permits: FRESHWATER WETLANDS**

1. **Conformance With Plans** All activities authorized by this permit must be in strict conformance with the approved plans submitted by the applicant or applicant's agent as part of the permit application. Such approved plans were prepared by GHD Consulting Services Inc.
2. **Post Permit Sign** The permit sign enclosed with this permit shall be posted in a conspicuous location on the worksite and adequately protected from the weather.
3. **Notify DEC 48 Hrs Prior to Work** The permittee or a representative must contact by telephone Heather Gierloff at 845-256-3086 at least 48 hours prior to the commencement of the project authorized herein.
4. **Install Erosion Controls** Before any soil is disturbed on the subject site, the permittee shall install erosion and sedimentation controls which are adequate to prevent erosion and sedimentation off-site. Such controls shall be maintained until the unpaved portions of subject site, if any, are stabilized by a self-sustaining cover of vegetation that is adequate to prevent erosion and sedimentation on and off such site. Before such controls are removed, the permittee shall remove all sediment that has accumulated at such controls.
5. **No Wetland Disturbance** No disturbance to the wetland proper is authorized.
6. **Precautions Against Contamination of Waters** All necessary precautions shall be taken to preclude contamination of any wetland or waterway by suspended solids, sediments, fuels, solvents, lubricants, epoxy coatings, paints, concrete, leachate or any other environmentally deleterious materials associated with the project.



7. State May Order Removal or Alteration of Work If future operations by the State of New York require an alteration in the position of the structure or work herein authorized, or if, in the opinion of the Department of Environmental Conservation it shall cause unreasonable obstruction to the free navigation of said waters or flood flows or endanger the health, safety or welfare of the people of the State, or cause loss or destruction of the natural resources of the State, the owner may be ordered by the Department to remove or alter the structural work, obstructions, or hazards caused thereby without expense to the State, and if, upon the expiration or revocation of this permit, the structure, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owners, shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable and flood capacity of the watercourse. No claim shall be made against the State of New York on account of any such removal or alteration.

8. State May Require Site Restoration If upon the expiration or revocation of this permit, the project hereby authorized has not been completed, the applicant shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may lawfully require, remove all or any portion of the uncompleted structure or fill and restore the site to its former condition. No claim shall be made against the State of New York on account of any such removal or alteration.

9. State Not Liable for Damage The State of New York shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the State for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

GENERAL CONDITIONS - Apply to ALL Authorized Permits:

1. Facility Inspection by The Department The permitted site or facility, including relevant records, is subject to inspection at reasonable hours and intervals by an authorized representative of the Department of Environmental Conservation (the Department) to determine whether the permittee is complying with this permit and the ECL. Such representative may order the work suspended pursuant to ECL 71- 0301 and SAPA 401(3).

The permittee shall provide a person to accompany the Department's representative during an inspection to the permit area when requested by the Department.

A copy of this permit, including all referenced maps, drawings and special conditions, must be available for inspection by the Department at all times at the project site or facility. Failure to produce a copy of the permit upon request by a Department representative is a violation of this permit.

2. Relationship of this Permit to Other Department Orders and Determinations Unless expressly provided for by the Department, issuance of this permit does not modify, supersede or rescind any order or determination previously issued by the Department or any of the terms, conditions or requirements contained in such order or determination.



3. Applications For Permit Renewals, Modifications or Transfers The permittee must submit a separate written application to the Department for permit renewal, modification or transfer of this permit. Such application must include any forms or supplemental information the Department requires. Any renewal, modification or transfer granted by the Department must be in writing. Submission of applications for permit renewal, modification or transfer are to be submitted to:

Regional Permit Administrator
NYSDEC Region 3 Headquarters
21 S Putt Corners Rd
New Paltz, NY12561

4. Submission of Renewal Application The permittee must submit a renewal application at least 30 days before permit expiration for the following permit authorizations: Freshwater Wetlands.

5. Permit Modifications, Suspensions and Revocations by the Department The Department reserves the right to exercise all available authority to modify, suspend or revoke this permit. The grounds for modification, suspension or revocation include:

- a. materially false or inaccurate statements in the permit application or supporting papers;
- b. failure by the permittee to comply with any terms or conditions of the permit;
- c. exceeding the scope of the project as described in the permit application;
- d. newly discovered material information or a material change in environmental conditions, relevant technology or applicable law or regulations since the issuance of the existing permit;
- e. noncompliance with previously issued permit conditions, orders of the commissioner, any provisions of the Environmental Conservation Law or regulations of the Department related to the permitted activity.

6. Permit Transfer Permits are transferrable unless specifically prohibited by statute, regulation or another permit condition. Applications for permit transfer should be submitted prior to actual transfer of ownership.



NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Item A: Permittee Accepts Legal Responsibility and Agrees to Indemnification

The permittee, excepting state or federal agencies, expressly agrees to indemnify and hold harmless the Department of Environmental Conservation of the State of New York, its representatives, employees, and agents ("DEC") for all claims, suits, actions, and damages, to the extent attributable to the permittee's acts or omissions in connection with the permittee's undertaking of activities in connection with, or operation and maintenance of, the facility or facilities authorized by the permit whether in compliance or not in compliance with the terms and conditions of the permit. This indemnification does not extend to any claims, suits, actions, or damages to the extent attributable to DEC's own negligent or intentional acts or omissions, or to any claims, suits, or actions naming the DEC and arising under Article 78 of the New York Civil Practice Laws and Rules or any citizen suit or civil rights provision under federal or state laws.

Item B: Permittee's Contractors to Comply with Permit

The permittee is responsible for informing its independent contractors, employees, agents and assigns of their responsibility to comply with this permit, including all special conditions while acting as the permittee's agent with respect to the permitted activities, and such persons shall be subject to the same sanctions for violations of the Environmental Conservation Law as those prescribed for the permittee.

Item C: Permittee Responsible for Obtaining Other Required Permits

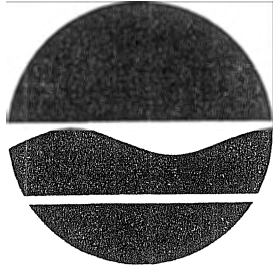
The permittee is responsible for obtaining any other permits, approvals, lands, easements and rights-of-way that may be required to carry out the activities that are authorized by this permit.

Item D: No Right to Trespass or Interfere with Riparian Rights

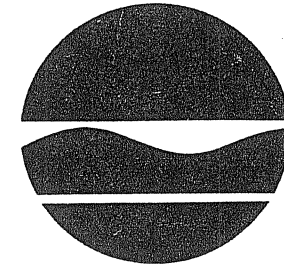
This permit does not convey to the permittee any right to trespass upon the lands or interfere with the riparian rights of others in order to perform the permitted work nor does it authorize the impairment of any rights, title, or interest in real or personal property held or vested in a person not a party to the permit.

Item E: SEQR Type II Action Under the State Environmental Quality Review Act (SEQR), this project has been determined to be a Type II Action and therefore is not subject to further procedures under this law.

New York State
Department of Environmental Conservation



NOTICE



The Department of Environmental Conservation (DEC) has issued permit(s) pursuant to the Environmental Conservation Law for work being conducted at this site. For further information regarding the nature and extent of work approved and any Department conditions on it, contact the DEC at 845/256-3054. Please refer to the permit number shown when contacting the DEC.

Permittee: Town of Yorktown Permit No. 3- 5554-00325/00001

Effective Date: 12/5/2016 Expiration date: 12/31/2018

Applicable if checked. No instream work allowed between October 1 & April 30

NOTE: This notice is **NOT** a permit.

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: GHD Consulting Services	SHEET <u>1</u> OF <u>1</u> HOLE NO. BWW-1
	PROJECT NO. G148-0101-15 PROJECT NAME Proposed Walden Woods Pump Station	BORING LOCATIONS per Plan
FOREMAN - DRILLER TP/ad	LOCATION Douglas Drive Yorktown, NY	
INSPECTOR	CASING TYPE FW SAMPLER SS CORE BAR	OFFSET DATE START 6/24/15 DATE FINISH 6/24/15
GROUND WATER OBSERVATIONS AT <u>5</u> FT AFTER <u>0</u> HOURS AT <u>0</u> FT ON <u>7-7-15</u>	SIZE I.D. 2 3/8" HAMMER WT. 140# HAMMER FALL 30"	SURFACE ELEV. GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE)		CORE TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		NO	Type	PEN	REC	DEPTH @ BOT	0 - 6	6 - 12				
5	20										tr cobbles from 4 - 5'	
	24											
	37											
	91											
	98											
	20	1	ss	24"	14"	7'0"	86	35		wet hard	Brn SILT, sm F gravel, lit roots, FM sand (fill)	
	32						20	18				
	34											
	36											
	54											
10	68	2	ss	24"	14"	12'0"	14	17		wet v stiff	Brn SILT & FMC SAND, lit F gravel	
	110						13	16				
	74											
	78											
	104											
15	84	3	ss	24"	15"	17'0"	20	54		wet v dense	Gry/Brn VF-F to M SAND, sm FC gravel, lit silt, tr cobble	
	70						16	19				
	400/10"											
20		4	ss	2"	2"	18'2"	100/2"			v dense	18'2"	weathered BEDROCK or BOULDER frags AUGER REFUSAL
												E.O.B. 18'2"
25												Installed 1" SCH 40 PVC Observation Well with 10' screen to 18' depth. (with Tripod)
40												

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

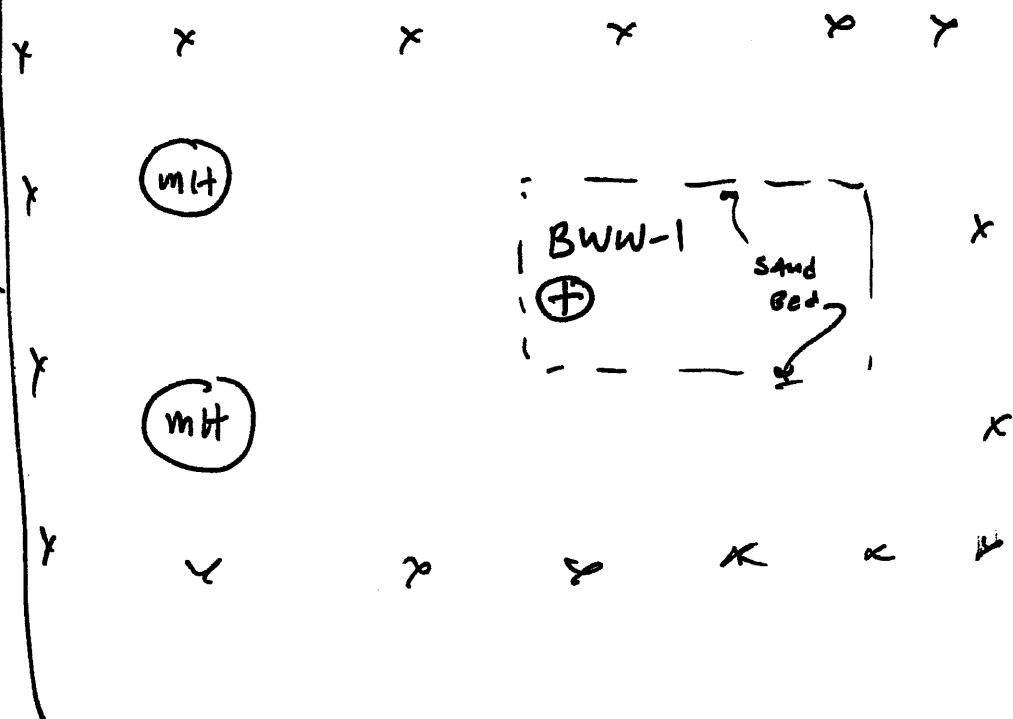
GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT. HOLE NO. **BWW-1**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
 WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE
 SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM
 PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND = 35 - 50% F = FINE

WHITTER

House #
3122

Douglas Drive



JOB NO.

G148-0101-15

SOILTESTING, INC.

90 Donovan Road
Oxford, CT 06478

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: GHD Consulting Services	SHEET <u>1</u> OF <u>1</u>
	PROJECT NO. G148-0101-15	HOLE NO. BJV-1
FOREMAN - DRILLER TP/ad	PROJECT NAME Proposed Jefferson Valley Pump Station	BORING LOCATIONS per Plan
INSPECTOR	LOCATION Forest Court Yorktown, NY	
GROUND WATER OBSERVATIONS AT <u>10</u> FT AFTER <u>0</u> HOURS AT <u> </u> FT AFTER <u> </u> HOURS	CASING TYPE HSA	OFFSET
	SAMPLER SS	DATE START 6/26/15
	CORE BAR	DATE FINISH 6/26/15
	SIZE I.D. 4 1/4"	SURFACE ELEV.
	HAMMER WT. 140#	GROUND WATER ELEV.
	HAMMER FALL 30"	

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE)		CORE TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		NO	Type	PEN	REC.	DEPTH @ BOT	0 - 6	6 - 12				
5		1	ss	24"	18"	7'0"	4	5		moist/wet stiff		Gry/Brn SILT, sm FMC SAND, lit clay, tr organic silt, F gravel (fill)
10		2	ss	24"	20"	12'0"	3	4		moist/wet stiff	11'0"	Brn ORGANIC SILT, tr roots Gry CLAY, tr roots, bark lit cobbles at 14'
15		3	ss	24"	9"	17'0"	14	13		I moist compact	15'0"	Brn FMC SAND, sm silt, lit F gravel
20							10	16			18'0" 19'0"	poss BEDROCK or BOULDER AUGER REFUSAL
25												E.O.B. 19'0"
30												
35												
40												

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT. **HOLE NO. BJV-1**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
 WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE
 SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM
 PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND = 35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: GHD Consulting Services	SHEET <u>1</u> OF <u>1</u> HOLE NO. BJV-2
	PROJECT NO. G148-0101-15 PROJECT NAME Proposed Jefferson Valley Pump Station	BORING LOCATIONS per Plan
FOREMAN - DRILLER TP/ad	LOCATION Forest Court Yorktown, NY	
INSPECTOR	CASING SAMPLER CORE BAR TYPE HSA SS	OFFSET DATE START 6/26/15 DATE FINISH 6/26/15
GROUND WATER OBSERVATIONS AT <u>10</u> FT AFTER <u>0</u> HOURS AT <u>6'0"</u> FT ON <u>7-7-15</u>	SIZE I.D. 4 1/4" HAMMER WT. 140# HAMMER FALL 30"	SURFACE ELEV. GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE)		CORE TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		NO	Type	PEN	REC	DEPTH @ BOT	0 - 6	6 - 12				
						2'0"						
5		1	ss	24"	20"	7'0"	5	5		v moist stiff		Gry SILT, sm FMC sand, lit F gravel, clay, tr organic silt, roots (fill)
							7	8				
10		2	ss	24"	5"	12'0"	2	3		v moist v stiff		Gry SILT & FMC SAND, lit clay, tr FC gravel, roots (poss fill)
							13	21				lit cobbles at 13' sm cobbles from 14 - 15'
15		3	ss	24"	6"	17'0"	9	8		moist/wet stiff	18'0"	Brn CLAYEY SILT & FMC SAND, lit F GRAVEL
							6	7				
20		4	ss	24"	12"	22'0"	11	18		moist/wet dense	22'0"	sm cobbles at 18' Brn FM SAND, sm silt, lit F gravel Brn FM SAND, tr silt
							17	19			23'0"	poss fractured BEDROCK AUGER REFUSAL
25												E.O.B. 23'0"
30												Installed 1" SCH 40 PVC observation well with 10' screen length to 23'
35												
40												

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT. HOLE NO. **BJV-2**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND = 35 - 50% F = FINE

Limited Asbestos Inspection Report

Performed at:

**Jefferson Valley Pumping Station located on Forest Court, Yorktown Heights,
New York**



Prepared for:

Ms. Sarah E. Cwikla

Project Director

GHD

150 Grand Street, 4th Floor

White Plains NY

Prepared by:

Environmental Maintenance Contractors, Inc.

5 Anderson Lane

Goldens Bridge, New York 10526

Tel: 914-232-7355, Fax: 914-232-7357

Email: rstumbo@enviromain.com

Date: June 29, 2015

ENVIRONMENTAL MAINTENANCE CONTRACTORS, INC.

Environmental Consulting, Testing, Reporting and Remedial / Abatement Services

*Asbestos Testing and Removal * Lead Based Paint (XRF) Testing * Underground Storage Tank Removal Services*
* Indoor Air Quality Testing * Mold Abatement Service * Hazardous Material Testing and Abatement *
Environmental Phase I and II Assessments

June 29, 2015

Attn: Ms. Sarah E. Cwikla
Project Director
GHD
150 Grand Street, 4th Floor
White Plains NY

Phone: 914 703 4700 Mobile: 203 258 2177
Email: Sarah.Ccwikla@ghd.com

LIMITED ASBESTOS SURVEY/INSPECTION REPORT

PROPERTY INSPECTED

Subject property is the Jefferson Valley Pumping Station located on Forest Court, Yorktown Heights, NY.

TARGET STRUCTURE/AREAS

Limited survey of readily accessible suspect Asbestos Containing Materials (ACM's) within interior and exterior of the Jefferson Valley Pumping Station located on Forest Court, Yorktown Heights, NY.

GENERAL DESCRIPTION OF TARGETED STRUCTURES/AREAS

The target areas are interior and exterior of the Jefferson Valley Pumping Station located on Forest Court, Yorktown Heights, NY.

INSPECTION RATIONALE

Environmental Maintenance Contractors, Inc. (EMC) was retained to perform a limited inspection to determine if any Asbestos Containing Materials (ACM's) exist within the target areas. No penetrations or exploratory demolition was performed during the inspection to access suspect asbestos containing building materials that may be located within ceilings, walls and floor cavities.

INSPECTION AND BULK SAMPLE COLLECTION

The target areas were inspected for Asbestos Containing Materials (ACM's) on June 24, 2015. All accessible areas/rooms were visually inspected and representative samples were collected, as appropriate and required by NYS. The inspection was performed by Francis Ciriaco. Representing EMC, Mr. Ciriaco (Cert. # 09-19591) is a NYS-DOL Certified Asbestos Inspector.

INSPECTION PROTOCOL

The purpose of the inspection was to identify readily accessible asbestos containing building materials within the target areas. For the purpose of performing this inspection, EMC inspectors visited all accessible areas within the target areas and collected samples of representative materials.

INACCESSIBLE AREAS

N/A

LABORATORY

Friable (joint compound, sheetrock, etc.) and Non-Friable-Organically Bound (NOB) (pipe gasket, caulking, roofing materials, etc.) materials were both analyzed by PLM. Any NOB samples that were negative for asbestos via PLM were analyzed via Transmission Electron Microscopy (TEM) for confirmatory purposes, per NYS requirements. The NYS DOH requires TEM analysis to conclusively state that a NOB sample does not contain asbestos.

SAMPLED MATERIALS

The following is a listing of the suspect asbestos containing building materials collected from the target areas and submitted for analysis for the purpose of this report:

- Joint Compound
- Sheetrock
- Engine Exhaust Insulation
- Engine Exhaust Gasket
- Door Insulation
- Pipe Gasket
- Ceiling Insulation
- Door Caulking
- Louver Caulking
- Roof Felt
- Roof Shingle

RESULTS & QUANTITIES (Asbestos Containing Materials Only)

Sample analysis indicates that the following materials were found to contain asbestos in concentrations greater than one-percent (>1%) and are therefore deemed Asbestos Containing Materials (ACM), including:

ACM Type	Location	Approx. Quantity
Engine Exhaust Insulation	Interior	2 Linear Feet
Louver Caulking	Exterior – Louver	5 Square Feet
Roof Shingles	Exterior – Entire Roof	750 Square Feet

CONCLUSIONS

The limited asbestos survey did identify accessible asbestos containing materials, within the target areas of the building known as the Jefferson Valley Pumping Station, located on Forest Court, Yorktown Heights, NY. Please find attached the laboratory sample analysis report for building materials sampled as well as a copy of the accredited laboratory certifications for the asbestos laboratory utilized for this project.

Please note that based on the nature of this inspection, it is possible that unidentified materials may be uncovered and/or encountered during demolition/construction activities. If additional suspect asbestos containing materials are encountered during demolition activities, work should cease within that area of work, the area should be isolated from unauthorized entry, and the materials should be sampled for analysis to determine total asbestos content. Only through further sampling and analysis by certified personnel and the use of an accredited laboratory can a suspect material be identified as non-asbestos containing.

Additionally, if any additional identified asbestos containing materials is located, and is similar in mode of occurrence or physical properties as other identified asbestos-containing materials, it should be considered asbestos containing.

As per applicable Federal, State, and City regulations all asbestos containing materials identified must be properly abated by a NYS DOL Licensed Contractors as well as NYSDOL Certified personnel prior to any demolition/renovation activities that could disturb these materials. Any penetrations to the ACM or impact to the intact ACM matrix would be considered a disturbance. Please note that any non-asbestos contractor performing any work that may impact the building materials must be informed of the presence and location of the ACM, and that disturbance is prohibited. In addition, the non-asbestos contractor personnel performing any work on or around ACM's must have current OSHA asbestos awareness training.

New York State Department of Labor Industrial Code Rule 56 requires that a copy of this report be immediately transmitted to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws. The completed asbestos survey for controlled demolition or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office. Compliance to these requirements will be the responsibility of the building/structure owner or their agent.

Please note that sample results for the “Joint Compound” on all sheetrock building materials indicated asbestos concentration of up to 0.5 percent and are considered non asbestos containing materials. However, care should be taken by workers during disturbance of these materials in order to avoid exposure to elevated concentration of asbestos fibers that may result.

Should you have any questions or require additional information, please do not hesitate to contact me at (914) 232-7355.

Sincerely,
Environmental Maintenance Contractors, Inc.


Allan Ciriaco
Vice President of Operations

Attachment(s): Laboratory Sample Results, Licenses and Certifications



Cardno ATC
 104 E. 25th Street, 10th Floor
 New York, NY 10010
 Tel. 212-353-8280
 Fax: 212-353-8306

Client: ENVIRONMENTAL MAINTENANCE CONTRACTORS
 5 ANDERSON LANE
 GOLDENS BRIDGE , NY 10526
Fax: (914) 232-7357 **Phone:** (914) 232-7355
Project: GHD

Sample Date: 6/24/2015
Date Received : 6/25/2015
Date Analyzed : 6/26/2015
Cardno ATC Batch # 33159

Methods: EPA 600/M4-82-020
 ELAP 198.1, 198.6 and 198.4

Location: JEFFERSON VALLEY, PUMPING STATION

Bulk Asbestos Analysis Results

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u> % Type	<u>Asbestos</u> % Type
				% Fibrous	% Non-Fibrous		
1	1st Floor	Joint Compound	PLM	Trace% Cellulose	99.75% Mineral Filler		0.25% Chrysotile
					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: White		Comments: NOB Recommended			Total Asbestos: 0.25 %
2	1st Floor	Joint Compound	PLM	Trace% Cellulose	99.5% Mineral Filler		0.5% Chrysotile
					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: White		Comments: NOB Recommended			Total Asbestos: 0.50 %
3	1st Floor	Sheetrock	PLM	20% Cellulose	80% Mineral Filler		
					0.0% Vermiculite		NONE DETECTED
Analyzed By: Ivan Reyes		Color: Off-wt/tan					
4	1st Floor	Sheetrock	PLM	20% Cellulose	80% Mineral Filler		
					0.0% Vermiculite		NONE DETECTED
Analyzed By: Ivan Reyes		Color: Off-wt/tan					
5	1st Floor	Engine Exhaust Insulation	PLM	5% Cellulose 40% FiberGlass	52% Mineral Filler		3% Chrysotile
					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Gray					Total Asbestos: 3.0 %
6	1st Floor	Engine Exhaust Insulation					
							NOT ANALYZED
				Comments: Positive stop, see #5			
7	1st Floor	Engine Exhaust Insulation					
							NOT ANALYZED
				Comments: Positive stop, see #5			



Cardno ATC
 104 E. 25th Street, 10th Floor
 New York, NY 10010
 Tel. 212-353-8280
 Fax: 212-353-8306

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
8	1st Floor	Engine Exhaust Gasket	NOB-TEM			87.8% Organic 4.2% Residue 8% Carbonate	NONE DETECTED
		Color: Brn/blk		0.0% Vermiculite			
Analyzed By: Ivan Reyes		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
9	1st Floor	Engine Exhaust Gasket	NOB-TEM			87.8% Organic 6.7% Residue 5.5% Carbonate	NONE DETECTED
		Color: Brn/blk		0.0% Vermiculite			
Analyzed By: Ivan Reyes		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
10	1st Floor	Door Insulation	PLM	90% Cellulose	10% Mineral Filler		NONE DETECTED
		Color: Brown		0.0% Vermiculite			
Analyzed By: Ivan Reyes							
11	1st Floor	Door Insulation	PLM	90% Cellulose	10% Mineral Filler		NONE DETECTED
		Color: Brown		0.0% Vermiculite			
Analyzed By: Ivan Reyes							
12	Basement	Door Insulation	PLM	95% Cellulose	5% Mineral Filler		NONE DETECTED
		Color: Brown		0.0% Vermiculite			
Analyzed By: Ivan Reyes							
13	Basement	Pipe Gasket	NOB-TEM			39.3% Organic 4.4% Residue 56.3% Carbonate	NONE DETECTED
		Color: Red		0.0% Vermiculite			
Analyzed By: Ivan Reyes		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
14	Basement	Pipe Gasket	NOB-TEM			31.7% Organic 7.4% Residue 60.9% Carbonate	NONE DETECTED
		Color: Red		0.0% Vermiculite			
Analyzed By: Ivan Reyes		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
15	Exterior (Inside Soffit)	Ceiling Insulation	PLM	5% Cellulose 85% FiberGlass	10% Mineral Filler		NONE DETECTED
		Color: Yellow		0.0% Vermiculite			
Analyzed By: Ivan Reyes							
16	Exterior (Inside Soffit)	Ceiling Insulation	PLM	3% Cellulose 85% FiberGlass	12% Mineral Filler		NONE DETECTED
		Color: Yellow		0.0% Vermiculite			
Analyzed By: Ivan Reyes							
17	Exterior (Inside Soffit)	Ceiling Insulation	PLM	6% Cellulose 85% FiberGlass	9% Mineral Filler		NONE DETECTED
		Color: Yellow		0.0% Vermiculite			
Analyzed By: Ivan Reyes							



Cardno ATC
 104 E. 25th Street, 10th Floor
 New York, NY 10010
 Tel. 212-353-8280
 Fax: 212-353-8306

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
18	Exterior (Inside Soffit)	Door Caulking	NOB-TEM			24.7% Organic 10% Residue 65.3% Carbonate	NONE DETECTED
33159 -18					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: White Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
19	Exterior (Inside Soffit)	Door Caulking	NOB-TEM			24.2% Organic 43.2% Residue 32.6% Carbonate	NONE DETECTED
33159 -19					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: White Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
20	Exterior (Inside Soffit)	Louver Caulking	NOB-TEM			11.8% Organic 33.4% Residue 51.1% Carbonate	3.7% Chrysotile
33159 -20					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Dk.Grey Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
							Total Asbestos: 3.7 %
21	Exterior	Louver Caulking	NOB-PLM			20.2% Organic 29.2% Residue 50.6% Carbonate	NONE DETECTED
33159 -21					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Dk.Grey Second Analyst: Mohamed Fata	Comments: PLM inconclusive, NOB-PLM inconclusive, positive stop, see #20				
22	Roof	Roof Felt	NOB-TEM			91.3% Organic 3.7% Residue 5% Carbonate	NONE DETECTED
33159 -22					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Black Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
23	Roof	Roof Felt	NOB-TEM			90.4% Organic 3.4% Residue 6.2% Carbonate	NONE DETECTED
33159 -23					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Black Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
24	Roof	Roof Shingle	NOB-PLM			55% Organic 8.6% Residue 34.2% Carbonate	2.2% Chrysotile
33159 -24					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: White/blk Second Analyst: Mohamed Fata	Comments: PLM inconclusive				
							Total Asbestos: 2.2 %
25	Roof	Roof Shingle					NOT ANALYZED
33159 -25							
							Comments: Positive stop, see #24



Cardno ATC
 104 E. 25th Street, 10th Floor
 New York, NY 10010
 Tel. 212-353-8280
 Fax: 212-353-8306

Sample #	Location	Type of Material	Method	Non-Asbestos		NOB	Asbestos
				% Fibrous	% Non-Fibrous	% Type	% Type

NOTES:

1) The Limit of Detection is the same as the Reporting Limit for these results.

2) The Reporting Limit (RL) is the Limit of Quantitation. For point counts the limit of quantitation of 0.25%; based on one asbestos point counter over 400 non-empty points.

3) Asbestos Containing Material (ACM) Definition: > 1% asbestos by weight is considered an ACM

4) Disclaimer: The laboratory is not responsible for sample collection. Please refer to enclosed letter. This report may not be reproduced, except in full, without written approval by Cardno ATC. This report may not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. This report relates only to the samples reported above as described in the chain of custody. Quality control data is available upon request.

5) Accredited by NVLAP #101187-0 and by NY State ELAP #10879

6) Confidentiality Notice: The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above

7) Liability Notice: Cardno ATC and its personnel shall not be liable for any misinformation provided to us by the client regarding these samples. This report relates only to samples submitted and analyzed.

8) Asbestos results are reliable to 2 significant figures.

9) The condition of all samples was acceptable upon receipt.

10) The laboratory certifies that the test results meet all requirements of NELAC.

11) Supplement to test report batch # _____. Amendments: _____. Amendment Dates: _____. Amended by: _____

12) PLM Letter is attached on this report.

13) TRACE: The result is reported as Trace when No points are counted and asbestos is identified. For ELAP Trace is < 1%.

14) Cardno ATC certifies that this report is an accurate and authentic report of the results obtained from the laboratory analysis

15) The uncertainty for these test results is available upon request.

16) ELAP requires method ELAP 198.1 for the analysis of samples containing ≤ 10% vermiculite. For samples containing > 10% vermiculite ELAP requires methods ELAP 198.1 followed by ELAP 198.6. "This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."

Ivan Reyes

Analyst:

Mohamed Fata

Analyst:

Roman Peysakhov

Analyst:

Milena Bonezzi 

Approved by
 Laboratory Director:

33159

Asbestos Bulk Sample Analysis - Chain of Custody

Client: <u>GHD</u>	Turn Around Time: <u>24hr</u> 48hr 72hr
Site Location: <u>JEFFERSON VALLEY PUMPING STATION</u>	Rush 12hr Other: _____
Project: _____	Date Sampled: <u>6-24-2015</u>
Technician: <u>Francis Ciriaco</u>	Cert#(s): <u>09-19591</u> Exp. <u>10/2015</u>
Phone: <u>914-232-7355</u>	Lab#: _____
Fax: <u>914-232-7357</u>	
Email: <u>admin@enviromain.com</u>	

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
1	1	JOINT COMPOUND	1ST FLOOR	Y		Please Stop on First Positive for each Group
2	1	" "				
3	2	SHEETROCK				
4	2	" "				
5	3	ENGINE EXHAUST INSULATION				
6	3	" "				
7	3	" "				
8	4	ENGINE EXHAUST GASKET	1ST FLOOR	N		Analyzed by <u>David Lopez</u> 6/25/15 12:05 pm
9	4	" "		N		
10	5	DOOR INSULATION				
11	5	" "	BASEMENT	Y		Drawing/Sketch (Required)
12	5	" "		N		
13	6	PIPE GASKET	BASEMENT	Y		11 not seen 9 not seen
14	6	" "		N		
15	7	CEILING INSULATION		EXTERIOR (INSIDE JOFFIT)	Y	

Sampled By: (Signature) <u>[Signature]</u>	Date
Relinquished By: (Signature) <u>[Signature]</u>	Date
Printed Name: <u>Francis Ciriaco</u>	Time
Relinquished By: (Signature) <u>[Signature]</u>	Date
Printed Name: <u>ATC/ao/GB</u>	Time
Relinquished By: (Signature) <u>[Signature]</u>	Date
Printed Name: <u>[Signature]</u>	Time

33159

Asbestos Bulk Sample Analysis - Chain of Custody

Client: <u>GHD</u>	DATA DELIVERY	Ture Around Time
Site Location: <u>JEFFERSON VALLEY PUMPING STATION</u>	Phone: <u>914-232-7355</u>	Rush 12hr <u>24hr</u> 48hr 72hr
Project: _____	Fax: <u>914-232-7357</u>	Other: _____
Technician: <u>Francis Ciriaco</u> Cert#(s): <u>09-19591</u> Exp. 10/2015	Email: <u>admin@enviromain.com</u>	Lab#: _____

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
16	7	CEILING INSULATION	EXTERIOR (INSIDE ROOF)	Y		Please Stop on First Positive for each Group
17	7	" "	" "	Y		
18	8	DOOR CAULKING		N		
19	8	" "				
20	9	LOWER CAULKING				
21	9	" "	EXTERIOR			
22	10	ROOF FELT	ROOF			
23	10	" "				
24	10	ROOF SHINGLE				
25	10	" "	ROOF			
						Drawing/Sketch (Required)

Sampled By: (Signature)	Date	Relinquished By: (Signature)	Date
Printed Name: Francis Ciriaco	Time	Printed Name:	Time
Relinquished By: (Signature)	Date	Relinquished By: (Signature)	Date
		<u>Atlas/eb</u>	
Printed Name:	Time	Printed Name:	Time

Atlas/eb

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE



FRANCIS O CIRIACO
CLASS(EXPIRES)
C ATEC(10/15) D INSP(10/15)
H PM (10/15)

CERT# 09-19591
DMV# 850409801

MUST BE CARRIED ON ASBESTOS PROJECTS



EYES BRO
HAIR BLK
HGT 5' 04"

IF FOUND RETURN TO:
NYSOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

Expiration Date:

May 31, 2016

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Environmental Maintenance Contractors, Inc.

5 Anderson Lane

Goldens Bridge, NY 10526

FILE NUMBER: 05-0348

LICENSE NUMBER: 28535

LICENSE CLASS: FULL

DATE OF ISSUE: 04/23/2015

EXPIRATION DATE: 05/31/2016

Duly Authorized Representative – Richard Stumbo:

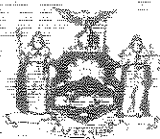
This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2016
Issued April 01, 2015

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. MILENA BONEZZI
CARDNO ATC
104 EAST 25TH STREET 10TH FLOOR
NEW YORK, NY 10010

NY Lab Id No. 10879

is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2003) for the category
ENVIRONMENTAL ANALYSES-POTABLE WATER
All approved analytes are listed below:

Miscellaneous

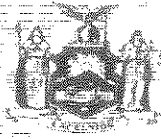
Asbestos EPA 100.1
EPA 100.2

Serial No.: 52162

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2016
Issued April 01, 2015

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. MILENA BONEZZI
CARDNO ATC
104 EAST 25TH STREET 10TH FLOOR
NEW YORK, NY 10010

NY Lab Id No. 10879

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Metals I

Lead, Total EPA 7000B

Miscellaneous

Asbestos in Friable Material Item 198.1 of Manual
EPA 600/M4/82/020

Asbestos in Non-Friable Material-PLM Item 198.6 of Manual (NOB by PLM)

Asbestos in Non-Friable Material-TEM Item 198.4 of Manual

Asbestos Vermiculite-Containing Material Item 198.8 of Manual

Lead in Dust Wipes EPA 7000B

Lead in Paint EPA 7000B

Sample Preparation Methods

EPA 3050B

Serial No.: 52163

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2016
Issued April 01, 2015

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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MS. MILENA BONEZZI
CARDNO ATC
104 EAST 25TH STREET 10TH FLOOR
NEW YORK, NY 10010

NY Lab Id No. 10879

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved subcategories and/or analytes are listed below:

Metals I

Lead, Total NIOSH 7082

Miscellaneous

Asbestos 40 CFR 763 APX A No. III

NIOSH 7402

Fibers NIOSH 7400 A RULES

Serial No.: 52164

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**National Voluntary
Laboratory Accreditation Program**



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Cardno ATC
 104 E. 25th Street 10th Floor
 New York, NY 10010
 Ms. Milena Bonezzi
 Phone: 212-353-8280 x247 Fax: 212-353-8306
 E-Mail: milena.bonezzi@cardno.com

BULK ASBESTOS FIBER ANALYSIS (PLM)

NVLAP LAB CODE 101187-0

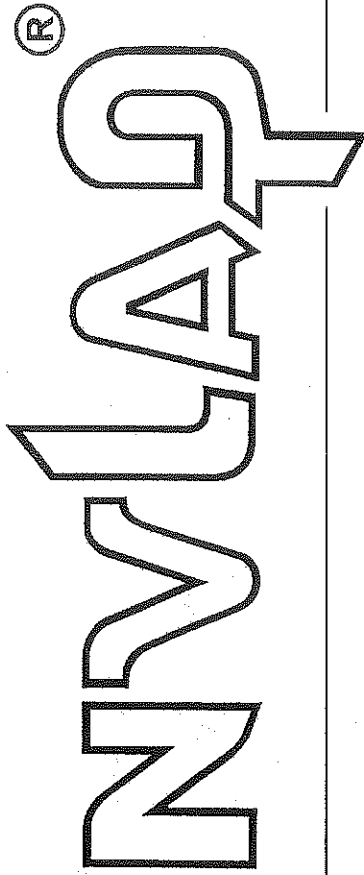
<i>NVLAP Code</i>	<i>Designation / Description</i>
18/A01	EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples

2014-07-01 through 2015-06-30

Effective dates

For the National Institute of Standards and Technology

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101187-0

Cardno ATC
New York, NY

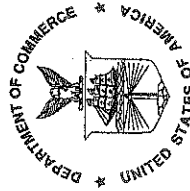
is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

BULK ASBESTOS FIBER ANALYSIS

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*

2014-07-01 through 2015-06-30

Effective dates



A handwritten signature in black ink, appearing to read "M. R. M. L. D.", is written over the seal.

For the National Institute of Standards and Technology



**National Voluntary
Laboratory Accreditation Program**



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Cardno ATC
104 E. 25th Street 10th Floor
New York, NY 10010
Ms. Milena Bonezzi
Phone: 212-353-8280 x247 Fax: 212-353-8306
E-Mail: milena.bonezzi@cardno.com

AIRBORNE ASBESTOS FIBER ANALYSIS (TEM)

NVLAP LAB CODE 101187-0

NVLAP Code Designation / Description

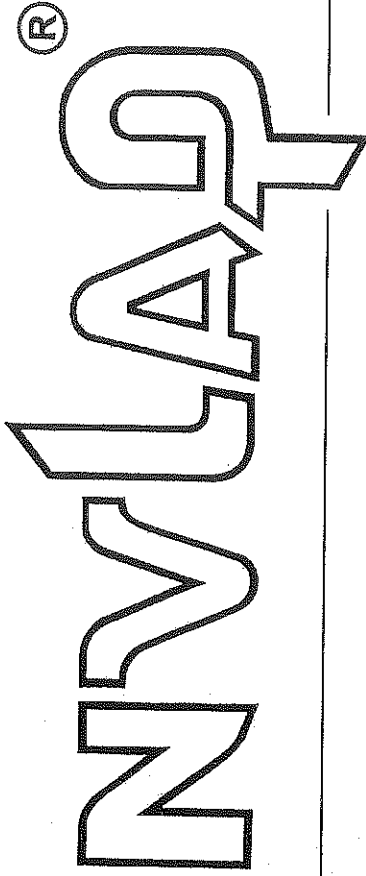
18/A02 U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

2014-07-01 through 2015-06-30

Effective dates

For the National Institute of Standards and Technology

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101187-0

Cardno ATC
New York, NY

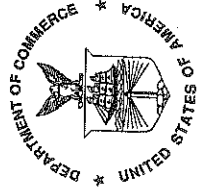
is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

AIRBORNE ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

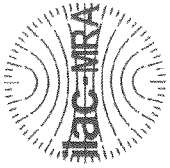
2014-07-01 through 2015-06-30

Effective dates



A handwritten signature in black ink, appearing to read "Michael R. Mello".

For the National Institute of Standards and Technology



AIHA Laboratory Accreditation Programs, LLC

acknowledges that

Cardno ATC

104 East 25th Street, 10Th Fl, New York, NY 10010
Laboratory ID: 100229

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC accreditation to the ISO/IEC 17025:2005 international standard, *General Requirements for the Competence of Testing and Calibration Laboratories* in the following:

LABORATORY ACCREDITATION PROGRAMS

- INDUSTRIAL HYGIENE Accreditation Expires: 11/01/2015
- ENVIRONMENTAL LEAD Accreditation Expires: 11/01/2015
- ENVIRONMENTAL MICROBIOLOGY Accreditation Expires:
- FOOD Accreditation Expires:
- UNIQUE SCOPES Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached **Scope of Accreditation**. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2005 and AIHA-LAP, LLC requirements. This certificate is not valid without the attached **Scope of Accreditation**. Please review the AIHA-LAP, LLC website (www.aihaaccreditedlabs.org) for the most current Scope.

Larry S. Pierce
Chairperson, Analytical Accreditation Board

Cheryl O. Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

Revision 13: 03/12/2013

Date Issued: 08/30/2013

Limited Lead Inspection Report

Performed at:

**Jefferson Valley Pumping Station located on Forest Court, Yorktown Heights,
New York**



Prepared for:

Ms. Sarah E. Cwikla

Project Director

GHD

150 Grand Street, 4th Floor

White Plains NY

Prepared by:

Environmental Maintenance Contractors, Inc.

5 Anderson Lane

Goldens Bridge, New York 10526

Tel: 914-232-7355, Fax: 914-232-7357

Email: rstumbo@enviromain.com

Date: June 29, 2015

ENVIRONMENTAL MAINTENANCE CONTRACTORS, INC.

Environmental Consulting, Testing and Reporting Services

June 29, 2015

Attn: Ms. Sarah E. Cwikla
Project Director

Phone: 914 703 4700 Mobile: 203 258 2177
Email: Sarah.Ccwikla@ghd.com

GHD
150 Grand Street, 4th Floor
White Plains NY

**Re: Testing of Paint for Lead Content via XRF Analysis at the Jefferson Valley
 pumping Station located on Forest Court, Yorktown Heights, NY**

Environmental Maintenance Contractors, Inc. (EMC) has completed the limited testing of painted surfaces within Jefferson Valley pumping Station located on Forest Court, Yorktown Heights, NY. The testing was performed on June 24, 2015

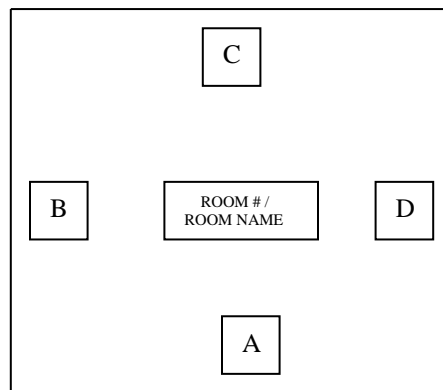
EMC dispatched an EPA Certified Lead Risk Assessor/Inspector (Environmental Technician) to test readily accessible painted components including the following:

- Walls
- Ceiling
- Crown Molding
- Conduit Pipe
- Shelf
- Floor
- Interior and Exterior Door Components
- Pipe Line
- Motor
- Backflow/Drain Pipe
- Soffit
- Cornice
- Inlet Pump Access Hatch
- Inlet Pump Pipe
- Valve
- Generator
- Generator Muffler
- Ceiling Access Hatch
- Drain Pipe
- Screen

EMC's Environmental Technician performed the testing using a portable Niton XLp 300A X-Ray Fluorescence (XRF) LBP Analyzer to directly read milligrams (one thousandth of a gram) of lead per square centimeter (mg/cm^2) of the tested surface area.

The XRF Readings data table accompanying this report lists the rooms inspected as room 1, room 2, room #, and/or room name, etc. (See attached diagram for details). In addition the data table lists which side a structure and/or feature was tested on as either A, B, C, or D. These letters refer to wall directions instead of north, south, east, or west. Wall "A" is the wall containing the entry doorway into the specific room with the following letters assigned to walls going clockwise around the room (see diagram below).

WALL DIRECTION DIAGRAM



The testing performed did identify painted surfaces that contain lead levels in excess of the regulatory standards of $1.0 \text{ mg}/\text{cm}^2$. Please note that although some of the tested surfaces contain low concentrations of lead ($<1.0 \text{ mg}/\text{cm}^2$), these components could still create lead dust hazards if the paint is turned into dust/fumes by burning, abrasion, scraping or sanding. A worker exposure assessment should be performed in order to assess the risk of exposure to the workers.

Any painted surfaces not tested as detailed in this report shall be treated as lead-containing until tested to confirm otherwise.

Should you have any questions or require additional information please do not hesitate to contact me @ 914-232-7355.

Sincerely,
Environmental Maintenance Contractors, Inc.


Richard Stumbo, President

Serial # XLP300A-9069NR7213

PAINT

Jefferson Valley Pump Station

Date: June 24, 2015

Ranges (NEG<INC<POS): Device PCS

Units: mg / cm ^2

Reading No	Time	Component	Substrate	Side	Condition	Color	Floor	Room	Results	PbC
114	6/24/2015 7:47			CALIBRATE					Positive	1.1
115	6/24/2015 7:47			CALIBRATE					Positive	1
116	6/24/2015 7:48			CALIBRATE					Positive	1
117	6/24/2015 7:48			CALIBRATE					Negative	0
118	6/24/2015 7:49			CALIBRATE					Negative	0
119	6/24/2015 7:49			CALIBRATE					Negative	0
120	6/24/2015 7:53	WALL	CONCRETE	A	INTACT	GREEN	FIRST	ROOM 1	Negative	0
121	6/24/2015 7:53	WALL	CONCRETE	A	INTACT	GREEN	FIRST	ROOM 1	Negative	0.01
122	6/24/2015 7:54	WALL	CONCRETE	B	INTACT	GREEN	FIRST	ROOM 1	Negative	0
123	6/24/2015 7:54	WALL	CONCRETE	B	INTACT	GREEN	FIRST	ROOM 1	Negative	0.01
124	6/24/2015 7:54	WALL	CONCRETE	C	INTACT	GREEN	FIRST	ROOM 1	Negative	0
125	6/24/2015 7:55	WALL	CONCRETE	C	INTACT	GREEN	FIRST	ROOM 1	Negative	0
126	6/24/2015 7:55	WALL	CONCRETE	D	INTACT	GREEN	FIRST	ROOM 1	Negative	0
127	6/24/2015 7:55	WALL	CONCRETE	D	INTACT	GREEN	FIRST	ROOM 1	Negative	0.03
128	6/24/2015 7:57	CEILING	DRYWALL		FAIR	WHITE	FIRST	ROOM 1	Negative	0
129	6/24/2015 7:57	CEILING	DRYWALL		FAIR	WHITE	FIRST	ROOM 1	Negative	0
130	6/24/2015 7:58	CROWN MOLDING	WOOD		FAIR	WHITE	FIRST	ROOM 1	Negative	0.17
131	6/24/2015 7:58	CROWN MOLDING	WOOD		FAIR	WHITE	FIRST	ROOM 1	Negative	0.16
132	6/24/2015 8:00	CONDUIT PIPE	METAL	A	FAIR	SILVER	FIRST	ROOM 1	Negative	0.18
133	6/24/2015 8:01	CONDUIT PIPE	METAL	C	INTACT	SILVER	FIRST	ROOM 1	Negative	0.11
134	6/24/2015 8:02	SHELVES	WOOD	A	INTACT	BLUE	FIRST	ROOM 1	Negative	0
135	6/24/2015 8:02	FLOOR	CONCRETE	A	FAIR	BLUE	FIRST	ROOM 1	Negative	0
136	6/24/2015 8:03	FLOOR	CONCRETE	A	FAIR	BLUE	FIRST	ROOM 1	Negative	0
137	6/24/2015 8:04	DOOR FRAME	METAL	A	INTACT	WHITE	FIRST	ROOM 1	Negative	0.07
138	6/24/2015 8:04	DOOR FRAME	METAL	A	INTACT	WHITE	FIRST	ROOM 1	Negative	0.09
139	6/24/2015 8:04	DOOR FRAME	METAL	A	INTACT	WHITE	FIRST	ROOM 1	Negative	0.05
140	6/24/2015 8:05	DOOR IN	METAL	A	INTACT	WHITE	FIRST	ROOM 1	Negative	0.1
142	6/24/2015 8:05	DOOR IN	METAL	A	INTACT	WHITE	FIRST	ROOM 1	Negative	0.06
143	6/24/2015 8:07	DOOR OUT	METAL	A	PEELING	WHITE	FIRST	ROOM 1	Negative	0.07
144	6/24/2015 8:07	DOOR OUT	METAL	A	PEELING	WHITE	FIRST	ROOM 1	Negative	0.08
145	6/24/2015 8:07	DOOR OUT	METAL	A	PEELING	WHITE	FIRST	ROOM 1	Negative	0.03

Environmental Maintenance Contractors, Inc.
5 Anderson Lane, Goldens Bridge, NY 10526
Tel: (914) 232-7355 Fax: (914) 232-7357

Reading No	Time	Component	Substrate	Side	Condition	Color	Floor	Room	Results	PbC
146	6/24/2015 8:09	DOOR CASING (EXTERIOR)	WOOD	A	PEELING	WHITE	FIRST	ROOM 1	Negative	0.5
147	6/24/2015 8:09	DOOR CASING (EXTERIOR)	WOOD	A	PEELING	WHITE	FIRST	ROOM 1	Negative	0.6
148	6/24/2015 8:09	DOOR CASING (EXTERIOR)	WOOD	A	PEELING	WHITE	FIRST	ROOM 1	Negative	0.7
149	6/24/2015 8:11	WALL	CONCRETE	A	INTACT	GREEN	BASEMENT	ROOM 2	Negative	0
150	6/24/2015 8:11	WALL	CONCRETE	A	INTACT	GREEN	BASEMENT	ROOM 2	Negative	0
151	6/24/2015 8:12	WALL	CONCRETE	B	INTACT	GREEN	BASEMENT	ROOM 2	Negative	0.01
152	6/24/2015 8:12	WALL	CONCRETE	C	INTACT	GREEN	BASEMENT	ROOM 2	Negative	0.01
153	6/24/2015 8:13	WALL	CONCRETE	C	INTACT	GREEN	BASEMENT	ROOM 2	Negative	0.01
154	6/24/2015 8:13	WALL	CONCRETE	D	INTACT	GREEN	BASEMENT	ROOM 2	Negative	0
155	6/24/2015 8:14	WALL	CONCRETE	D	INTACT	GREEN	BASEMENT	ROOM 2	Negative	0
156	6/24/2015 8:14	CEILING	CONCRETE		INTACT	WHITE	BASEMENT	ROOM 2	Negative	0
159	6/24/2015 8:15	CEILING	CONCRETE		INTACT	WHITE	BASEMENT	ROOM 2	Negative	0.01
160	6/24/2015 8:16	CONDUIT PIPE	METAL		INTACT	SILVER	BASEMENT	ROOM 2	Negative	0.07
161	6/24/2015 8:16	CONDUIT PIPE	METAL		INTACT	SILVER	BASEMENT	ROOM 2	Negative	0.17
162	6/24/2015 8:16	CONDUIT PIPE	METAL		INTACT	SILVER	BASEMENT	ROOM 2	Negative	0
163	6/24/2015 8:17	FLOOR	CONCRETE		POOR	GREEN	BASEMENT	ROOM 2	Negative	0
164	6/24/2015 8:17	FLOOR	CONCRETE		POOR	GREEN	BASEMENT	ROOM 2	Negative	0.01
165	6/24/2015 8:18	MECHANICAL BASE	CONCRETE		POOR	GREEN	BASEMENT	ROOM 2	Negative	0.01
166	6/24/2015 8:19	PIPE LINE	METAL		PEELING	GREY	BASEMENT	ROOM 2	Negative	0.07
167	6/24/2015 8:19	PIPE LINE	METAL		PEELING	GREY	BASEMENT	ROOM 2	Negative	0
168	6/24/2015 8:20	PIPE LINE	METAL		PEELING	GREY	BASEMENT	ROOM 2	Negative	0.03
169	6/24/2015 8:20	PIPE LINE	METAL		PEELING	GREY	BASEMENT	ROOM 2	Negative	0.1
170	6/24/2015 8:20	PIPE LINE	METAL		PEELING	GREY	BASEMENT	ROOM 2	Negative	0
171	6/24/2015 8:21	PIPE LINE	METAL		PEELING	GREY	BASEMENT	ROOM 2	Negative	0.02
172	6/24/2015 8:21	VALVE	METAL		PEELING	RED	BASEMENT	ROOM 2	Negative	0.03
173	6/24/2015 8:22	PUMP UNIT	METAL		INTACT	BLUE	BASEMENT	ROOM 2	Negative	0
174	6/24/2015 8:22	PUMP UNIT	METAL		INTACT	BLUE	BASEMENT	ROOM 2	Negative	0
175	6/24/2015 8:23	MOTOR	METAL		INTACT	BLUE	BASEMENT	ROOM 2	Negative	0
176	6/24/2015 8:23	MOTOR	METAL		INTACT	RED	BASEMENT	ROOM 2	Negative	0.02
177	6/24/2015 8:25	BACK FLOW/DRAIN PIPE	METAL		INTACT	BLACK	BASEMENT	ROOM 2	Positive	1.3
178	6/24/2015 8:25	BACK FLOW/DRAIN PIPE	METAL		INTACT	BLACK	BASEMENT	ROOM 2	Positive	1.5
179	6/24/2015 8:26	DOOR FRAME	METAL	A	INTACT	WHITE	BASEMENT	ROOM 2	Negative	0.08
180	6/24/2015 8:27	DOOR IN	METAL	A	FAIR	WHITE	BASEMENT	ROOM 2	Negative	0.09
181	6/24/2015 8:28	DOOR OUT	METAL	A	POOR	WHITE	BASEMENT	ROOM 2	Negative	0.04
182	6/24/2015 8:28	DOOR OUT (EXTERIOR)	METAL	A	POOR	WHITE	BASEMENT	ROOM 2	Negative	0.1
183	6/24/2015 8:29	DOOR FRAME (EXTERIOR)	METAL	A	PEELING	WHITE	BASEMENT	ROOM 2	Negative	0.11
184	6/24/2015 8:33	FASCIA	WOOD	A	POOR	WHITE		EXTERIOR	Negative	0.07
185	6/24/2015 8:34	FASCIA	WOOD	A	POOR	WHITE		EXTERIOR	Negative	0.12

Reading No	Time	Component	Substrate	Side	Condition	Color	Floor	Room	Results	PbC
186	6/24/2015 8:35	SOFFIT	WOOD	A	POOR	WHITE		EXTERIOR	Negative	0.5
187	6/24/2015 8:36	SOFFIT	WOOD	A	POOR	WHITE		EXTERIOR	Negative	0.3
188	6/24/2015 8:37	CORNICE	WOOD	A	PEELING	WHITE		EXTERIOR	Negative	0.02
189	6/24/2015 8:37	CORNICE	WOOD	A	PEELING	WHITE		EXTERIOR	Negative	0.05
190	6/24/2015 8:41	INLET PUPM HATCH	METAL		PEELING	BLACK		EXTERIOR	Negative	0.11
191	6/24/2015 8:42	INLET PUPM PIPE	METAL		POOR	BLACK		EXTERIOR	Negative	0.04
192	6/24/2015 8:42	INLET PUPM PIPE	METAL		POOR	BLACK		EXTERIOR	Negative	0.18
193	6/24/2015 8:43	VALVE	METAL		POOR	RED		EXTERIOR	Negative	0.8
194	6/24/2015 8:43	VALVE	METAL		POOR	RED		EXTERIOR	Negative	0.19
195	6/24/2015 8:43	VALVE	METAL		POOR	RED		EXTERIOR	Negative	0.08
196	6/24/2015 8:45	GENERATOR	METAL		INTACT	GREEN	FIRST	ROOM 1	Negative	0.15
197	6/24/2015 8:45	GENERATOR	METAL		INTACT	GREEN	FIRST	ROOM 1	Negative	0.12
198	6/24/2015 8:45	GENERATOR	METAL		INTACT	GREEN	FIRST	ROOM 1	Negative	0.11
199	6/24/2015 8:46	GENERATOR MUFFLER	METAL		INTACT	BLACK	FIRST	ROOM 1	Negative	0.09
200	6/24/2015 8:46	GENERATOR MUFFLER	METAL		INTACT	BLACK	FIRST	ROOM 1	Negative	0
201	6/24/2015 8:50			CALIBRATE					Positive	1
202	6/24/2015 8:51			CALIBRATE					Positive	1.1
203	6/24/2015 8:51			CALIBRATE					Positive	1.2
204	6/24/2015 8:52			CALIBRATE					Negative	0
205	6/24/2015 8:52			CALIBRATE					Negative	0
206	6/24/2015 8:52			CALIBRATE					Negative	0
207	6/24/2015 9:00	CEILING HATCH	METAL		FAIR	WHITE	FIRST	ROOM 1	Negative	0
208	6/24/2015 9:00	CEILING HATCH FRAME	METAL		FAIR	WHITE	FIRST	ROOM 1	Negative	0.03
209	6/24/2015 9:11	BACK FLOW/DRAIN PIPE	METAL		FAIR	BLUE	FIRST	ROOM 1	Positive	1.3
210	6/24/2015 9:12	SCREEN	METAL		POOR	WHITE	EXTERIOR		Negative	-0.03
211	6/24/2015 9:13	SCREEN	METAL		POOR	WHITE	EXTERIOR		Negative	0
212	6/24/2015 9:15			CALIBRATE					Positive	1
213	6/24/2015 9:15			CALIBRATE					Positive	1
214	6/24/2015 9:16			CALIBRATE					Positive	1.1
215	6/24/2015 9:16			CALIBRATE					Negative	0
216	6/24/2015 9:16			CALIBRATE					Negative	0
217	6/24/2015 9:17			CALIBRATE					Negative	0.01

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

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CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such

construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

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

1.02 *Terminology*

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

B. *Intent of Certain Terms or Adjectives:*

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

C. *Day:*

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

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

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

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

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

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the

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

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to

complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners,

employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

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

- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
1. A Field Order;
 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
 3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

- A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:
1. is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
 2. is of such a nature as to require a change in the Contract Documents; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

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

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

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

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is

responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 Licensed Sureties and Insurers

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly

licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

- a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

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

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors,

members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

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

- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds

and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements

for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

- a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

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

- 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
- 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of

Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the

Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

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

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full

responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
 3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall

take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

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

1. *Shop Drawings:*

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

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of

each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

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

6.18 *Continuing the Work*

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

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

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

- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be

affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

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

8.03 *Furnish Data*

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

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

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

8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

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

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

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

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

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

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

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

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

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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

11.01 Cost of the Work

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of

property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

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

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

11.02 *Allowances*

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

- a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
- b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

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

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

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

- c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
- d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 Notice of Defects

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

13.02 Access to Work

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

13.03 Tests and Inspections

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
 - D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
 - E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
 - F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the

parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

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

13.09 *Owner May Correct Defective Work*

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

- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

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

14.02 Progress Payments

A. Applications for Payments:

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

arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

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

D. Reduction in Payment:

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

- b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

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

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive

certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for

Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

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

14.08 *Final Completion Delayed*

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

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or

remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may,

upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
 - 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 - 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

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

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2007 Edition). All provisions which are not so amended or supplemented remain in full force and effect.

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

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01 *Defined Terms*

SC-1.01 Modify existing definitions as follows:

3. Replace the phrase “acceptable to Engineer” in Paragraph 1.01.A.3 of the General Conditions with the phrase “furnished by the Engineer”
11. Replace the phrase “concerning the Work” in Paragraph 1.01.A.11 with the phrase “portions of Work assigned to the specific Contractor”.
13. Replace the phrase “completion of the Work” in Paragraph 1.01.A.13 with the phrase “completion of the portions of the Work assigned to the specific Contractor”.
15. Replace Paragraph 1.01.A.15 in its entirety with the following:

Contractor – All individuals or entities with whom the Owner has entered into an Agreement for portions of Work described in the Contract Documents. Work not assigned to a specific Contractor shall be the responsibility of all Contractors.

SC-1.01 Add the following definitions immediately following Subparagraph 1.01.A.51:

52. General Contractor –The individual or entity with whom Owner has entered into an Agreement to perform the portions of the Work assigned in the Contract Documents to the General Contractor.
53. Electrical Contractor –The individual or entity with whom Owner has entered into an Agreement to perform the portions of the Work assigned in the Contract Documents to the Electrical Contractor.
54. Heating, Ventilating, and Air Conditioning Contractor –The individual or entity with whom Owner has entered into an Agreement to perform the portions of the Work assigned in the Contract Documents to the Heating, Ventilating, and Air Conditioning Contractor.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.02 *Copies of Documents*

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following in its place:

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

SC-2.03 *Commencement of Contract Times; Notice to Proceed*

SC-2.03 In the last sentence of Paragraph 2.03.A, replace "later than the sixtieth day after the day of Bid Opening" with "later than the seventy-fifth day after the day of Bid Opening".

SC-2.05 *Before Starting Construction*

SC-2.05 Add the following language at the end of the first sentence of Paragraph 2.05.A.1:

the preliminary Progress Schedule shall be the 90-Day Progress Schedule identified in Section 01310, Progress Schedule. A baseline Progress Schedule and subsequent monthly updates are required at the times indicated in Section 01310, Progress Schedule.

SC-2.05 Add the following language at the end of the second sentence of Paragraph 2.05.A.3:

The Schedule of Values shall be subdivided into categories matching each line item on the Bid Form. Additional requirements for the Schedule of Values are supplemented in Section 01019, Contract Considerations.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01 *Intent*

SC-3.01 Add the following new paragraph immediately after Paragraph 3.01.C:

- D. Contractor Documents are written in the imperative mood. When direction is given, it shall be understood that the direction is given to Contractor. For example, the phrase "Provide two pumps" shall be understood to mean "Contractor shall provide two pumps."

SC-3.03 *Reporting and Resolving Discrepancies*

SC-3.03 Add the following new paragraph immediately after Paragraph 3.03.B.1.b:

2. In determining Contract Price with respect to a conflict, error, or discrepancy within the Contract Documents, the Contract Documents shall be given precedence in the following order with Change Orders being the highest precedence:
 1. Change Orders
 2. Work Change Directives
 3. Field Orders
 4. Agreement
 5. Addenda
 6. Laws and Regulations
 7. Supplementary Conditions
 8. General Conditions
 9. Drawings
 10. Specifications

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SUPPLEMENTARY CONDITIONS

11. Owner's Standard Details
12. Bid Form

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

SC-4.02 *Subsurface and Physical Conditions*

SC-4.02 Add the following new paragraphs immediately after Paragraph 4.02.B:

- C. The following reports of explorations and tests of subsurface conditions at or contiguous to the Site are known to Owner:
 1. Report dated July 9, 2015, prepared by Soil Testing, Inc. entitled: "Pump Station Rehabilitation - Three Sites," consisting of 8 pages. The "technical data" contained in such report upon which Contractor may rely is soil boring test results.
- D. The reports and drawings identified above are not part of the Contract Documents, but the "technical data" contained therein upon which Contractor may rely, as expressly identified and established above, are incorporated in the Contract Documents by reference. Contractor is not entitled to rely upon any other information and data known to or identified by Owner or Engineer.
- E. Copies of reports identified in SC-4.02.C are included with the bid documents.
- F. No additional reports of explorations or tests of subsurface conditions at or contiguous to the Site, or drawings of physical conditions relating to existing or subsurface structures at the Site, are known to Owner.

SC-4.06 *Hazardous Environmental Condition at Site*

SC-4.06 Add the following new Subparagraphs 4.06.A.1, 4.306.A.2 and 4.06.A.3:

1. The following reports regarding Hazardous Environmental Conditions at the Site are known to Owner:
 - a. Report dated June 29, 2015, prepared by Environmental Maintenance Contractors entitled "Limited Lead Inspection Report - Jefferson Valley," consisting of 6 pages. The "technical data" contained in such report upon which Contractor may rely is lead test results.
 - b. Report dated June 29, 2015, prepared by Environmental Maintenance Contractors entitled "Limited Asbestos Inspection Report - Jefferson Valley," consisting of 6 pages. The "technical data" contained in such report upon which Contractor may rely is lead test results.
2. Copies of reports identified in SC-4.06 are included with the bid documents.

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3. No additional reports of hazardous materials at or contiguous to the Site, or drawings of physical conditions relating to existing hazardous materials, are known to Owner.

ARTICLE 5 - BONDS AND INSURANCE

SC-5.04 Contractor's Liability Insurance

SC-5.04 Add the following new Paragraphs immediately after paragraph 5.04.B:

- C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
 1. Workers' Compensation, and related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:
 - a. State: Statutory
 - b. Applicable Federal (e.g., Longshoreman's): Statutory
 - c. Employer's Liability: \$500,000
 2. Contractor's General Liability under paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of Contractor:
 - a. General Aggregate: \$2,000,000
 - b. Products - Completed Operations Aggregate: \$2,000,000
 - c. Personal and Advertising Injury: \$1,000,000
 - d. Each Occurrence (Bodily Injury and Property Damage): \$1,000,000
 - e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.
 - f. Excess or Umbrella Liability
 - 1) General Aggregate: \$5,000,000
 - 2) Each Occurrence: \$5,000,000
 3. Automobile Liability under paragraph 5.04.A.6 of the General Conditions:
 - a. Combined Single Limit of: \$1,000,000
 4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:
 - a. Bodily Injury:
 - Each Accident \$1,000,000
 - Annual Aggregate \$2,000,000

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- b. Property Damage:
 - Each Accident \$1,000,000
 - Annual Aggregate \$2,000,000
- 5. Owner, Engineer, and the following Engineer's Consultants shall be listed as additional insureds: KJM Construction.
- D. The provisions or endorsements necessary to comply with paragraph 5.04.B.5 of the General Conditions shall include the obligation to notify the Owner and Engineer when an aggregate limit of liability required or certified has been reduced by the payment of claim(s).

SC-5.06 *Property Insurance*

SC-5.06. Delete Paragraph 5.06.A in its entirety and insert the following in its place:

- A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. Contractor shall be responsible for any deductible or self-insured retention. This insurance shall:
 - 1. include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's consultant's listed herein as additional insureds, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or loss payee;
 - 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by these Supplementary Conditions.
 - 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 - 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 - 5. allow for partial utilization of the Work by Owner;
 - 6. include testing and startup;
 - 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued; and
 - 8. comply with the requirements of Paragraph 5.06.C of the General Conditions.

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ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

SC-6.02 *Labor; Working Hours*

SC-6.02. Add the following new Paragraphs immediately after Paragraph 6.02.B:

- C. Normal working hours are defined as 7:00 a.m. to 5:00 p.m., Monday through Friday, excluding holidays. The following are considered Holidays during which work at the Site is not allowed:
- New Year's Day
 - Memorial Day
 - Independence Day
 - Labor Day
 - Thanksgiving
 - Day after Thanksgiving
 - Christmas
 - add others
- D. Should Contractor's working hours extend outside normal working hours, any and all costs for weekend, Holiday, and/or on Site overtime services of Engineer's personnel, including but not limited to direct salaries, fringe benefits, overhead and profit, administration and supervision, incurred by Owner, will be the sole obligation of Contractor. The overtime rates shall be actual costs per hour for a representative of the Client and actual costs per hour for representative of Engineer. In addition, Contractor shall pay for all travel costs for the above parties to reach the Site on weekends, Holidays, and/or after hours work.

SC-6.05 *Substitutes and "Or Equals"*

SC-6.05. Add the following language at the end of the last sentence of Subparagraph 6.05.A:

After award of the Contract, no substitutes or "or-equals" may be submitted for items listed in the Major Products Schedule included in the Bid Form, unless otherwise instructed by Owner.

SC-6.05 Add the following subparagraph immediately after Subparagraph 6.05.A.1.b:

- c. Contractor provides a line-by-line comparison of the proposed product to the specified product. Line-by-line comparison shall not only include all specified features, but shall also include all other design and/or manufacturing differences between the proposed product and the specified product. Line-by-line comparison shall show no significant design or manufacturing differences that, in the Engineer's opinion, could result in lesser quality, performance, or reliability of the proposed product compared to the specified product.

SC-6.05.A.2. Add the following subparagraph immediately after Subparagraph 6.05.A.2.d of the General Conditions:

- e. If the substitute item requires modifications to the structures, piping, layouts, etc., detailed on the Drawings or described in the Contract Documents, the application shall also include details of proposed modifications necessary to accommodate the substitute item. Such

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details shall include scaled layouts, dimensions, and other pertinent information to enable Engineer to evaluate the entire application. If the substitute item and proposed modifications are approved, Contractor, at no additional cost to Owner, shall do all work necessary to make such modifications and absorb all costs of any related changes imposed on other contractors. Final details of such modifications shall be prepared and submitted for approval by Contractor in accordance with Section 01300, Submittals.

SC-6.05.A. Add the following paragraph immediately after Paragraph 6.05.A.2 of the General Conditions:

3. Time Constraints: All applications for use of substitutes or 'or equal' items shall be submitted to Engineer within 90 days of the Effective Date of the Agreement. No applications will be considered thereafter unless Contractor produces satisfactory evidence that the specified item is no longer manufactured or is unavailable for the Project.

SC-6.05.C. Add the following subparagraph after Paragraph 6.05.C of the General Conditions:

1. In order to aid Engineer in determining the equality of a proposed 'or equal' or substitute item (when compared to the item actually specified), Contractor shall arrange for the performance of any tests requested by Engineer. The nature, extent, tester and supervisions of such tests including engineering costs, shall be borne by Contractor. Certified test results shall be mailed directly to Engineer for all tests requested.

SC-6.06 *Concerning Subcontractors, Suppliers, and Others*

SC-6.06 Add a new paragraph immediately after Paragraph 6.06.G:

- H. Owner may furnish to any Subcontractor or Supplier, to the extent practical, information about amounts paid to Contractor on account of Work performed for Contractor by a particular Subcontractor or Supplier.

SC-6.08 *Permits*

SC-6.08.A. Add the following subparagraph to Paragraph 6.08.A of the General Conditions:

1. Owner has obtained the following permits in connection with this Project:
 - NYSDEC Wetland Permit
 - Town of Yorktown Wetland Permit

Contractor is required to comply with all requirements of permits imposed upon Owner in the same manner required by Owner.

SC-6.10 *Taxes*

SC-6.10 Add a new Paragraph immediately after Paragraph 6.10.A:

- B. Owner is exempt from payment of sales and compensating use taxes of the State of New York and of cities and counties thereof on all materials to be incorporated into the Work.
 1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.

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2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

SC-6.12 *Record Documents*

SC-6.12 Add the following paragraph immediately after Paragraph 6.12.A:

- B. If Owner utilizes any part of the Project in accordance with paragraph GC-14.05, Contractor shall provide Engineer for Owner's use, a complete set of record drawings current to the date of Owner's utilization.

SC-6.13 *Safety and Protection*

SC-6.13 Delete the second sentence of Paragraph 6.13.C and insert the following:

The following Owner safety programs are applicable to the Work:

- Not applicable.

SC-6.16 *Emergencies*

Add the following paragraph after Paragraph 6.16.A of the General Conditions:

- B. Contractor shall designate one person to respond to emergencies and act on the Contractor's behalf during off-work hours at the Site. The person's name, address, and telephone number shall be provided to Owner during the preconstruction conference and the designated person shall be on call during off-work hours. Response time shall not exceed one hour after notification is given by Owner and/or Engineer that an emergency exists at the Site.

SC-6.17 *Shop Drawings and Samples*

SC-6.17.C.2 Replace "or specific written certification" with "certifying".

SC-6.17.D.1 In the first sentence of Paragraph 6.17.D.1, replace "in accordance with the Schedule of Submittals acceptable to Engineer" with "in accordance with Section 01300, Submittals".

SC-6.17 Add the following new paragraphs immediately after Paragraph 6.17.E:

- F. Furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, Samples, or other items requiring approval Owner will deduct costs for such services from progress payments made to Contractor.

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- G. In the event that Contractor requests a change of a previously approved item, OWNER will deduct costs for Engineer's charges for its review time unless the need for such change is beyond the control of Contractor.

ARTICLE 7 - OTHER WORK

SC-7.02 *Coordination*

SC-7.02 Delete Paragraph 7.02.A and B in its entirety and replace with the following:

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site.
1. General Contractor shall have authority and responsibility for coordination of the various contractors at the Site.

SC-7.04 *Claims Between Contractors*

SC-7.04 Add the following new paragraph immediately after Paragraph 7.03:

SC-7.04 *Claims Between Contractors*

- A. Should Contractor cause damage to the work or property of any other contractor at the Site, or should any claim arising out of Contractor's performance of the Work at the Site be made by any other contractor against Contractor, Owner, Engineer, or the Construction Coordinator, then Contractor (without involving Owner, Engineer, or Construction Coordinator) shall either (1) remedy the damage, (2) agree to compensate the other contractor for remedy of the damage, or (3) remedy the damage and attempt to settle with such other contractor by agreement, or otherwise resolve the dispute by arbitration or at law.
- B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, the Construction Coordinator and the officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any other contractor against Owner, Engineer consultants, or the Construction Coordinator to the extent said claim is based on or arises out of Contractor's performance of the Work. Should another contractor cause damage to the Work or property of Contractor or should the performance of work by any other contractor at the Site give rise to any other Claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or the Construction Coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, or the Construction Coordinator on account of any such damage or Claim.
- C. If Contractor is delayed at any time in performing or furnishing the Work by any act or neglect of another contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a

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Claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, and Construction Coordinator for any delay, disruption, interference, or hindrance caused by any other contractor. This paragraph does not prevent recovery from Owner, Engineer, or Construction Coordinator for activities that are their respective responsibilities.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

SC-8.09 *Limitations on Owner's Responsibilities*

Add the following paragraph immediately after Paragraph 8.09.A of the General Conditions:

- B. Owner will let other direct Contracts. Contract No. 1 will have responsibility for coordination of the various contractors. The extent of Owner's responsibilities under this arrangement are set forth in paragraph SC-7.02.A of the Supplementary Conditions.

SC-8.11 Add the following new paragraph immediately after Paragraph 8.11.A:

- B. On request of Contractor prior to execution of any Change Order involving a significant increase in Contract Price, Owner shall furnish to Contractor reasonable evidence that adequate financial arrangements have been made by Owner to enable Owner to fulfill the increased financial obligations to be undertaken by Owner as a result of such Change Order.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

SC-9.03 *Project Representative*

SC-9.03 Add the following new paragraphs immediately after Paragraph 9.03.A:

- B. The Resident Project Representative (RPR) will be Engineer's employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall be through or with the full knowledge and approval of Contractor. The RPR shall:
 1. *Schedules:* Review the progress schedule, schedule of Shop Drawing and Sample submittals, and schedule of values prepared by Contractor and consult with Engineer concerning acceptability.
 2. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.

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3. *Liaison:*
 - a. Serve as Engineer's liaison with Contractor, working principally through Contractor's authorized representative, assist in providing information regarding the intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
4. *Interpretation of Contract Documents:* Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
5. *Shop Drawings and Samples:*
 - a. Record date of receipt of Samples and approved Shop Drawings.
 - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
6. *Modifications:* Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
7. *Review of Work and Rejection of Defective Work:*
 - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress will not produce a completed Project that conforms generally to the Contract Documents or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
8. *Inspections, Tests, and System Startups:*
 - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

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- b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
9. *Records:*
 - a. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
 - b. Maintain records for use in preparing Project documentation.
10. *Reports:*
 - a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and Sample submittals.
 - b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
 - c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any Hazardous Environmental Condition.
11. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
12. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
13. *Completion:*
 - a. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.
 - b. Participate in a final inspection in the company of Engineer, Owner, and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.

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- c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the Notice of Acceptability of the Work.
- C. The RPR shall not:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
 3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor's superintendent.
 4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work unless such advice or directions are specifically required by the Contract Documents.
 5. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
 6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
 7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
 8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

(No Amendments to General Conditions.)

ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

SC-11.01 *Cost of the Work*

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

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

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

SC-11.01.D. Add the following to the end of Paragraph 11.01.D of the General Conditions:

When requested by Engineer, Contractor shall identify sources used to determine rental rates of equipment and submit related evidence to Engineer to support such data.

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

SC-12.01 *Change of Contract Price*

SC-12.01.C *Contractor's Fee*. Delete the semicolon at the end of Subparagraph 12.01.C.2.c, and add the following language:

, provided, however, that on any subcontracted work the total maximum fee to be paid by Owner under this subparagraph shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

SC-12.03 *Delays*

SC-12.03.A Revise the first sentence to read: "Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times may be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A."

SC-12.03 Add the following paragraph after Paragraph 12.03.E:

- F. When establishing the Progress Schedule, an allowance shall be made as follows for lost days of work per month due to inclement weather:

January	2 days
February	1 day
March	0 days
April	0 days
May	0 days
June	0 days
July	0 days
August	0 days
September.....	0 days
October	0 days

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November..... 0 days

December..... 2 days

Contractor, at the time of each Application for Payment, shall submit to Engineer and Owner a list of all working days lost due to either inclement weather or Site conditions caused by inclement weather for the period covered by the Application for Payment above and beyond the four days allowance required each month. Accompanying this list shall be a summary of the specific conditions which caused the loss. This request will be reviewed by the Engineer in light of observations made by Owner, Engineer, and resident inspector, if any. Approval of the Application for Payment by Owner and Funding Agency, if any, will also include approval of the weather delay request, if acceptable. After Substantial Completion, a Change Order will be executed if a time extension for weather related delays is approved. Any time extension granted for inclement weather will be based solely on the time approved in Applications for Payment.

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

(No Amendments to General Conditions.)

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.01 Schedule of Values

SC-14.01.A. Replace the phrase "form of Application for Payment acceptable to Engineer" in the first sentence with the phrase "form of Application for Payment furnished by Engineer."

SC-14.02.A. Add the following to the end of Subparagraph 14.02.A.1 of the General Conditions:

By signing the Application and Certificate for Payment, Contractor certifies that all items, units, quantities, and prices of Work and material in the estimate are correct, that all claimed Work has been performed and materials supplied in full accordance with the Contract, and that Contractor has no claims for damages, losses or expense against Owner for compensation in addition to that provided for in the application except such claims for change of Contract Price as Contractor has filed with Engineer and Owner in writing (in accordance with Article 10) prior to the date of his certifying the application.

SC-14.02.B. Add the following subparagraph after subparagraph 14.02.B.5.d of the General Conditions:

- e. or because of Contractor's failure to submit certifications, affidavits, schedules, or other written information when and as required in the Contract Documents, or Contractor's failure to make submittals in accordance with the Schedule of Submittals.

SC-14.02.C. Payment Becomes Due

SC-14.02.C.1. In Subparagraph 14.02.C.1, replace "Ten days," with "Sixty days."

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SC-14.07 *Final Payment*

SC-14.07.A. Add the following subparagraph immediately after Paragraph 14.07.A.3:

4. The application shall be made on forms provided by Engineer. By signing the application and certificate for payment, Contractor certifies that the total cost of the Work and the amount due Contractor for payment is full compensation for all Work done under the terms of the Contract in its original form; that the payment is full compensation for all Work ordered to be done under Change Orders; and that the payment is full compensation for all other Work done by Contractor and for all damages, losses, and expense incurred by Contractor for doing and furnishing everything relating to or arising out of the Work, and that Contractor waives all right to claim or receive any further compensation in addition to that provided for in the final payment except as provided in paragraph 14.09.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

(No Amendments to General Conditions.)

ARTICLE 16 - DISPUTE RESOLUTION

SC-16.01 *Methods and Procedures*

SC-16.01 Delete Paragraph 16.01 in its entirety and insert the following in its place:

SC-16.01 Methods and Procedures

- A. This Agreement shall be governed by and construed in accordance with the laws of the State of New York without giving effect to that State's choice of law rules. The Parties hereby submit to the exclusive jurisdiction of the Supreme Court of the State of New York, County of Westchester, in any action or proceeding arising out of or relating to this Agreement. Any proceeding against the Town will be tried without a jury.

SC-16.02 Add the following new paragraph immediately after Paragraph 16.01.

SC-16.02 *Dispute Resolution*

- A. All Claims or counterclaims, disputes, or other matters in question between Owner and Contractor arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by Paragraph 14.09) including but not limited to those not resolved under the provisions of Paragraphs SC-16.01A and 16.01.B will be decided by the Supreme Court subject to the conditions and limitations of this Paragraph SC-16.02. This agreement or consent to entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for a Supreme Court hearing will be filed in writing with the other party to the Contract and a copy will be sent to Engineer for information. The demand for legal action will be made within the 30 day period specified in Paragraph SC-16.01.C, and in all other cases within a reasonable time after the Claim or counterclaim, dispute, or other matter in

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question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statute of limitations.

- C. No legal action arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:
 - 1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the dispute resolution; and
 - 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the dispute resolution and which will arise in such proceedings.
- D. The award rendered by the Supreme Court shall include: (i) a concise breakdown of the award; (ii) a written explanation of the award specifically citing the Contract Document provisions deemed applicable and relied on in making the award.
- E. The award will be final and will not be subject to modification or appeal.
- F. Any proceeding against the Owner shall be tried without a jury.

ARTICLE 17 - MISCELLANEOUS

Add the following new paragraphs immediately after Paragraph 17.06:

SC-17.07 *Labor and Legal Requirements*

- A. Contractor shall abide by all regulations and laws that relate to labor that may affect the Work of this Contract, including Federal, State, County, Town, City, and Village regulations.
- B. The latest Prevailing Wage Rate Schedules setting forth minimum wages and supplements for this area of the state, together with labor standard provisions and non-discrimination in employment provisions are appended to the Agreement.
- C. The Contractor shall make provision for the disability benefits, unemployment insurance and social security required by law.
- D. The Contractor shall keep himself fully informed of all laws of the State (in which the Project is located) and of the United States of America, and of all municipal laws and ordinances in any manner affecting the Work of this Contract, and of all orders or decrees of any body or tribunal having any jurisdiction or authority in any manner affecting such Work, and shall be responsible for strict compliance therewith. If any clause of this Contract does not conform to any such law, such clause shall be void insofar as it conflicts with such law, and such law shall be operative in lieu thereof.
- E. Each and every provision of law and clause required by law to be inserted in this Contract should be, is and is deemed to be inserted herein, and if through a mistake or otherwise

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any such provision is not inserted, or it is not correctly inserted, then upon the application of either party the Contract shall forthwith be amended physically to make such insertion.

- F. If any provision herein shall be as to destroy the mutuality of this Contract or to render it invalid or illegal, then if such provision shall not appear to have been so material that without it the Contract would not have been made by the parties, it shall not be deemed to form part thereof but the balance of the Contract shall remain in full force and effect.

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Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

Town of Yorktown Engineering

Louise Kobiliak, Secretary
363 Underhill Avenue
Yorktown Heights NY 10598

Schedule Year 2017 through 2018
Date Requested 06/27/2016
PRC# 2016006378

Location Town of Yorktown
Project ID# #16-2
Project Type Pump Station Upgrade

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Wage Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2017 through June 2018. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.state.ny.us. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission; a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion [online](#).

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project. There are very few exceptions to this rule. Complete information regarding these exceptions is available on the "[4 Day / 10 Hour Work Schedule](#)" form (PW 30.1).

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule from the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12240; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.state.ny.us.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.state.ny.us.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website www.labor.state.ny.us.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least Five (5) years from the project's date of completion. [See Spota Bill Notice](#). At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment. Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed \$100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds \$25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYS DOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "[Public Work Project](#)" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12240 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of \$50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.



Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

Town of Yorktown Engineering

Louise Kobiliak, Secretary
363 Underhill Avenue
Yorktown Heights NY 10598

Schedule Year 2017 through 2018
Date Requested 06/27/2016
PRC# 2016006378

Location Town of Yorktown
Project ID# #16-2
Project Type Pump Station Upgrade

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information

All information must be supplied

Federal Employer Identification Number: _____		
Name: _____		
Address: _____ _____		
City: _____	State: _____	Zip: _____
Amount of Contract: \$ _____	Contract Type:	
Approximate Starting Date: ____/____/____	<input type="checkbox"/> (01) General Construction	
Approximate Completion Date: ____/____/____	<input type="checkbox"/> (02) Heating/Ventilation	
	<input type="checkbox"/> (03) Electrical	
	<input type="checkbox"/> (04) Plumbing	
	<input type="checkbox"/> (05) Other : _____	

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

IMPORTANT NOTICE

FOR

CONTRACTORS & CONTRACTING AGENCIES

Social Security Numbers on Certified Payrolls

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concerns with regard to inclusion of this information on payrolls if another identifier will suffice.

For these reasons, *the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor.*

NOTE: This change does not affect the Department's ability to request and receive the entire social security number from employers during the course of its public work / prevailing wage investigations.

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12240

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

Construction Industry Fair Play Act

Required Posting For Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site.

Failure to post the notice can result in penalties of up to \$1,500 for a first offense and up to \$5,000 for a second offense.

The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, www.labor.ny.gov.

If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.state.ny.us .



New York State Department of Labor
Required Notice under Article 25-B of the Labor Law

**ATTENTION ALL EMPLOYEES, CONTRACTORS AND SUBCONTRACTORS:
YOU ARE COVERED BY THE
CONSTRUCTION INDUSTRY FAIR PLAY ACT**

The law says that you are an employee unless:

- You are free from direction and control in performing your job AND
- You perform work that is not part of the usual work done by the business that hired you AND
- You have an independently established business

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

**IT IS AGAINST THE LAW FOR AN EMPLOYER TO MISCLASSIFY EMPLOYEES AS
INDEPENDENT CONTRACTORS OR PAY EMPLOYEES OFF-THE-BOOKS.**

Employee rights. If you are an employee:

- You are entitled to state and federal worker protections such as
 - unemployment benefits, if unemployed through no fault of your own, able to work, and otherwise qualified
 - workers' compensation benefits for on-the-job injuries
 - payment for wages earned, minimum wage, and overtime (under certain conditions)
 - prevailing wages on public work projects
 - the provisions of the National Labor Relations Act and
 - a safe work environment
- It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor:

- You must pay all taxes required by New York State and Federal Law.

Penalties for paying off-the-books or improperly treating employees as independent contractors:

- **Civil Penalty** First Offense: up to \$2,500 per employee.
 Subsequent Offense(s): up to \$5,000 per employee.
- **Criminal Penalty** First Offense: Misdemeanor - up to 30 days in jail, up to a \$25,000 fine and debarment from performing Public Work for up to one year.
 Subsequent Offense(s): Misdemeanor - up to 60 days in jail, up to a \$50,000 fine and debarment from performing Public Work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at 1(866)435-1499 or send an email to dol.misclassified@labor.state.ny.us. All complaints of fraud and violations are taken seriously and you can remain anonymous.

Employer Name:

WORKER NOTIFICATION

(Labor Law §220, paragraph a of subdivision 3-a)

Effective February 24, 2008

This provision is an addition to the existing prevailing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her particular job classification. The required notification will be provided with each wage schedule, may be downloaded from our website www.labor.state.ny.us or made available upon request by contacting the Bureau of Public Work at 518-457-5589.

* In the event that the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

Attention Employees

THIS IS A: PUBLIC WORK PROJECT

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at:
www.labor.ny.gov

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5156		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

OSHA 10-hour Construction Safety and Health Course – S1537-A

Effective July 18, 2008

This provision is an addition to the existing prevailing wage rate law, Labor Law §220, section 220-h. It requires that on all public work projects of at least \$250,000.00, all laborers, workers and mechanics working on the site, be certified as having successfully completed the OSHA 10-hour construction safety and health course. It further requires that the advertised bids and contracts for every public work contract of at least \$250,000.00, contain a provision of this requirement.

NOTE: The OSHA 10 Legislation only applies to workers on a public work project that are required, under Article 8, to receive the prevailing wage.

Where to find OSHA 10-hour Construction Course

1. NYS Department of Labor website for scheduled outreach training at:

www.labor.state.ny.us/workerprotection/safetyhealth/DOSH_ONSITE_CONSULTATION.shtm

2. OSHA Training Institute Education Centers:

Rochester Institute of Technology OSHA Education Center

Rochester, NY

Donna Winter

Fax (585) 475-6292

e-mail: dlwtpo@rit.edu

(866) 385-7470 Ext. 2919

www.rit.edu/~outreach/course.php3?CourseID=54

Atlantic OSHA Training Center

UMDNJ – School of Public Health

Piscataway, NJ

Janet Crooks

Fax (732) 235-9460

e-mail: crooksje@umdnj.edu

(732) 235-9455

<https://ophp.umdnj.edu/wconnect/ShowSchedule.awp?~~GROUP~AOTCON~10~>

Atlantic OSHA Training Center

University at Buffalo

Buffalo, New York

Joe Syracuse

Fax (716) 829-2806

e-mail: mailto:japs@buffalo.edu

(716) 829-2125

http://www.smbs.buffalo.edu/CENTERS/trc/schedule_OSHA.php

Keene State College

Manchester, NH

Leslie Singleton

e-mail: lsingletin@keene.edu

(800) 449-6742

www.keene.edu/courses/print/courses_osh.cfm

3. List of trainers and training schedules for OSHA outreach training at:

www.OutreachTrainers.org

Requirements for OSHA 10 Compliance

Chapter 282 of the Laws of 2007, codified as Labor Law 220-h took effect on July 18, 2008. The statute provides as follows:

The advertised specifications for every contract for public work of \$250,000.00 or more must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training “prior to the performing any work on the project.”

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.*)
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-485-5696.

WICKS Reform 2008

(For all contracts advertised or solicited for bid on or after 7/1/08)

- Raises the threshold for public work projects subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work. The total project's threshold would increase from \$50,000 to: \$3 million in Bronx, Kings, New York, Queens and Richmond counties; \$1.5 million in Nassau, Suffolk and Westchester counties; and \$500,000 in all other counties.
- For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical work and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or use of a Project Labor Agreement (PLA), and must be open to public inspection.
- Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.
- The Commissioner of Labor shall have the power to enforce separate specification requirements on projects, and may issue stop-bid orders against public owners for non-compliance.
- Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.
- Reduces from 15 to 7 days the period in which contractors must pay subcontractors.

IMPORTANT INFORMATION

**Regarding Use of Form PW30.1
(Previously 30R)**

“Employer Registration for Use of 4 Day / 10 Hour Work Schedule”

To use the ‘4 Day / 10 Hour Work Schedule’:

There **MUST** be a *Dispensation of Hours (PW30)* in place on the project

AND

You **MUST** register your intent to work 4 / 10 hour days, by completing the PW30.1 Form.

REMEMBER...

The ‘4 Day / 10 Hour Work Schedule’ applies **ONLY** to Job Classifications and Counties listed on the PW30.1 Form.

Do not write in any additional Classifications or Counties.

(Please note : For each Job Classification check the individual wage schedule for specific details regarding their 4/10 hour day posting.)

Instructions for Completing Form PW30.1

(Previously 30R)

“Employer Registration for Use of 4 Day / 10 Hour Work Schedule”

Before completing Form PW30.1 check to be sure ...

- There is a *Dispensation of Hours* in place on the project.
- The 4 Day / 10 Hour Work Schedule applies to the Job Classifications you will be using.
- The 4 Day / 10 Hour Work Schedule applies to the County / Counties where the work will take place.

Instructions (Type or Print legibly):

Contractor Information:

- Enter the Legal Name of the business, FEIN, Street Address, City, State, Zip Code; the Company’s Phone and Fax numbers; and the Company’s email address (if applicable)
- Enter the Name of a Contact Person for the Company along with their Phone and Fax numbers, and the personal email address (if applicable)

Project Information:

- Enter the Prevailing Rate Case number (PRC#) assigned to this project
- Enter the Project Name / Type (i.e. Smithtown CSD – Replacement of HS Roof)
- Enter the Exact Location of Project (i.e. Smithtown HS, 143 County Route #2, Smithtown, NY; Bldgs. 1 & 2)
- If you are a Subcontractor, enter the name of the Prime Contractor for which you work
- On the Checklist of Job Classifications -
 - Go to pages 2 and 3 of the form
 - Place a checkmark in the box to the right of the Job Classification you are choosing
 - Mark all Job Classifications that apply

Do not write in any additional Classifications or Counties.

Requestor Information:

- Enter the name of the person submitting the registration, their title with the company , and the date the registration is filled out

Return Completed Form:

- **Mail** the completed PW30.1 form to: NYSDOL Bureau of Public Work, SOBC – Bldg.12 – Rm.130, Albany, NY 12240 **-OR-**
- **Fax** the completed PW30.1 form to: NYSDOL Bureau of Public Work at (518)485-1870



Bureau of Public Work Harriman
State Office Campus
Building 12, Room 130
Albany, New York 12240
Phone: (518) 457-5589 | Fax: (518) 485-1870
www.labor.ny.gov

Employer Registration for Use of 4 Day / 10 Hour Work Schedule

Before completing this form, make sure that:

- There is a Dispensation of Hours in place on the project.
The 4 Day / 10 Hour Work Schedule applies to the Job Classifications you will be using.
The 4 Day / 10 Hour Work Schedule applies to the County / Counties where the work will take place.

Please type or print the requested information and then mail or fax to the address above.

Contractor Information

Company Name: FEIN:
Address:
City: State: Zip Code:
Phone No: Fax No: Email:
Contact Person:
Phone No: Fax No: Email:

Project Information

Project PRC#: Project Name/Type:
Exact Location of Project: County:
(If you are Subcontractor)
Prime Contractor Name:

Job Classification(s) to Work 4/10 Schedule: (Choose all that apply on Job Classification Checklist - Pages 3-8)
*** Do not write in any additional Classifications or Counties***

Requestor Information

Name:
Title: Date:

Please use the list below with the number assigned to each county as a reference to the corresponding numbers listed in the following pages under **Entire Counties & Partial Counties**.

- | | | | |
|-----|-----------------------------|-----|---------------------------------|
| 1. | Albany County | 33. | Oneida County |
| 2. | Allegany County | 34. | Onondaga County |
| 3. | Bronx County | 35. | Ontario County |
| 4. | Broome County | 36. | Orange County |
| 5. | Cattaraugus County | 37. | Orleans County |
| 6. | Cayuga County | 38. | Oswego County |
| 7. | Chautauqua County | 39. | Otsego County |
| 8. | Chemung County | 40. | Putnam County |
| 9. | Chenango County | 41. | Queens County |
| 10. | Clinton County | 42. | Rensselaer County |
| 11. | Columbia County | 43. | Richmond County (Staten Island) |
| 12. | Cortland County | 44. | Rockland County |
| 13. | Delaware County | 45. | Saint Lawrence County |
| 14. | Dutchess County | 46. | Saratoga County |
| 15. | Erie County | 47. | Schenectady County |
| 16. | Essex County | 48. | Schoharie County |
| 17. | Franklin County | 49. | Schuyler County |
| 18. | Fulton County | 50. | Seneca County |
| 19. | Genesee County | 51. | Steuben County |
| 20. | Greene County | 52. | Suffolk County |
| 21. | Hamilton County | 53. | Sullivan County |
| 22. | Herkimer County | 54. | Tioga County |
| 23. | Jefferson County | 55. | Tompkins County |
| 24. | Kings County (Brooklyn) | 56. | Ulster County |
| 25. | Lewis County | 57. | Warren County |
| 26. | Livingston County | 58. | Washington County |
| 27. | Madison County | 59. | Wayne County |
| 28. | Monroe County | 60. | Westchester County |
| 29. | Montgomery County | 61. | Wyoming County |
| 30. | Nassau County | 62. | Yates County |
| 31. | New York County (Manhattan) | | |
| 32. | Niagara County | | |

Job Classification Checklist

(Place a checkmark by all classifications that will be using the 4/10 schedule)

**** Do not write in any additional Classifications or Counties****

Job Classification	Tag #	Entire Counties	Partial Counties	Check Box
Carpenter – Building	276B-All	7	2 ,5	
Carpenter – Building	276B-Cat	15	5	
Carpenter – Building	276-B-LIV	26, 28, 35, 59	61	
Carpenter – Building	276B-Gen	19, 32, 37	61	
Carpenter – Heavy & Highway	276HH-All	2, 5, 7		
Carpenter – Heavy & Highway	276HH-Erie	15		
Carpenter – Heavy & Highway	276HH- Gen	19, 32, 37, 61		
Carpenter – Heavy & Highway	276HH-Liv	26, 28, 35, 59		
Carpenter – Residential	276R-All	7	2, 5	
Carpenter – Building	277B-Bro	4, 54		
Carpenter – Building	277B-CAY	6, 50, 62		
Carpenter – Building	277B-CS	8, 12, 49, 51, 55	2	
Carpenter – Building	277 JLS	23, 25, 45		
Carpenter – Building	277 omh	22, 27, 33		
Carpenter – Building	277 On	34		
Carpenter – Building	277 Os	38		
Carpenter – Building	277CDO Bldg	9, 13, 39		
Carpenter – Heavy & Highway	277CDO HH	9, 13, 39		
Carpenter – Heavy & Highway	277HH-BRO	4, 6, 8, 12, ,22, 23, 25, 27, 33, 34, 38, 45, 49, 50, 51, 54, 55, 62		
Carpenter – Building	291B-Alb	1, 18, 20, 29, 42, 47, 48		
Carpenter – Building	291B-Cli	10, 16, 17		
Carpenter – Building	291B-Ham	21, 57, 58		
Carpenter – Building	291B-Sar	46		
Carpenter – Heavy & Highway	291HH-Alb	1, 10, 16, 17,18, 20, 21, 29, 42, 46, 47, 48, 57, 58		
Electrician	25m	30, 52		
Electrician – Teledata Cable Splicer	43	12, 22, 27, 33, 38	6, 9, 34, 39, 55, 59	

Job Classification Checklist

(Place a checkmark by all classifications that will be using the 4/10 schedule)

*** Do not write in any additional Classifications or Counties***

Job Classification	Tag #	Entire Counties	Partial Counties	Check Box
Electrician	86	26, 28	19, 35, 37, 59, 61	
Electrician	840 Teledata and 840 Z1	62	6, 34, 35, 50, 59	
Electrician	910	10, 16, 17, 23, 25, 45		
Electrical Lineman	1049Line/Gas	30, 41, 52		
Electrical Lineman	1249a	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 44, 46, 47, 48, 49, 50, 45, 51, 53, 54, 55, 56, 57, 58, 59, 61, 62		
Electrical Lineman	1249a West	60		
Electrical Lineman	1249a-LT	1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 32, 33, 34, 35, 37, 38, 39, 42, 46, 47, 48, 49, 50, 45, 51, 53, 54, 55, 57, 58, 59, 61, 62		
Electrical Lineman	1249aREG8LT	11, 14, 36, 40, 44, 56		
Electrical Lineman	1249aWestLT	60		
Elevator Constructor	138	11, 14, 20, 36, 40, 53, 56	13, 44, 60	
Elevator Constructor	14	2, 5, 7, 15, 19, 32, 37, 61		
Elevator Constructor	27	8, 26, 28, 35, 49, 50, 51, 59, 62		
Elevator Constructor	35	1, 10, 16, 18, 21, 22, 29, 39, 42, 46, 47, 48, 57, 58		
Elevator Constructor	62.1	4, 6, 9, 12, 23, 25, 27, 33, 34, 38, 45, 54, 55	13	
Glazier	201	1, 10, 11, 16, 17, 18, 20, 21, 29, 42, 46, 47, 48, 57, 58		
Glazier	660r	2, 5, 7, 15, 19, 32, 37, 61		
Glazier	660	2, 5, 7, 15, 19, 32, 37, 61		
Glazier	677.1	23, 25, 26, 28, 35, 45, 50, 59, 62		
Glazier	677Z-2	6, 12, 22, 27, 33, 34, 38		
Glazier	677z3	4, 8, 9, 13, 39, 49, 51, 54, 55		
Glazier	677r.2	6, 12, 22, 27, 33, 34, 38		
Insulator – Heat & Frost	30-Syracuse	4, 6, 8, 9, 12, 22, 23, 25, 27, 33, 34, 38, 39, 49, 50, 45, 54, 55		
Laborer – Building	621b	2, 7	5	
Laborer – Building	633 bON	34		

Job Classification Checklist

(Place a checkmark by all classifications that will be using the 4/10 schedule)

*** Do not write in any additional Classifications or Counties***

Job Classification	Tag #	Entire Counties	Partial Counties	Check Box
Laborer – Building	633b Cay	6		
Laborer – Building	633bOS	38		
Laborer – Building	785(7)	4	9, 13, 54	
Laborer – Building	785B-CS	8, 51	49	
Laborer – Building	7-785b	12, 55	49, 54	
Laborers – Heavy & Highway	157h/h	47	18, 29, 46	
Laborers – Heavy & Highway	190 h/h	1, 42, 58	11, 20, 46	
Laborers – Heavy & Highway	35/2h	21, 22, 27, 33	18, 29	
Laborer – Residential	621r	2, 7	5	
Laborers – Tunnel	157	47	18, 29, 46	
Laborers – Tunnel	35T	21, 22, 27, 33	18, 29	
Laborers – Tunnel	190	1, 42, 58	11, 20, 46	
Mason – Building	2TS.1	1, 10, 11, 16, 17, 18, 20, 21, 29, 42, 46, 47, 48, 57, 58		
Mason – Building	2TS.2	22, 23, 25, 33, 45	27	
Mason – Building	2TS.3	6, 34, 38	27	
Mason – Building	2b-on	34		
Mason – Building	2b.1	1, 11, 18, 20, 21, 29, 42, 46, 47, 48, 58	57	
Mason – Building	2b.2	22, 33	25	
Mason – Building	2b.3	6, 34	27	
Mason – Building	2b.4	38		
Mason – Building	2b.5	23	25	
Mason – Building	2b.6	45		
Mason – Building	2b.8	10, 16, 17	57	
Mason – Building	3b-Co-Z2	8, 49, 51	2	
Mason – Building	3B-Z1	19, 26, 28, 35, 50, 59, 61, 62		
Mason – Building – Residential	3B-Z1R	19, 26, 28, 35, 50, 59, 61, 62		
Mason – Building	3B-Bing-Z2	4, 9, 13, 39, 54		
Mason – Building	3B-lth-Z2	12, 55		

Job Classification Checklist

(Place a checkmark by all classifications that will be using the 4/10 schedule)

*** Do not write in any additional Classifications or Counties***

Job Classification	Tag #	Entire Counties	Partial Counties	Check Box
Mason – Building	3B-Jam-Z2	7	2, 5	
Mason – Building – Residential	3B-Jam-Z2R	2, 4, 8, 7, 9, 12, 39, 13, 49, 51, 54, 55	5	
Mason – Building	3B-Z3	15, 32	5	
Mason – Building	3B-Z3.Orleans	37		
Mason – Residential	3B-Z3R	15, 32	5	
Mason – Residential	3B-z3R.Orleans	37		
Mason - Heavy & Highway	3h	2, 4, 8, 7, 9, 12, 13, 19, 26, 28, 35, 37, 39, 49, 50, 51, 54, 55, 59, 61, 62	5, 15, 32	
Mason – Tile Finisher	3TF-Z1	19, 26, 28, 35, 50, 59, 61, 62		
Mason – Tile Finisher	3TF-Z2	2, 4, 8, 7, 9, 12, 13, 39, 49, 51, 54, 55	5	
Mason – Tile Finisher	3TF-Z3	15, 32, 37	5	
Mason – Tile Finisher	3TF-Z1R	19, 26, 28, 35, 50, 59, 61, 62		
Mason – Tile Finisher	3TF-Z2R	2, 4, 7, 9, 12, 13, 39, 49, 51, 54, 55	5	
Mason – Tile Finisher	3TF-Z3R	15, 32, 37	5	
Mason – Tile Setter	3TS-Z1	19, 26, 28, 35, 50, 59, 61, 62		
Mason – Tile Setter Residential	3TS-Z1R	19, 26, 28, 35, 50, 59, 61, 62		
Mason – Tile Setter	3TS-Z2	2, 4, 7, 8, 9, 12, 13, 39, 49, 51, 54, 55	5	
Mason – Tile Setter Residential	3TS-Z2R	2, 4, 7, 8, 9, 12, 13, 39, 49, 51, 54, 55	5	
Mason – Tile Setter	3TS-Z3	15, 32, 37	5	
Mason – Tile Setter Residential	3TS-Z3R	15, 32, 37	5	
Mason – Building/Heavy & Highway	780	3, 24, 30, 31, 41, 43, 52		
Operating Engineer - Heavy & Highway	137H/H	40, 60	14	
Operating Engineer – Heavy & Highway	158-832H	2, 8, 26, 28, 35, 49, 51, 59, 62	19	
Operating Engineer – Heavy & Highway	158-H/H	1, 4, 9, 10, 11, 14, 16, 17, 18, 20, 21, 22, 29, 39, 42, 46, 47, 48, 54, 57, 58		
Operating Engineer – Heavy & Highway	158-545h	6, 12, 23, 25, 27, 33, 38, 45, 50, 55		
Painter	1456-LS	1, 3, 10, 11, 14, 16, 17, 18, 20, 21, 24, 29, 30, 31, 36, 40, 41, 42, 43, 44, 46, 47, 48, 52, 53, 56, 57, 58, 60		
Painter	150	28, 59, 62	26, 35	

Job Classification Checklist

(Place a checkmark by all classifications that will be using the 4/10 schedule)

*** Do not write in any additional Classifications or Counties***

Job Classification	Tag #	Entire Counties	Partial Counties	Check Box
Painter	178 B	4, 9, 54		
Painter	178 E	8, 49	51	
Painter	178 I	12, 55		
Painter	178 O	13, 39		
Painter	31	6, 22, 27, 33, 34, 50	25, 35, 38	
Painter	38.O		38	
Painter	38.W	23, 45	25	
Painter	4- Buf,Nia,Olean	2, 15, 19, 32, 37, 61	5, 7, 26, 51	
Painter	4-Jamestown		5, 7	
Sheetmetal Worker	46	26, 28, 35, 50, 59, 62		
Sheetmetal Worker	46r	26, 28, 35, 50, 59, 62		
Teamsters – Heavy & Highway	294h/h	1, 11, 18, 20, 29, 42, 46, 47, 48, 58	57	
Teamsters – Heavy & Highway	317bhh	6, 12, 50, 51, 55, 62	2	
Teamsters - Building/Heavy & Highway	456	40, 60		

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.

Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.

Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.

Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. In most cases the payment or provision of supplements is for each hour worked (noted in the schedule as 'Per hour worked'). Some classifications require the payment or provision of supplements for each hour paid (noted in the schedule as 'Per hour paid'), which require supplements to be paid or provided at a premium rate for premium hours worked. Some classifications may also require the payment or provision of supplements for paid holidays on which no work is performed.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.state.ny.us) for current wage rate information.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3

Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12240

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Westchester County General Construction

Boilermaker **12/01/2017**

JOB DESCRIPTION Boilermaker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2017	01/01/2018
Boilermaker	\$ 55.23	\$ 57.17
Repairs & Renovations	\$ 55.23	\$ 57.17

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2017	01/01/2018
Boilermaker	32% of hourly	32% of hourly
Repair \$ Renovations	Wage Paid	Wage Paid
	+ \$ 25.27	+ \$ 25.35

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

Repairs & Renovation Includes replacement of parts and repairs & renovation of existing unit.

OVERTIME PAY

See (D, O) on OVERTIME PAGE
 Repairs & Renovation see (B,E,Q)

HOLIDAY

Paid: See (8, 16, 23, 24) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 12, 15, 16, 22, 23, 24, 25) on HOLIDAY PAGE

NOTE: *Employee must work in pay week to receive Holiday Pay.
 **Employee gets 4 times the hourly wage rate for working Labor Day.

REGISTERED APPRENTICES

Wage per hour:
 (1/2) Year Terms at the following percentage of Boilermaker's Wage

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

Supplemental Benefits Per Hour:

	07/01/2017	01/01/2018
Apprentice(s)	32% of Hourly	32% of Hourly
	Wage Paid Plus	Wage Paid Plus
	Amount Below	Amount Below
1st Term	\$ 19.35	\$ 19.37
2nd Term	20.20	20.22
3rd Term	21.04	21.06
4th Term	21.89	21.92
5th Term	22.74	22.77
6th Term	23.60	23.62
7th Term	24.43	24.46

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Carpenter **12/01/2017**

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2017
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Piledriver \$ 51.63
Dockbuilder \$ 51.63

SUPPLEMENTAL BENEFITS

Per hour worked:

Journeyworker \$ 48.62

OVERTIME PAY

See (B, E2, O) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.

Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour

(1)year terms:

1st	2nd	3rd	4th
\$20.65	\$25.82	\$33.56	\$41.30

Supplemental benefits per hour:

Apprentices \$ 32.49

8-1556 Db

Carpenter

12/01/2017

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2017

Carpet/Resilient

Floor Coverer \$ 50.50

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS

Per hour worked:

\$ 45.85

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE.

Paid for 1st & 2nd yr.

Apprentices See (5,6,11,13,16,18,19,25)

Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wage per hour - (1) year terms:

1st	2nd	3rd	4th
\$20.20	\$25.25	\$32.83	\$40.40

Supplemental benefits per hour - all apprentice terms:

\$ 31.11

8-2287

Carpenter

12/01/2017

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour: 07/01/2017

Marine Construction:

Marine Diver \$ 65.38
Marine Tender 46.44

SUPPLEMENTAL BENEFITS

Per Hour Worked:

Journeyman \$ 48.62

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 13, 16, 18, 19) on HOLIDAY PAGE

8-1456MC

Carpenter

12/01/2017

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2017

Building
Millwright \$ 51.50

SUPPLEMENTAL BENEFITS

Per hour worked:

Millwright \$ 52.38

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18,19)* on HOLIDAY PAGE.

Overtime See (5,6,8,11,13,18,19,25) on HOLIDAY PAGE.

* Must show up to work

REGISTERED APPRENTICES

Wages per hour:

(1) year terms:

1st.	2nd.	3rd.	4th.
\$28.33	\$33.48	\$38.63	\$48.93

Supplemental benefits per hour paid:

(1) year terms:

1st.	2nd.	3rd.	4th.
\$34.25	\$37.85	\$42.10	\$48.66

8-740.1

Carpenter

12/01/2017

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour: 07/01/2017

Timberman \$ 46.99

SUPPLEMENTAL BENEFITS

Per Hour Worked: 07/01/2017

\$ 48.23

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.

Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour:

(1) year terms:

1st	2nd	3rd	4th
\$18.80	\$23.50	\$30.54	\$37.59

Supplemental benefits per hour:

\$ 32.30

8-1556 Tm

Carpenter

12/01/2017

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Westchester

PARTIAL COUNTIES

Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.

Putnam: South of but including the following, Cold Spring, TompkinsCorner, Mahopac, Croton Falls, east to Connecticut border.

Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

WAGES

Per hour: 07/01/2017 10/17/2017

Core Drilling:
 Driller \$ 38.82 + additional \$ 1.66

Driller Helper 30.96 + additional \$ 1.45

Note: Hazardous Waste Pay Differential:

For Level C, an additional 10% above wage rate per hour

For Level B, an additional 10% above wage rate per hour

For Level A, an additional 10% above wage rate per hour

Note: When required to work on water: an additional \$ 0.50 per hour.

SUPPLEMENTAL BENEFITS

Per hour worked: 07/01/2017 10/17/2017

Driller and Helper \$ 24.66 \$ 24.66

OVERTIME PAY

OVERTIME: See (B,E,K*,P,R**) on OVERTIME PAGE.

HOLIDAY

Paid: See (5,6) on HOLIDAY PAGE.
 Overtime: * See (5,6) on HOLIDAY PAGE.
 ** See (8,10,11,13) on HOLIDAY PAGE.

8-1536-CoreDriller

Carpenter - Building / Heavy&Highway

12/01/2017

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

WAGES

WAGES:(per hour)

	07/01/2017	07/01/2018
BUILDING:		Additional
Carpenter	\$ 44.85	\$ 0.75
HEAVY/HIGHWAY:		
Carpenter	\$ 44.85	
Carpenter Concrete Forms	\$ 44.85	

SHIFT DIFFERENTIAL: When it is mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen(15) percent of wage plus applicable benefits.

NOTE:Carpenters employed in the removal or abatement of asbestos or any toxic or hazardous material or required to work near asbestos or any toxic or hazardous material and required to wear protective equipment shall receive two (2) hours extra pay per day, plus applicable supplemental benefits.

SUPPLEMENTAL BENEFITS

Per hour paid:

BUILDING AND HEAVY/HIGHWAY:

Journeyworker \$ 30.85

OVERTIME PAY

BUILDING:

See (B, E, Q) on OVERTIME PAGE.

HEAVY/HIGHWAY:

See (B, E, Q, T) on OVERTIME PAGE.

HOLIDAY

BUILDING:

Paid: See (1) on HOLIDAY PAGE.

Overtime: See (5, 6, 16**, 25**) on HOLIDAY PAGE.

HEAVY/HIGHWAY:

Paid: See (5, 6, 25) on HOLIDAY PAGE including benefits.

Overtime: See (5*, 6*, 25**) on HOLIDAY PAGE.

*NOTE: For Holidays 5 and 6 code T applies, with benefits at straight time rate.

**NOTE: For Holidays 16 and 25 code Q applies, with benefits at straight time rate.

REGISTERED APPRENTICES

1 year terms at the following wage rates.

BUILDING-HEAVY/HIGHWAY:

1st	2nd	3rd	4th
\$22.18	\$25.91	\$29.63	\$33.36

Supplemental Benefits per hour paid:

Apprentices

All terms \$ 15.95

11-279.1B/HH

Electrician

12/01/2017

JOB DESCRIPTION Electrician

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES

Per hour Paid: 07/01/2017
 Service Technician \$ 32.40

Service and Maintenance on Alarm and Security Systems.

Maintenance, repair and /or replacement of defective (or damaged) equipment on, but not limited to, Burglar - Fire - Security - CCTV - Card Access - Life Safety Systems and associated devices. (Whether by service contract of T&M by customer request.)

SUPPLEMENTAL BENEFITS

Per hour:
 Journeyworker: \$ 16.10

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

9-3H

Electrician

12/01/2017

JOB DESCRIPTION Electrician

DISTRICT 8

ENTIRE COUNTIES

Westchester

WAGES

Per hour:	07/01/2017	04/26/2018	04/25/2019
Electrician/A-Technician	\$ 51.75	\$ 51.75	\$ 52.75
Teledata	\$ 51.75	\$ 51.75	\$ 52.75

* Note: All maintenance (TEMPORARY WORK ONLY) of feeders, sub-feeders and wiring of electrical equipment for HEATING OF BUILDINGS shall be paid for at 80% of the regular hourly rate for the first 40 hours. After 40 hours they shall be paid time and one-half.

Note: On a job where employees are required to work on bridges over navigable waters, transmission towers, light poles, bosun chairs, swinging scaffolds , etc. 40 feet or more above the water or ground or under compressed air, or tunnel projects under construction or where assisted breathing apparatus is required, they will be paid at the rate of time and one-half for such work except on normal pole line or building construction work.

SUPPLEMENTAL BENEFITS

Per hour worked:	07/01/2017	04/26/2018	04/25/2019
Journeyworker	\$ 45.72	\$ 48.80	\$ 50.55

OVERTIME PAY

See (A, G, *J, P) on OVERTIME PAGE

*NOTE: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Entering Program PRIOR to April 23, 2014

(1) year terms at the following wage rates:

	07/01/2017	04/26/2018	04/25/2019
1st term	\$ 14.25	\$ 14.25	\$ 14.25
2nd term	17.05	17.05	17.05
3rd term	19.15	19.15	19.15
4th term	21.10	21.10	21.10
MIJ	26.50	26.50	26.50

Supplemental Benefits per hour worked:

	07/01/2017	04/26/2018	04/25/2019
1st term	\$ 10.32	\$ 10.32	\$ 10.32
2nd term	13.76	13.76	13.76
3rd term	15.16	15.16	15.16
4th term	16.46	16.46	16.46

MIJ	13.38	13.38	13.38
Entering Program AFTER April 23, 2014 (1) year terms at the following wage rates:			
	07/01/2017	04/26/2018	04/25/2019
1st term	\$ 13.00	\$ 13.00	\$ 13.00
2nd term	15.00	15.00	15.00
3rd term	17.00	17.00	17.00
4th term	19.00	19.00	19.00
MIJ 1-12 months	23.00	23.00	23.00
MIJ 13-18 months	26.50	26.50	26.50

Supplemental Benefits per hour worked:			
	07/01/2017	04/26/2018	04/25/2019
1st term	\$ 9.49	\$ 9.49	\$ 9.49
2nd term	12.39	12.39	12.39
3rd term	13.73	13.73	13.73
4th term	15.06	15.06	15.06
MIJ 1-12 months	12.08	12.08	12.08
MIJ 13-18 months	13.38	13.38	13.38

8-3/W

Electrician **12/01/2017**

JOB DESCRIPTION Electrician **DISTRICT 8**
ENTIRE COUNTIES
 Westchester

WAGES

	07/01/2017	04/26/2018	04/25/2019
Electrician	\$ 26.50	\$ 26.50	\$ 26.50
H - Telephone	\$ 26.50	\$ 26.50	\$ 26.50

Electrical and Teledata work of limited scope, consisting of repairs and /or replacement of defective electrical and teledata equipment.
 - Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.
 See Electrician/A Technician classification for all new installations of wiring, conduit, junction boxes and light fixtures.

SUPPLEMENTAL BENEFITS

	07/01/2017	04/26/2018	04/25/2019
Electrician & H - Telephone	\$ 13.38	\$ 13.38	\$ 13.38

OVERTIME PAY
 See (B, G, *J, P) on OVERTIME PAGE
 *Note: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY
 Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

8-3m

Elevator Constructor **12/01/2017**

JOB DESCRIPTION Elevator Constructor **DISTRICT 4**
ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES
 Rockland: Entire County except for the Township of Stony Point
 Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

	07/01/2017	03/17/2018
Elevator Constructor	\$ 62.64	\$ 64.48

Modernization &

Service/Repair 49.14 50.49

SUPPLEMENTAL BENEFITS

Per Hour:

Elevator Constructor \$ 38.27 \$ 39.98

Modernization & Service/Repair 37.25 38.94

OVERTIME PAY

Constructor. See (D, M, T) on OVERTIME PAGE.

Modern./Service See (B, F, S) on OVERTIME PAGE.

HOLIDAY

Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES PER HOUR:

*Note:1st Term is based on Average wage of Constructor & Modernization.

Terms 2 thru 4 Based on Journeyman's wage of classification Working in.

1 YEAR TERMS:

1st Term* 50%	2nd Term 55%	3rd Term 65%	4th Term 75%
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SUPPLEMENTAL BENEFITS

Elevator Constructor

1st Term	\$ 30.99	\$ 32.50
2nd Term	31.69	33.22
3rd Term	32.82	34.38
4th Term	33.94	35.54

Modernization & Service/Repair

1st Term	\$ 30.92	\$ 32.43
2nd Term	31.32	32.83
3rd Term	32.37	33.92
4th Term	33.43	35.01

4-1

Elevator Constructor

12/01/2017

JOB DESCRIPTION Elevator Constructor

DISTRICT 1

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, Ulster

PARTIAL COUNTIES

Delaware: Towns of Andes, Bovina, Colchester, Davenport, Delhi, Harpersfield, Hemdon, Kortright, Meredith, Middletown, Roxbury, Hancock & Stamford

Rockland: Only the Township of Stony Point.

Westchester: Only the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per Hour	07/01/2017	01/01/2018	01/01/2019
Mechanic	\$ 55.02	+\$2.85	+\$2.94
Helper	70% of Mechanic Wage Rate		

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday or Tuesday thru Friday.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked

07/01/2017
 Journeyman/Helper
 \$ 31.585*

(*)Plus 6% of regular hourly.

OVERTIME PAY

See (D, O) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 15, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE

Note: When a paid holiday falls on Saturday, it shall be observed on Friday. When a paid holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES

Wages per hour:

0-6 mo*	6-12 mo	2nd yr	3rd yr	4th yr
50 %	55 %	65 %	70 %	80 %

*No supplemental benefits

Supplemental Benefits per hour worked:

Same as Journeyman/Helper

1-138

Glazier

12/01/2017

JOB DESCRIPTION Glazier

DISTRICT 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per hour:	07/01/2017	05/01/2018
Glazier	\$ 53.90	+ additional
Scaffolding	\$ 54.90	\$ 1.25

Scaffolding includes swing scaffold, mechanical equipment, scissor jacks, man lifts, booms & buckets 24' or more, but not pipe scaffolding.

Repair & Maintenance \$ 27.23

Repair & Maintenance- All repair & maintenance work on a particular building, whenever performed, where the total cumulative contract value is under \$121,550

SUPPLEMENTAL BENEFITS

Per hour paid:	07/01/2017
Journeyworker	\$ 31.99
Repair & Maintenance	\$ 18.24

OVERTIME PAY

See (C*, D* E2, O) on OVERTIME PAGE. (Premium is applied to the respective base wage only.)

* If an optional 8th hour is required to complete the entire project, the same shall be paid at the regular rate of pay. If a 9th hour is worked, then both hours or more (8th & 9th or more) will be paid at double time rate of pay.

For 'Repair & Maintenance' see (B, B2, F, P) on overtime page.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (4, 6, 16, 25) on HOLIDAY PAGE

For 'Repair & Maintenance' see (5, 6, 16, 25)

REGISTERED APPRENTICES

Wage per hour:

(1) year terms at the following wage rates:

07/01/2017

1st term	\$ 18.44
2nd term	26.61
3rd term	32.10
4th term	42.97

Supplemental Benefits:
 (Per hour worked)

1st term	\$ 15.36
2nd term	21.21
3rd term	23.41
4th term	27.56

8-1281 (DC9 NYC)

Insulator - Heat & Frost

12/01/2017

JOB DESCRIPTION Insulator - Heat & Frost

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Westchester

WAGES

Per hour: 07/01/2017

Insulator	\$ 51.30
Discomfort & Additional Training**	\$ 54.25
Fire Stop Work*	\$ 28.45

* Applies on all exclusive Fire Stop Work (When contract is for Fire Stop work only). No apprentices on these contracts only.

**Applies to work requiring: garb or equipment worn against the body not customarily worn by insulators; psychological evaluation; special training, including but not limited to "Yellow Badge" radiation training

Note: Additional \$0.50 per hour for work 30 feet or more above floor or ground level.

SUPPLEMENTAL BENEFITS

Per hour paid:

Journeyworker	\$ 32.05
Discomfort & Additional Training	\$ 33.94
Fire Stop Work: Journeyworker	\$ 16.41

OVERTIME PAY

See (B, E, E2, Q, *T) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Note: Last working day preceding Christmas and New Years day, workers shall work no later than 12:00 noon and shall receive 8 hrs pay.

Overtime: See (2*, 4, 6, 16, 25) on HOLIDAY PAGE.

*Note: Labor Day triple time if worked.

REGISTERED APPRENTICES

(1) year terms:

Insulator Apprentices:

1st	2nd	3rd	4th
\$ 22.59	\$ 27.37	\$ 36.95	\$ 41.74

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
\$ 23.76	\$ 28.84	\$ 39.00	\$ 44.10

Supplemental Benefits paid per hour paid:

Insulator Apprentices:	
1st term	\$ 13.23
2nd term	16.36
3rd term	22.63
4th term	25.75

Discomfort & Additional Training Apprentices:	
1st term	\$ 13.99
2nd term	17.32
3rd term	23.96
4th term	27.29

8-91

Ironworker **12/01/2017**

JOB DESCRIPTION Ironworker **DISTRICT 4**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
 Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

WAGES
 Per hour: 07/01/2017 07/01/2018

Reinforcing & Metal Lathing	\$ 56.28	\$ 2.00/Hr. to be Allocated
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SUPPLEMENTAL BENEFITS
 Per hour paid:

Reinforcing & Metal Lathing	\$ 33.30
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OVERTIME PAY
 See (B, B1, Q) on OVERTIME PAGE

HOLIDAY
 Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 13, 18, 19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
 (1) year terms at the following wage rates:
 Wages Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 28.38	\$ 32.38	\$ 35.38	\$ 37.38

SUPPLEMENTAL BENEFITS
 Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 11.34	\$ 13.34	\$ 17.30	\$ 18.30

4-46Reinf

Ironworker **12/01/2017**

JOB DESCRIPTION Ironworker **DISTRICT 9**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
 Per Hour: 07/01/2017 01/01/2018

IRONWORKER:

Ironworker Rigger	\$ 60.47	Additional \$1.36
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Ironworker Stone

Derrickman \$ 60.47

SUPPLEMENTAL BENEFITS

Ironworker: \$ 39.24

OVERTIME PAY

See (B, D1, *E, Q, **V) on OVERTIME PAGE

*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.

** Benefits same premium as wages on Holidays only

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 25) on HOLIDAY PAGE

*Work stops at schedule lunch break with full day's pay.

REGISTERED APPRENTICES

Wage per hour:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th	5th	6th
07/01/2017	\$30.34	\$30.34	\$43.07	\$47.89	\$52.70	\$52.70

Supplemental benefits:

Per hour paid:	\$19.63	\$19.63	\$29.47	\$29.47	\$29.47	\$29.47
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9-197D/R

Ironworker

12/01/2017

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2017	01/01/2018
Ornamental	\$ 45.10	Additional
Chain Link Fence	45.10	\$ 1.25/Hr.
Guide Rail Installation	45.10	To be allocated

SUPPLEMENTAL BENEFITS

Per hour paid:
 Journeyworker: \$ 51.16

OVERTIME PAY

OVERTIME: See (A*,D1,E**,Q,V) on OVERTIME PAGE.

*Time and one-half shall be paid for all work in excess of seven (7) hours at the end of a work day to a maximum of two (2) hours on any regular work day (8th & 9th hours of work) and double time shall be paid for all work thereafter.

**Time and one-half shall be paid for all work on Saturday up to seven (7) hours and double time shall be paid for all work thereafter.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

1st term represents first 1-10 months, thereafter (1/2) year terms at the following percentage of Journeyman's wage.

1st	2nd	3rd	4th	5th
50%	55%	60%	70%	80%

Supplemental Benefits per hour paid:

1st Term	\$ 38.74
2nd Term	39.93
3rd Term	41.12
4th Term	43.51
5th Term	45.89

4-580-Or

Ironworker **12/01/2017**

JOB DESCRIPTION Ironworker **DISTRICT 4**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

PER HOUR:	07/01/2017	01/01/2018	07/01/2018
Ironworker:		Additional	Additional
Structural	\$ 50.05	\$1.72/Hr.	\$1.83/Hr.
Bridges		to be allocated	to be allocated
Machinery			

SUPPLEMENTAL BENEFITS

PER HOUR:	
Journeyman	\$ 73.03

OVERTIME PAY

See (B, B1, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES PER HOUR:

6 month terms at the following rate:

1st	\$ 26.12
2nd	26.72
3rd - 6th	27.32

Supplemental Benefits	
PER HOUR:	
All Terms	50.72

4-40/361-Str

Laborer - Building **12/01/2017**

JOB DESCRIPTION Laborer - Building **DISTRICT 8**

ENTIRE COUNTIES
 Putnam, Westchester

WAGES

	07/01/2017
Laborer	\$ 38.35
Laborer - Asbestos & Hazardous Materials Removal	\$ 40.00*

- * Abatement/Removal of:
- Lead based or lead containing paint on materials to be repainted is classified as Painter.
 - Asbestos containing roofs and roofing material is classified as Roofer.

NOTE: Upgrade/Material condition work plan for work performed during non-outage under a wage formula of 90% wage/100% fringe benefits at nuclear power plants.

SUPPLEMENTAL BENEFITS

Per hour worked:	07/01/2017
Journeyworker	\$ 24.85

OVERTIME PAY

See (B, E, E2, Q, *V) on OVERTIME PAGE

*Note: For Sundays and Holidays worked benefits are at the same premium as wages.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

LABORER ONLY

Hourly terms at the following wage:

Level A	Level B	Level C	Level D	Level E
0-1000	1001-2000	2001-3000	3001-4000	4001+
\$ 22.46	\$ 26.26	\$ 30.10	\$ 36.00	\$ 38.35

Supplemental Benefits per hour worked:

Apprentices

Level A	\$ 12.10
Level B	14.70
Level C	17.10
Level D	17.25
Level E	24.85

8-235/B

Laborer - Heavy&Highway

12/01/2017

JOB DESCRIPTION Laborer - Heavy&Highway

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

PUTNAM: APPLIES TO ALL HEAVY & HIGHWAY WORK EXCLUDING HIGHWAYS, STREETS, AND BRIDGES

GROUP I: Blaster and Quarry Master

GROUP II: Burner, Drillers(jumbo, joy, wagon, air track, hydraulic), Drill Operator, Self Contained Rotary Drill, Curbs/ Asphalt Screedman/Raker, Bar Person.

GROUP III: Pavement Breakers, Jeeper Operator, Jack Hammer, Pneumatic Tools (all), Gas Driller, Guniting, Railroad Spike Puller, Pipelayer, Chain Saw, Deck winches on scows, Power Buggy Operator, Power Wheelbarrow Operator, Bar Person Helper.

GROUP IV: Concrete Laborers, Asph. Worker, Rock Scaler, Vibrator Oper., Bit Grinder, Air Tamper, Pumps, Epoxy (adhesives, fillers and troweled on), Barco Rammer, Concrete Grinder, Crack Router Operator, Guide Rail-digging holes and placing concrete and demolition when not to be replaced, distribution of materials and tightening of bolts.

GROUP V: Drillers Helpers, Common Laborer, Mason Tenders, Signal Person, Pit Person, Truck Spotter, Powder Person, Landscape/Nursery Person, Dump Person, Temp. Heat.

GROUP VIA: Asbestos/Toxic Waste Laborer-All removal (Roads, Tunnels, Landfills, etc.) Confined space laborer

Wages:(per hour)	07/01/2017	04/01/2018	03/31/2019
GROUP I	\$ 41.26*	Additional \$ 2.10**	Additional \$ 2.15**
GROUP II	39.91*	2.10**	2.15**
GROUP III	39.51*	2.10**	2.15**
GROUP IV	39.16*	2.10**	2.15**
GROUP V	38.81*	2.10**	2.15**
GROUP VIA	40.81*	2.10**	2.15**
Operator Qualified			
Gas Mechanic	51.26*	2.10**	2.15**
Flagperson	32.46*	2.10**	2.15**

*NOTE: To calculate overtime premiums, deduct \$0.10 from above wages

SHIFT WORK: A shift premium will be paid on Public Work contracts for off-shift or irregular shift work when mandated by the NYS D.O.T. or other Governmental Agency contracts. Employees shall receive an additional 15% per hour above current rate for all regular and irregular shift work. Premium pay shall be calculated using the 15% per hour differential as base rate.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:

First 40 Hours	
Per Hour Paid	\$ 21.44
Over 40 Hours	
Per Hour Worked	\$ 16.14

OVERTIME PAY

See (B, E, P, R, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

NOTE: For Holiday Overtime: 5, 6 - Code 'S' applies
 For Holiday Overtime: 8, 9, 15, 25 - Code 'R' applies

REGISTERED APPRENTICES

1st term	2nd term	3rd term	4th term
1-1000hrs	1001-2000hrs	2001-3000hrs	3001-4000hrs
\$ 22.15	\$ 26.13	\$ 30.11	\$ 33.99

Supplemental Benefits per hour worked:

1st term	\$ 3.85 - After 40 hours: \$ 3.60
2nd term	\$ 3.95 - After 40 hours: \$ 3.60
3rd term	\$ 4.45 - After 40 hours: \$ 4.00
4th term	\$ 5.00 - After 40 hours: \$ 4.50

8-60H/H

Labourer - Tunnel

12/01/2017

JOB DESCRIPTION Labourer - Tunnel

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Orange, Otsego, Putnam, Rockland, Sullivan, Ulster, Westchester

PARTIAL COUNTIES

Chenango: Townships of Columbus, Sherburne and New Berlin.

Columbia: Townships of Ancram, Claverack, Claremont, Copake, Galatin, Germantown, Greenport, Hillsdale, Hudson, Livingston, Philmont and Taconic.

Delaware: Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Merideth and Davenport.

Greene: Township of Catskill

WAGES

Class 1: All support laborers/sandhogs working above the shaft or tunnel.

Class 2: All laborers/sandhogs working in the shaft or tunnel.

Class 4: Safety Miners

WAGES: (per hour)

	07/01/2017	07/01/2018
Class 1	\$46.80	\$ 48.05
Class 2	\$48.85	\$ 50.20
Class 4	\$55.05	\$ 56.60

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional \$ 3.00 an hour.

SHIFT DIFFERENTIAL: 2nd and 3rd shift or an irregular shift shall be paid at time and one half the regular rate Monday through Friday.

Saturday shall be paid at 1.65 times the regular rate.

Sunday shall be paid at 2.15 times the regular rate.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 28.40 on straight hours	\$ 29.75 on straight hours
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* \$ 42.48

* \$ 44.62

*on shift work, overtime, irregular work, Saturday, Sunday and Holiday hours.

OVERTIME PAY

See (B, E, Q, W) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 15, *16, 25) on HOLIDAY PAGE

* Double rate and benefits if worked

11-17/235Tun

Lineman Electrician

12/01/2017

JOB DESCRIPTION Lineman Electrician

DISTRICT 6

ENTIRE COUNTIES

Westchester

WAGES

Below rates apply to electrical overhead and underground distribution and maintenance work and overhead and underground transmission line work, electrical substations, switching structures, continuous pipe-type underground fluid or gas filled transmission conduit and cable installations, maintenance jobs or projects, railroad catenary installations and maintenance, third rail installations, the bonding of rails and the installation of fiber optic cable. (Ref #14.04.01)

Includes Teledata Work performed within ten (10) feet of high voltage (600 volts or over) transmission lines.

Per hour:	07/01/2017	05/07/2018	05/06/2019	05/04/2020
Lineman, Tech, Welder	\$ 51.71	\$ 53.11	\$ 54.81	\$ 56.51
Crane, Crawler Backhoe	51.71	53.11	54.81	56.51
Cable Splicer-Pipe Type	56.88	58.42	60.29	62.16
Digging Mach Operator	46.54	47.80	49.33	50.86
Cert. Welder-Pipe Type	54.30	55.77	57.55	59.34
Tractor Trailer Driver	43.95	45.14	46.59	48.03
Groundman, Truck Driver	41.37	42.49	43.85	45.21
Equipment Mechanic	41.37	42.49	43.85	45.21
Flagman	31.03	31.87	32.89	33.91

Additional \$1.00 per hour for entire crew when a helicopter is used.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

**** IMPORTANT NOTICE ****

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day.

*Effective 05/06/2013, Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

Journeyman	\$ 22.65	\$ 23.40	\$ 24.15	\$ 24.90
	*plus 6.75% of hourly wage	*plus 6.75% of hourly wage	*plus 6.75% of hourly wage	*plus 6.75% of hourly wage

*The 6.75% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q,) on OVERTIME PAGE. *Note* Double time for emergency work designated by the Dept of Jurisdiction.

NOTE: WAGE CAP...Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked.

Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.
 Overtime See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES: Per hour. 1000 hour terms.

	07/01/2017	05/07/2018	05/06/2019	05/04/2020
1st term	\$ 31.03	\$ 31.87	\$ 32.89	\$ 33.91
2nd term	33.61	34.52	35.63	36.73
3rd term	36.20	37.18	38.37	39.56
4th term	38.78	39.83	41.11	42.38
5th term	41.37	42.49	43.85	45.21
6th term	43.95	45.14	46.59	48.03
7th term	46.54	47.80	49.33	50.86

SUPPLEMENTAL BENEFITS: Same as Journeyman

6-1249aWest

Lineman Electrician - Teledata

12/01/2017

JOB DESCRIPTION Lineman Electrician - Teledata

DISTRICT 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour:

FOR OUTSIDE WORK.

07/01/2017

Cable Splicer	\$ 30.90
Installer, Repairman	29.33
Teledata Lineman	29.33
Technician, Equipment Operator	29.33
Groundman	15.56

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 4.43
	*plus 3% of wage paid

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

NOTE: WAGE CAP...Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 16) on HOLIDAY PAGE

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting

12/01/2017

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting

DISTRICT 6

ENTIRE COUNTIES

Westchester

WAGES

Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

A Groundman/Groundman Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a ground man/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.

(Ref #14.01.03)

Per hour:

	07/01/2017	05/07/2018	05/06/2019	05/04/2020
Lineman, Technician	\$ 47.56	\$ 48.71	\$ 50.16	\$ 51.61
Crane, Crawler Backhoe	47.56	48.71	50.16	51.61
Certified Welder	49.94	51.15	52.67	54.19
Digging Machine	42.80	43.84	45.14	46.45
Tractor Trailer Driver	40.43	41.40	42.64	43.87
Groundman, Truck Driver	38.05	38.97	40.13	41.29
Equipment Mechanic	38.05	38.97	40.13	41.29
Flagman	28.54	29.23	30.10	30.97

Above rates applicable on all Lighting and Traffic Signal Systems with the installation, testing, operation, maintenance and repair of all traffic control and illumination projects, traffic monitoring systems, road weather information systems, and the installation of Fiber Optic Cable.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

**** IMPORTANT NOTICE ****

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day.
 *Effective 05/06/2013, Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

Journeyman	\$ 22.65 *plus 6.75% of hourly wage	\$ 23.40 *plus 6.75% of hourly wage	\$ 24.15 *plus 6.75% of hourly wage	\$ 24.90 *plus 6.75% of hourly wage
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*The 6.75% is based on the hourly wage paid, straight time rate or premium rate.
 Supplements paid at STRAIGHT TIME rate for holidays.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE. *Note* Double time for emergency work designated by the Dept. of Jurisdiction.
 NOTE: WAGE CAP...Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked.
 Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.
 Overtime: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES: Per hour. 1000 hour terms.

	07/01/2017	05/07/2018	05/06/2019	05/04/2020
1st term	\$ 28.54	\$ 29.23	\$ 30.10	\$ 30.97
2nd term	30.91	31.66	32.60	33.55
3rd term	33.29	34.10	35.11	36.13
4th term	35.67	36.53	37.62	38.71
5th term	38.05	38.97	40.13	41.29
6th term	40.43	41.40	42.64	43.87
7th term	42.80	43.84	45.14	46.45

SUPPLEMENTAL BENEFITS: Same as Journeyman

6-1249aWestLT

Mason - Building **12/01/2017**

JOB DESCRIPTION Mason - Building **DISTRICT 9**

ENTIRE COUNTIES
 Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2017

Building:
 Tile Finisher \$ 43.36

SUPPLEMENTAL BENEFITS

Per Hour:

Journey worker \$ 20.57* per hour paid
 plus \$ 8.42 per hour worked

OVERTIME PAY

See (B, E, Q, *V) on OVERTIME PAGE
 * This portion of Supplemental benefits subject to same premium rate as shown for overtime wages.
 Work beyond 10 hours on a Saturday shall be paid at double the hourly wage rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88A-tf

Mason - Building **12/01/2017**

JOB DESCRIPTION Mason - Building **DISTRICT 11**

ENTIRE COUNTIES
 Putnam, Rockland, Westchester

PARTIAL COUNTIES
 Orange: Only the Township of Tuxedo.

WAGES

	07/01/2017	06/01/2018	06/01/2019
Bricklayer	\$ 40.80	\$ 41.46	\$ 42.09
Cement Mason Bldg	40.80	41.46	42.09
Plasterer/Stone Mason	40.68	41.46	42.09
Pointer/Caulker	40.68	41.46	42.09

Additional \$1.00 per hour for power saw work
 Additional \$0.50 per hour for swing scaffold or staging work

SHIFT DIFFERENTIAL: When shift work is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Second shift an additional 15% of wage plus benefits to be paid
 Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour paid:

Journeyman \$ 33.24 34.08 35.20

OVERTIME PAY

OVERTIME:

Cement Mason See (B, E, Q, W) on OVERTIME PAGE.

All Others See (B, E, Q) on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour paid

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5wp-b

Mason - Building

12/01/2017

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Building:

07/01/2017

Wages per hour:

Mosaic & Terrazzo Mechanic \$ 52.46

Mosaic & Terrazzo Finisher 50.86

SUPPLEMENTAL BENEFITS

Journeyworker:

Per hour:

Mosaic & Terrazzo Mechanic \$ 23.55* per hour paid plus \$ 10.49 per hour worked

Mosaic & Terrazzo Finisher \$23.55* per hour paid plus \$10.51 per hour worked

OVERTIME PAY

See (A, *E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Easter Sunday is an observed holiday. Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

REGISTERED APPRENTICES

Wages per hour:
 (750 Hour) terms at the following wage rate.

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2017	\$ 26.23	\$ 28.85	\$ 31.48	\$ 34.10	\$ 36.72	\$ 39.35	\$ 44.59	\$ 49.84

Supplemental benefits per hour:

07/01/2017	\$ 11.78* plus \$ 5.22**
	\$ 12.95* plus \$ 5.73**
	\$ 14.13* plus \$ 6.24**
	\$ 15.31* plus \$ 6.77**
	\$ 16.49* plus \$ 7.29**
	\$ 17.66* plus \$ 7.81**
	\$ 20.02* plus \$ 8.85**
	\$ 22.37* plus \$ 9.90**

* Per Hour paid and subject to same premium as overtime wages.

** Per hour worked

9-7/3

Mason - Building

12/01/2017

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour: 07/01/2017 01/01/2018

Building-Marble Restoration:

Marble, Stone & Terrazzo Polisher, etc	\$ 40.62	\$ 40.89
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SUPPLEMENTAL BENEFITS

Per Hour Paid:

Journeyworker:

Building-Marble Restoration:

Marble, Stone & Polisher	\$ 26.06	\$ 26.69
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OVERTIME PAY

See (B, *E, Q, V) on OVERTIME PAGE

*ON SATURDAYS, 8TH HOUR AND SUCCESSIVE HOURS PAID AT DOUBLE HOURLY RATE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

1ST TERM APPRENTICE GETS PAID FOR ALL OBSERVED HOLIDAYS.

REGISTERED APPRENTICES

WAGES per hour:

(900 hour) terms at the following per cent of journeyman's wages:

	1st 0-900	2nd 901-1800	3rd 1801-2700	4th over 2700
07/01/2017	70%	80%	90%	100%

Supplemental Benefits Per Hour:

07/01/2017	\$ 23.25	\$ 23.98	\$ 24.72	\$ 25.45
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Mason - Building **12/01/2017**

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Wages: 07/01/2017 01/01/2018

Marble Cutters& Setters \$ 58.18 \$ 58.53

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker \$ 35.12 \$ 36.22

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage Per Hour:

750 hour terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-750	751-1500	1501-2250	2251-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6751	6751-7500
\$23.10	\$25.98	\$28.87	\$31.76	\$34.64	\$37.53	\$40.42	\$43.30	\$49.08	\$54.85

Supplemental Benefits per hour paid at the following term:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$24.53	\$25.31	\$26.12	\$26.91	\$27.71	\$28.51	\$29.32	\$30.12	\$31.71	\$33.31 9-7/4

Mason - Building **12/01/2017**

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour: 07/01/2017 01/01/2018

Marble, Stone, etc.
 Maintenance Finishers: \$ 22.42 \$ 22.67

Note 1: An additional \$2.00 per hour for time spent grinding floor using "60 grit" and below.

Note 2: Flaming equipment operator shall be paid an additional \$25.00 per day.

SUPPLEMENTAL BENEFITS

Per Hour:

Marble, Stone, etc
 Maintenance Finishers: \$ 13.11 \$ 13.34

OVERTIME PAY

See (B, *E, Q, V) on OVERTIME PAGE

*Double hourly rate after 8 hours on Saturday

HOLIDAY

Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
 1st term apprentice gets paid for all observed holidays.

REGISTERED APPRENTICES

WAGES per hour:
 (750 hour) terms at the 07/01/2017
 following percentage
 of journeyman's wage
 rate:

1st term	0-750	70%
2nd term	750-1500	74%
3rd term	1501-2250	78%
4th term	2251-3000	82%
5th term	3001-3750	88%
6th term	3751-4500	96%

Supplemental Benefits:
 Per hour paid

1st term	\$ 12.77
2nd term	12.78
3rd term	12.80
4th term	12.81
5th term	12.83
6th term	12.86

9-7/24M-MF

Mason - Building **12/01/2017**

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES
 Nassau, Rockland, Suffolk, Westchester

WAGES
 Per hour: 07/01/2017

Building:
 Tile Setters \$ 56.13

SUPPLEMENTAL BENEFITS
 Per Hour:

Journey Worker \$23.60* per hour paid
 Plus \$8.57 per hour worked

OVERTIME PAY
 See (B, E, Q, V) on OVERTIME PAGE
 * This portion of benefits subject to same premium rate as shown for overtime wages.
 Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

HOLIDAY
 Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage per hour:

Tile Setters:

(750 hour) term at the following wage rate:

Term:	1st	2nd	3rd	4th	5th	6th	7th	8th
	1-	751-	1501-	2251-	3001-	3751-	4501-	5251
	750	1500	2250	3000	3750	4500	5250	6000
	\$29.13	\$33.57	\$36.69	\$40.13	\$43.77	\$47.22	\$50.15	\$53.93

Supplemental Benefits per hour:

1st term	\$14.95* plus \$0.75	6th term	\$18.45* plus \$1.58
2nd term	\$14.95* plus \$0.89	7th term	\$15.95* plus \$5.62

3rd term	\$15.95* plus \$1.15	8th term	\$20.70* plus \$6.06
4th term	\$16.95* plus \$1.20		
5th term	\$17.45* plus \$1.53		

9-7/52A

Mason - Building / Heavy&Highway

12/01/2017

JOB DESCRIPTION Mason - Building / Heavy&Highway

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2017	01/01/2018
Marble-Finisher	\$ 46.32	\$ 46.66

SUPPLEMENTAL BENEFITS

Journeyworker:
per hour paid

Marble- Finisher	\$ 33.29	\$34.03
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OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

* Work beyond 8 hours on a Saturday shall be paid at double the rate.

** When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

Mason - Heavy&Highway

12/01/2017

JOB DESCRIPTION Mason - Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

PARTIAL COUNTIES

Orange: Only the Township of Tuxedo.

WAGES

Per hour:	07/01/2017	06/01/2018	06/01/2019
Bricklayer	\$ 41.31	\$ 41.96	\$ 42.59
Cement Mason	41.31	41.96	42.59
Marble/Stone Mason	41.31	41.96	42.59
Plasterer	41.31	41.96	42.59
Pointer/Caulker	41.31	41.96	42.59

Additional \$1.00 per hour for power saw work

Additional \$0.50 per hour for swing scaffold or staging work

SHIFT DIFFERENTIAL: When shift work is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Second shift an additional 15% of wage plus benefits to be paid

Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour paid:

Journeyman	\$ 33.23	\$ 34.08	\$ 35.19
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OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

Cement Mason See (B, E, Q, W)

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour paid

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5WP-H/H

Operating Engineer - Building

12/01/2017

JOB DESCRIPTION Operating Engineer - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

PARTIAL COUNTIES

Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

WAGES

NOTE:Construction surveying

Party chief--One who directs a survey party

Instrument Man--One who runs the instrument and assists Party Chief.

Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour) 07/01/2017

Building Construction:

Party Chief	\$ 68.41
Instrument Man	\$ 54.45
Rodman	\$ 37.27

Steel Erection:

Party Chief	\$ 71.55
Instrument Man	\$ 57.14
Rodman	\$ 40.32

Heavy Construction-NYC counties only:
 (Foundation, Excavation.)

Party Chief	\$ 76.53
Instrument man	\$ 57.92
Rodman	\$ 49.65

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2017

Building Construction	\$20.55* + 6.90
Steel Erection Only	\$20.80* + 6.90
Heavy Construction	\$21.05 + 6.90

* This portion subject to same premium as wages

OVERTIME PAY

See (A, B, E, Q) on OVERTIME PAGE

Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.

Code "B" applies to Heavy Construction and Steel Erection and had double the rate after 8 hours on Saturdays.

HOLIDAY

Paid: See (5, 6, 8, 11, 12, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 12, 25) on HOLIDAY PAGE

9-15Db

Operating Engineer - Building

12/01/2017

JOB DESCRIPTION Operating Engineer - Building

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I:

Cranes(All Types up to 49 tons), Boom Trucks, Cherry Pickers, Clamshell Crane, Derrick, Dragline, Franki Pile Rig or similar, High Lift (Lull or similar) with crane attachment and winch used for hoisting or lifting, Hydraulic Cranes, Pile Drivers, Potain and similar.

Cranes (All types 50-99 tons), Conventional and Hydraulic.

Cranes (All types 100 tons and over), Tower, Climbing, Conventional, Hydraulic.

GROUP I-A: Barber Green Loader-Euclid Loader, Bulldozer, Carrier-Trailer Horse, Concrete Cleaning Decontamination Machine Operator,Concrete-Portable Hoist, Conway or Similar Mucking Machines, Elevator & Cage, Excavators all types, Front End Loaders, Gradall, Shovel, Backhoe, etc.(Crawler or Truck), Heavy Equipment Robotics Operator/Mechanic, Hoist Engineer-Material, Hoist Portable Mobile Unit, Hoist-Single, Double or Triple Drum, Horizontal Directional Drill Locator, Horizontal Directional Drill Operator,and Jersey Spreader, Letourneau or Tournapull(Scrapers over 20 yards Struck), Lift Slab Console, etc., Lull HiLift or Similar, Maintenance Engineer, Master Environmental Maintenance Mechanics, Mucking Machines Operator/Mechanic or Similar Type, Overhead Crane, Pavement Breaker(Air Ram), Paver(Concrete), Post Hole Digger, Power House Plant, Road Boring Machine, Road Mix Machine, Ross Carrier and Similar Machines, Rubber tire double end backhoes and similar machines, Scoopmobile Tractor-Shovel Over 1.5 yards, Shovel (Tunnels), Spreader (Asphalt) Telephie(Cableway), Tractor Type Demolition Equipment, Trenching Machines-Vermeer Concrete Saw Trencher and Similar, Ultra High Pressure Waterjet Cutting Tool System, Vacuum Blasting Machine operator/mechanic, Winch Truck A Frame).

GROUP I-B: Compressor (Steel Erection), Mechanic (Outside All Types, Negative Air Machine (Asbestos Removal),Push Button (Buzz Box) Elevator.

GROUP II: Bulldozer D6 and Under, Compactor Self-Propelled, Concrete Pump, Crane Operator in Training(Over 100 Tons, Grader, Machines Pulling Sheep's Foot Roller, Roller 4 ton and over, Scrapers-20 yards Struck and Under, Vibratory Rollers, Welder.

GROUP III-A: Asphalt Plant, Concrete Mixing Plants, Concrete Buggy(One yard and up, Ride on dumper,Benford or Similar) Fire Watchman, Forklift(All power sources),Joy Drill or similar,Tractor Drilling Machine, Loader(1 1/2 yards and under),Portable Asphalt Plant, Portable Batch Plant, Portable Crusher, Skid Steer(Bobcat or similar), Stone Crusher, Well Drilling Machine, Well Point System.

GROUP III-B: Compressor Over 125 cu.Feet, Conveyor Belt Machine Regardless of Size, Compressor Plant, Ladder Hoist, Lighting Unit (Portable & Generator), Stud Machine.

GROUP IV-A: Batch Plant, Concrete Breaker, Concrete Spreader, Curb Cutter Machine, Finishing Machine-Concrete, Fine Grading Machine, Hepa Vac Clean Air Machine, Material Hopper(sand stone-cement), Mulching Grass Spreader, Pump Gypsum etc, Pump-Plaster-GROUT-Fireproofing. Roller(Under 4 Ton),Spreading and Fine Grading Machine, Steel Cutting Machine, Siphon Pump, Tar Joint Machine, Television Cameras for Water, Sewer, Gas etc. Turbo Jet Burner or Similar Equipment, Vibrator (1 to 5),

GROUP IV-B: Compressor(Under 125 cu.Feet), Heater(All Types), Lighting Unit (Portable & Generator) Pump,Pump Station(Water,Sewer, Portable, Temporary), Steam Jenny, Sweeper, Chipper, Mulcher, Welding Machine (Steel Erection & Excavation)

GROUP V: Crane Operator in Training(65 Tons to 100 Tons), Mechanics Helper,Motorized Roller (walk behind), Stock Attendant, Welder's Helper.

GROUP VI-A: Welder,Certified.

GROUP VI-B: Utility Man, Warehouse Man.

WAGES: (per hour)

07/01/2017

GROUP I

Cranes- up to 49 tons	\$ 61.70
Cranes- 50 tons to 99 tons	63.86
Cranes- 100 tons and over	72.99
GROUP I-A	53.95
GROUP I-B	49.68
GROUP II	52.03
GROUP III-A	50.11
GROUP III-B	47.67
GROUP IV-A	49.60
GROUP IV-B	41.85
GROUP V	45.17
GROUP VI-A	52.96
GROUP VI-B	
Utility Man	42.83
Warehouse Man	44.92

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects.
 Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour.
 Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour.
 Loader operators over 5 cubic yard capacity additional .50 per hour.
 Shovel operators over 4 cubic yard capacity additional \$1.00 per hour.

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2017
Journeyworker	\$ 20.50
	Per hour paid
	+ \$ 8.02
	Per hour worked

OVERTIME PAY

OVERTIME:..... See (B, E,P,R*,U**,V) on OVERTIME PAGE.

HOLIDAY

Paid:..... See (5, 6, 11, 12, 15, 25) on HOLIDAY PAGE.

Overtime:..... See (5, 6, 11, 12, 15, 25) on HOLIDAY PAGE.

* For Holiday codes 11, 12, 15, 25, code R applies.

** For Holiday codes 5 & 6, code U applies.

Note: If employees are required to work on Easter Sunday they shall be paid at the rate of triple time.

8-137B

Operating Engineer - Heavy&Highway

12/01/2017

JOB DESCRIPTION Operating Engineer - Heavy&Highway

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane, (Crawler, Truck), Dragline,Rough Terrain Crane.

GROUP I-A: Auger, Auto Grader, Dynahoe and Dual purpose and similar machines, Barber Green Loader-Euclid Loader or similar type machine, boat captain, boring machine(all types), Bulldozer-All Sizes, Central Mix Plant Operator, Cherry Picker(Cableway)-Hydraulic, chipper (all types), close circuit t.v., Compactor with Blade,Concrete Portable Hoist, C.M.I. or Similar, Conway or Similar Mucking Machines, Gradall, Shovel Backhoe, etc. Grader, Derrick (Stone-Steel) Elevator & Cage, Front End Loaders over 1 1/2yds Hoist Single, Double, Triple Drum, Hoist Portable Mobile Unit, Hoist Engineer Concrete(Crane-Derrick-Mine Hoist), Hoist Engineer-Material, Hydraulic Boom, Letourneau or Tournapull (Scrapers over 20 yds struck), Mucking Machines, Overhead Crane, Paver (concrete) Pulsemeter, Push Button (Buss Box) Elevator, Road Mix Machines, Ross Carrier and similar, Shovels (Tunnels), SideBoom, Spreader (asphalt), Scoopmobile-Tractor-Shovel over 1 1/2 yards, Trenching Machines, Telephies-Vermeer Concrete Saw Trencher and/or Similar, Tractor type Demolition Equipment, Whirly,P-811 Track Renewal Machine-Similiar, certified Welder, Excavator (and all attachments).

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver-Asphalt.

GROUP II-A: Balast regulators, Compactor Self Propelled, Cow Tracks, Fusion Machine, Rail Anchor Machines, Scrapers-20 yds truck and under, Switchtampers, Vibratory Roller, etc., Roller 4 ton and over, Welder.

GROUP II-B: Mechanic (Outside) All Types.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler (High Pressure), Concrete Breaker, Concrete Pump, Concrete Spreader, Farm Tractor (All Types), Forklift (All), Gas Tapping(Live),Hydroseeder, Loader 1 1/2 yards and under, Locomotive(All Sizes), Machine Pulling Sheep's Foot Roller, Portable Plant, Portable Batch Plant, Portable Crusher, Powerhouse Plant, Roller (Under 4 ton), Stone Crusher, Sweeper, Turbo JetBurner or Similar, Sheer Excavator, Skid Steer/Bobcat, Well Drilling Machine.

GROUP IV-A: Service Person (Grease Truck).

GROUP IV-B: Conveyor Belt Machine, Heater all types, Lighting Unit (Portable & Generator), Mechanic's Helper, Pilot/Assistant Engineer/2 seated, Pumps-Pump Station-Water-Sewer-Gypsum-Plaster, etc., Pump Truck(Sewer Jet or Similar), Stock Room Attendant, Welding Machine Steel Erection Excavation), Well Point System, Welder's Helper,

GROUP V-A: Engineer-All Tower Cranes-All Climbing Cranes and all cranes of 100 ton capacity or greater(3900 Manitowac or similar), Hoist Engineer(Steel), Engineer-Pile Driver, Welder-Certified, Jersey Spreader, Pavement Breaker(Air Ram), Post Hole Digger.

WAGES: Per hour:	07/01/2017	03/05/2018	03/04/2019
Group I	\$ 58.54	\$ 59.75	\$ 61.03
Group I-A	51.68	52.71	53.80
Group I-B	54.42	55.52	56.69
Group II-A	49.52	50.49	51.52
Group II-B	51.05	52.06	53.13
Group III	48.67	49.61	50.61
Group IV-A	44.29	45.12	46.00
Group IV-B	38.50	38.78	39.49
Group V-A			
Engineer All Tower, Climbing and Cranes of 100 Tons	66.22	67.64	69.14
Hoist Engineer(Steel)	60.03	61.28	62.61
Engineer(Pile Driver)	63.97	65.33	66.77
Jersey Spreader,Pavement Breaker (Air Ram)Post Hole Digger	50.65	51.65	52.71

SHIFT DIFFERENTIAL:

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour over the rate listed in the Wage Schedule. Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour over the rate listed in the Wage Schedule. Loader and Excavator Operators: over 5 cubic yards capacity \$0.50 per hour over the rate listed in the Wage Schedule. Shovel Operators: over 4 cubic yards capacity \$1.00 per hour over the rate listed in the Wage Schedule.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday; Friday may be used as a make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman:	07/01/2017	03/05/2018	05/04/2019
	\$ 18.75 on all hours paid	\$ 19.85 on all hours paid	\$ 20.50 on all hours paid
	PLUS \$ 8.00 for first 40 hours worked. PLUS \$ 1.00 on all hours worked	PLUS \$ 8.00 for first 40 hours worked. PLUS \$ 1.00 on all hours worked	PLUS \$ 8.00 for first 40 hours worked. PLUS \$ 1.05 on all hours worked

OVERTIME PAY

See (B, E, E2, P, *R, **U) on OVERTIME PAGE

HOLIDAY

Paid:..... See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE
 Overtime..... See (5, 6, 8, 9, 15, 25) on OVERTIME PAGE

* For Holiday codes 8,9,15,25 code R applies
 ** For Holiday Codes 5 & 6 code U applies

Note: If employees are required to work on Easter Sunday they shall be paid at the rate of triple time.

REGISTERED APPRENTICES

(1)year terms at the following rate.

	07/01/2017	03/05/2018	03/04/2019
1st term	\$ 25.84	\$ 26.36	\$ 26.90
2nd term	31.01	31.62	32.28
3rd term	36.18	36.90	37.66
4th term	41.34	42.17	43.04

Supplemental Benefits per hour:

Apprentices:	07/01/2017	03/05/2018	03/04/2017
	\$ 19.15 on all hours paid PLUS \$1.00 on all hours worked	\$ 19.85 on all hours paid PLUS \$ 1.00 on all hours worked	\$ 20.50 on all hours paid PLUS \$ 1.05 on all hours worked

8-137HH

Operating Engineer - Heavy&Highway

12/01/2017

JOB DESCRIPTION Operating Engineer - Heavy&Highway

DISTRICT 9

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: South of the North city line of Poughkeepsie

WAGES

Party Chief - One who directs a survey party
 Instrument Man - One who runs the instrument and assists Party Chief
 Rodman - One who holds the rod and in general, assists the Survey Crew
 Categories cover GPS & Underground Surveying

Per Hour: 07/01/2017

Party Chief	\$ 73.93
Instrument Man	55.84
Rodman	47.77

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2017

All Categories
 Straight Time: \$ 27.95

Premium:
 Time & 1/2 \$ 38.48

Double Time \$ 49.00

OVERTIME PAY

See (B, *E, Q) on OVERTIME PAGE

* Doubletime paid on all hours in excess of 8 hours on Saturday

HOLIDAY

Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
 Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

9-15Dh

Operating Engineer - Heavy&Highway - Tunnel

12/01/2017

JOB DESCRIPTION Operating Engineer - Heavy&Highway - Tunnel

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane(Crawler, Truck), Dragline, Drill Rig Casa Grande(Cat or Similar), Floating Crane (Crane on Barge-Under 100 Tons), Hoist Engineer (Concrete/Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger, Auto Grader, Dynahoe & Dual purpose & similar machines, Barber Green Loader-Euclid Loader or similar type machine, Boat Captain, Boring Machine(all types), Bull Dozer-all types, Central Mix Plant Operator, Cherry Picker(Cableway or hydraulic), Chipper-all types, Close Circuit T.V., Compactor with Blade, Concrete Portable Hoist, C.M.I. or similar, Conway or similar Mucking Machine, Crane(Crawler or Truck) dragline, Gradall, Shovel Backhoe, etc. Grader, Derrick(Stone-Steel), Elevator & Cage(materials or passengers), Front End Loaders over 1 1/2 yards, Hoist Single, Double, Triple Drum, Hoist Portable Mobile Unit, Hoist Engineer-Concrete(Crane-Derrick-Mine Hoist), Hoist Engineer-Material, Hydraulic Boom, Letourneau or Tournapull(Scrapers over 20 yards struck), Log Skidder, Milling Machine, Moveable Concrete Barrier Transfer & Transport Vehicle, Mucking Machines. Overhead Crane, Paver(concrete), Pulsemeter, Push Button(Buzz Box)Elevator, Raise Boring Machine, Road Mix Machines. Robot Hammer(Brock or similar), Robotic EquipmentRoss Carrier and similar machines, Shovels(Tunnels), Side Boom, Slip Form Machine, Spreader(Asphalt), Scoopmobile-Tractor-Shovel over 1 1/2 yards, Trenching Machines, Telephies-Vermeer Concrete Saw Trencher and/or similar, Tractor type demolition equipment, Whirly.

GROUP I-B: Road Paver(Asphalt).

GROUP II-A: Balast Regulators, Compactor Self-propelled, Cow Tracks, Fusion Machine, Rail Anchor Machines, Roller 4 ton and over, Scrapers (20 yard struck and under), Switch Tampers, Vibratory Roller, etc., Welder.

GROUP II-B: Mechanic(outside) all types.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler (High Pressure), Concrete Breaker, Concrete Pump, Concrete Spreader, Curb Cutter Machine, Farm Tractor(all types), Finishing Machine(Concrete) Fine Grading Machine, Firemen, Forklift(ALL), John Henry Drill or similar, Joy Drill or similar Tractor Drilling Machine, Loader 1 1/2 yards and under, Locomotive(all sizes), Maintenance Engineer, Machine Pulling Sheeps Foot Roller, Material Hopper, Mixer Concrete(21-E & over), Mulching Grass Spreader, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher, Powerhouse Plant, Quarry Master, Roller under 4 ton, Spreading and Fine Grading Machine, Steel Cutting Machine, Stone Crusher, Sweeper, Turbo Jet Burner or similar, Well Drilling Machine, Winch Truck "A" Frame.

GROUP IV-A: Service Person(Fuel Truck), Service Person(Grease Truck).

GROUP IV-B: Bending Machine, Compressor-Compressor Plant-Paint, Compressor-Steel Erection, Compressor Truck Mounted(2-6), Conveyor Belt Machine, Dust Collector, Heater(all types), Lighting Unit(portable & generator), Mixer Concrete under 21-E, Pilot/Assistant Engineer/2 seated, Pumps-Pump Station-Water-Sewer-Gypsum-Plaster, etc., Pump Truck(Sewer Jet or similar), Roller Motorized(Walk behind), Steam Jenny, Stock Room Attendant, Syphon Pump-Air-Stream, Tar Joint Machine, Vibrator(1 to 5), Welding Machine, Welders Helper.

GROUP V-A: Engineer(all Tower Cranes, all Climbing Cranes & all cranes of 100 ton capacity or greater),Hoist Engineer(Steel-Sub Structure), Engineer-Pile Driver, Jersey-Spreader, Pavement breaker, Post Hole Digger

WAGES: (per hour)

07/01/2017

GROUP I	\$ 58.91
GROUP I-A	52.06
GROUP I-B	54.80
GROUP II-A	49.90
GROUP II-B	51.43
GROUP III	49.04
GROUP IV-A	44.67
GROUP IV-B	38.50
GROUP V-A	
Engineer-Cranes	66.59
Engineer-Pile Driver	64.29
Hoist Engineer	60.41
Jersey Spreader	51.04
Pavement Breaker	51.04

Post Hole Digger 51.04

SHIFT DIFFERENTIAL:

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects. Operators required to use two buckets pouring concrete on other than road pavement shall receive \$0.50 per hour over scale. Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour. Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour. Operators of shovels with a capacity over (4) cubic yards shall be paid an additional \$1.00 per hour. Operators of loaders with a capacity over (5) cubic yards shall be paid an additional \$0.50 per hour.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:

07/01/2017
 \$ 18.75 on all hours paid
 PLUS \$8.00 limited to first 40 hours worked
 PLUS \$1.00 for all hours worked

OVERTIME PAY

See (D, O, *U, V) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 7, 8, 11, 12) on HOLIDAY PAGE

Overtime: See (5, 6, 7, 8, 11, 12) on HOLIDAY PAGE

* Note: For Holiday codes 5 & 6, code U applies.

Note: If employees are required to work on Easter Sunday, they shall be paid at the rate of triple time.

REGISTERED APPRENTICES

(1)year terms at the following rates:

07/01/2017

1st year	\$ 24.52
2nd year	29.42
3rd year	34.33
4th year	39.23

Supplemental Benefits per hour:

\$ 18.75 for all hours paid
 +\$1.00 for all hours worked

8-137Tun

Operating Engineer - Marine Dredging

12/01/2017

JOB DESCRIPTION Operating Engineer - Marine Dredging

DISTRICT 4

ENTIRE COUNTIES

Albany, Bronx, Cayuga, Chautauqua, Clinton, Columbia, Dutchess, Erie, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Niagara, Orange, Orleans, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES

These wages do not apply to Operating Engineers on land based construction projects. For those projects, please see the Operating Engineer Heavy/Highway Rates. The wage rates below for barge mounted cranes and other equipment are only for marine dredging work in navigable waters found in the counties listed above.

Per Hour:

DREDGING OPERATIONS	07/01/2017	10/01/2017
CLASS A		
Operator, Leverman,	\$ 37.25	\$ 38.18
Lead Dredgeman		

CLASS A1 To conform to Operating Engineer
 Dozer, Front Loader Prevailing Wage in locality where work
 Operator is being performed including benefits.

CLASS B		
Barge Operator	\$ 32.21	\$33.02

Spider/Spill
 Tug Operator(over1000hp),
 OperatorII, Fill Placer,
 Derrick Operator, Engineer,
 Chief Mate, Electrician,
 Chief Welder,
 Maintenance Engineer

Certified Welder, Boat Operator(licensed)	\$ 30.33	\$ 31.09
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CLASS C Drag Barge Operator, Steward, Mate, Assistant Fill Placer,	\$ 29.50	\$ 30.24
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Welder (please add)\$ 0.06

Boat Operator	\$ 28.54	\$ 29.26
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CLASS D Shoreman, Deckhand, Rodman, Scowman, Cook, Messman, Porter/Janitor	\$ 23.71	\$ 24.30
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Oiler(please add)\$ 0.09

SUPPLEMENTAL BENEFITS

Per Hour:

THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	07/01/2017 \$10.75 plus 8% of straight time wage, Overtime hours add \$ 0.63	10-01-2017 \$11.23 plus 8% of straight time wage, Overtime hours add \$ 0.63
All Class C	\$10.45 plus 8% of straight time wage, Overtime hours add \$ 0.48	\$10.93 plus 8% of straight time wage, Overtime hours add \$ 0.48
All Class D	\$10.15 plus 8% of straight time wage, Overtime hours add \$ 0.33	\$10.63 plus 8% of straight time wage, Overtime hours add \$ 0.33

OVERTIME PAY

See (B, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew - Consulting Engineer **12/01/2017**

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES

Dutchess: That part in Dutchess County lying South of the North City line of Poughkeepsie.

WAGES

Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour: 07/01/2017
 Survey Classifications

Party Chief \$ 42.29
 Instrument Man 35.39
 Rodman 31.04

SUPPLEMENTAL BENEFITS

Per Hour:

All Crew Members: \$ 17.70

OVERTIME PAY

OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.

*Doubletime paid on the 9th hour on Saturday.

HOLIDAY

Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

Painter

12/01/2017

JOB DESCRIPTION Painter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour: 07/01/2017

Brush \$ 46.85*

Abatement/Removal of lead based or lead containing paint on materials to be repainted. 46.85*

Spray & Scaffold \$ 49.85*

Fire Escape 49.85*

Decorator 49.85*

Paperhanger/Wall Coverer 50.03

*Subtract \$ 0.10 to calculate premium rate.

SUPPLEMENTAL BENEFITS

Per hour worked: 07/01/2017

Paperhanger \$ 26.19

All others 24.47

Premium 26.97**

**Applies only to "All others" category,not paperhanger journeyman.

OVERTIME PAY

See (A, H) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

One (1) year terms at the following wage rate.

Per hour: 07/01/2017

Appr 1st term... \$ 17.85*

Appr 2nd term... 23.26*

Appr 3rd term... 28.14*

Appr 4th term... 37.52*

*Subtract \$ 0.10 to calculate premium rate.

Supplemental benefits:

Per Hour worked:	07/01/2017
Appr 1st term...	\$ 12.77
Appr 2nd term...	15.62
Appr 3rd term...	18.06
Appr 4th term...	22.88

8-NYDC9-B/S

Painter

12/01/2017

JOB DESCRIPTION Painter

DISTRICT 8

ENTIRE COUNTIES

Putnam, Suffolk, Westchester

PARTIAL COUNTIES

Nassau: All of Nassau except the areas described below: Atlantic Beach, Ceaderhurst, East Rockaway, Gibson, Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on the South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave., Rockville Centre is the boundary line up to Lawson Blvd. turn right going west all the above territory. Starting at Union Turnpike and Lakeville Rd. going north to Northern Blvd. the west side of Lakeville road to Northern blvd. At Northern blvd. going east the district north of Northern blvd. to Port Washington Blvd. West of Port Washington blvd.to St.Francis Hospital then north of first traffic light to Port Washington and Sands Point, Manor HAven, Harbour Acres.

WAGES

Per hour:	07/01/2017
Drywall Taper	\$ 46.85

SUPPLEMENTAL BENEFITS

Per hour worked:	07/01/2017
Journeyman	\$ 22.47

OVERTIME PAY

See (A, H) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages - Per Hour:	07/01/2017
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1500 hour terms at the following wage rate:

1st term	\$ 17.85
2nd term	\$ 23.26
3rd term	\$ 28.14
4th term	\$ 37.52

Supplemental Benefits - Per hour:

One year term (1500 hours) at the following dollar amount.

1st year	\$ 11.73
2nd year	\$ 14.42
3rd year	\$ 16.70
4th year	\$ 21.20

8-NYDCT9-DWT

Painter - Bridge & Structural Steel

12/01/2017

JOB DESCRIPTION Painter - Bridge & Structural Steel

DISTRICT 8

ENTIRE COUNTIES

Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

Per Hour Worked:

STEEL:

Bridge Painting:	07/01/2017	10/01/2017	10/01/2018
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From May 1st to Nov. 15th -	\$ 49.50 + 6.38*	\$ 50.00 + 6.63*	\$ 51.00 + 6.88*
From Nov. 16th to April 30th -	\$ 49.50 + 6.38*	\$ 50.00 + 6.63*	\$ 51.00 + 6.88*

*Not subject to overtime and limited to first 40 hours

NOTE: All premium wages are to be calculated on base rate per hour only.

EXCEPTION: During the period of May 1st to November 15th, for the first and last week of employment on the project, and for the weeks of Memorial Day, Independence Day and Labor Day, this rate shall be paid for the actual number of hours worked.

Power Tool/Spray is an additional \$6.00 per hour above hourly rate, whether straight time or overtime

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SUPPLEMENTAL BENEFITS

Per Hour Worked:

Journeyworker:	07/01/2017	10/01/2017	10/01/2018
From May 1st to Nov. 15th -			
Hourly Rate up to 40 hours	\$ 30.90	\$ 31.90	\$ 33.60
Hourly Rate after 40 hours	7.50	7.50	7.50
From Nov. 16th to April 30th -			
Hourly Rate up to 50 hours	\$ 29.70	\$ 31.90	\$ 33.60
Hourly Rate after 50 hours	7.50	7.50	7.50

EXCEPTION: During the period of May 1st to November 15th, for the first and last week of employment on the project, and for the weeks of Memorial Day, Independence Day and Labor Day, this rate shall be paid for the actual number of hours worked.

OVERTIME PAY

See (A, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage - Per hour worked:

Apprentices: (1) year terms	07/01/2017	10/01/2017	10/01/2018
1st year	\$ 22.35	\$ 22.65	\$ 23.13
2nd year	33.53	33.98	34.73
3rd year	44.70	45.30	46.30

Supplemental Benefits - Per hour worked:

1st year	\$ 12.36	\$ 12.76	\$ 13.44
2nd year	18.54	19.14	20.16
3rd year	24.72	25.52	26.88

8-DC-9/806/155-BrSS

Painter - Line Striping **12/01/2017**

JOB DESCRIPTION Painter - Line Striping

DISTRICT 8

ENTIRE COUNTIES

Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

Per hour:

Painter (Striping-Highway):	07/01/2017
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Striping-Machine Operator*	\$ 27.11
Linerman Thermoplastic	\$ 32.37

Note: * Includes but is not limited to: Positioning of cones and directing of traffic using hand held devices. Excludes the Driver/Operator of equipment used in the maintenance and protection of traffic safety.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day.

NOTE - In order to use the '4 Day/10 Hour Work Schedule,' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour paid: 07/01/2017
 Journeyworker:

Striping-Machine operator	\$ 14.18
Linerman Thermoplastic	\$ 14.55

OVERTIME PAY

See (B, E, E2, F, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 20) on HOLIDAY PAGE
 Overtime: See (5, 8, 11, 12, 15, 16, 17, 20, 21, 22) on HOLIDAY PAGE

8-1456-LS

Painter - Metal Polisher

12/01/2017

JOB DESCRIPTION Painter - Metal Polisher

DISTRICT 8

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuylar, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2017	06/01/2018
Metal Polisher	\$ 29.73	\$ 30.58
Metal Polisher**	30.68	31.53
Metal Polisher***	33.23	34.08

**Note: Applies on New Construction & complete renovation

*** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2017	06/01/2018
Journeyworker:		
All classification	\$ 7.55	\$ 7.65

OVERTIME PAY

See (B, E, E2, P, T) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
 Overtime: See (5, 6, 9, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year term at the following wage rates:

	07/01/2017	06/01/2018
1st year	\$ 12.14	\$ 14.25
2nd year	13.44	15.50
3rd year	16.29	18.25

Supplemental benefits:
 Per hour paid:

1st year	\$ 5.62	\$ 5.62
2nd year	5.62	5.62
3rd year	5.62	5.62

8-8A/28A-MP

Plumber **12/01/2017**

JOB DESCRIPTION Plumber **DISTRICT 8**

ENTIRE COUNTIES
 Putnam, Westchester

WAGES

Per hour:

	07/01/2017
Plumber and Steamfitter	\$ 54.16

SHIFT WORK:

When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 30.13 Per hour paid +\$2.73 per hr. worked
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OVERTIME PAY

See (B, E, E2, Q, V) on OVERTIME PAGE
 OVERTIME:... See on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1)year terms at the following wages:

1st Term	\$ 20.00
2nd Term	22.99
3rd Term	26.52
4th Term	37.98
5th Term	40.77

Supplemental Benefits per hour:

1st term	\$ 12.60 per hour paid + 1.16 per hour worked
2nd term	\$ 13.99 per hour paid + 1.30 per hour worked
3rd term	\$ 16.65 per hour paid + 1.60 per hour worked
4th term	\$ 21.49 per hour paid + 2.36 per hour worked
5th term	\$ 22.89 per hour paid + 2.36 per hour worked

8-21.1-ST

Plumber - HVAC / Service **12/01/2017**

JOB DESCRIPTION Plumber - HVAC / Service

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Putnam, Westchester

PARTIAL COUNTIES

Delaware: Only the townships of Middletown and Roxbury

Ulster: Entire County(including Walkkill and Shawangunk Prisons) except for remainder of Town of Shawangunk and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour: 07/01/2017

HVAC Service \$ 41.50

SUPPLEMENTAL BENEFITS

Per hour worked:

07/01/2017

Journeyworker HVAC Service

\$ 21.54

OVERTIME PAY

See (B, *E, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

HVAC SERVICE

(1)year terms at the following wages:

	1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
07/01/2017	\$ 19.37	\$ 22.69	\$ 28.31	\$ 34.63	\$37.30

Supplemental Benefits per hour worked:

Apprentices 07/01/2017

1st term	\$ 17.33
2nd term	\$ 18.04
3rd term	\$ 18.90
4th term	\$ 19.99
5th term	\$ 20.80

8-21.1&2-SF/Re/AC

Plumber - Jobbing & Alterations **12/01/2017**

JOB DESCRIPTION Plumber - Jobbing & Alterations

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Putnam, Ulster, Westchester

WAGES

Per hour: 07/01/2017

Journeyworker: \$ 41.95

Repairs, replacements and alteration work is any repair or replacement of a present plumbing system that does not change existing roughing or water supply lines.

SHIFT WORK:

When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS

Per hour:
Journeyworker

\$ 25.11 per
hour paid
+\$ 2.73 per
hour worked

OVERTIME PAY

See (B, *E, E2, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year terms at the following wages:

1st year	\$ 18.37
2nd year	20.35
3rd year	21.89
4th year	30.83
5th year	32.51

Supplemental Benefits per hour:

1st year	\$ 8.24 per hour paid + \$ 0.50 per hour worked
2nd year	\$ 9.45 per hour paid + \$ 0.93 per hour worked
3rd year	\$ 12.88 per hour paid + \$ 1.05 per hour worked
4th year	\$ 17.28 per hour paid + \$ 1.46 per hour worked
5th year	\$ 18.54 per hour paid + \$ 1.90 per hour worked

8-21.3-J&A

Roofer

12/01/2017

JOB DESCRIPTION Roofer

DISTRICT 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour: 07/01/2017

Roofer/Waterproofer \$ 41.50

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS

Journeyworker \$ 32.37

OVERTIME PAY

See (B, H) on OVERTIME PAGE

Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year terms at the following percentage of Journeyworkers hourly wage.

1st	2nd	3rd	4th
35%	50%	60%	75%

Supplements per hour paid at the following rates:

1st	2nd	3rd	4th
\$ 3.02	\$ 15.46	\$ 18.54	\$ 23.17

9-8R

Sheetmetal Worker **12/01/2017**

JOB DESCRIPTION Sheetmetal Worker **DISTRICT 8**

ENTIRE COUNTIES
 Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES
 SheetMetal Worker 07/01/2017
\$ 42.66

SHIFT WORK
 For all NYS D.O.T. and other Governmental mandated off-shift work:
 10% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS
 Journeyworker \$ 40.49

OVERTIME PAY
 OVERTIME:.. See (B, E, Q,) on OVERTIME PAGE.
 *Note: For Sundays or Holidays worked, HOURLY WAGE is
 double the total of the hourly wage plus the
 hourly benefit paid all in wages. (Benefits are
 included in the wages).

HOLIDAY
 Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 15, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES

1st	2nd	3rd	4th	5th	6th	7th	8th
\$15.77	\$17.73	\$ 19.71	\$ 21.68	\$ 23.64	\$ 25.62	\$ 28.07	\$ 30.51

Supplemental Benefits per hour:

Apprentices

1st term	\$ 17.05
2nd term	19.30
3rd term	21.49
4th term	23.72
5th term	25.94
6th term	28.18
7th term	29.91
8th term	31.67

8-38

Sheetmetal Worker **12/01/2017**

JOB DESCRIPTION Sheetmetal Worker **DISTRICT 4**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
 Per Hour: 07/01/2017
 Sign Erector \$ 47.67

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

SUPPLEMENTAL BENEFITS
 Per Hour: 07/01/2017
 Sign Erector \$ 44.44

OVERTIME PAY
 See (A, F, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE
 Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Per Hour:
 6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

SUPPLEMENTAL BENEFITS

Per Hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$12.55	\$14.23	\$15.89	\$17.57	\$24.30	\$26.84	\$29.27	\$31.47	\$33.65	\$35.83

4-137-SE

Sprinkler Fitter

12/01/2017

JOB DESCRIPTION Sprinkler Fitter

DISTRICT 1

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

Per hour

	07/01/2017	01/01/2018	04/01/2018
Sprinkler Fitter	\$ 43.97	43.97	45.42

SUPPLEMENTAL BENEFITS

Per hour worked

Journeyman	\$ 22.42	23.12	23.42
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OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES

Wages per hour

For Apprentices HIRED ON OR AFTER 04/01/2010:

One Half Year terms at the following percentage of journeyman's wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
45%	50%	55%	60%	65%	70%	75%	80%	85%	90%

Supplemental Benefits per hour worked

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 8.85	\$ 8.91	\$ 16.49	\$ 16.55	\$ 17.11	\$ 17.17	\$ 17.23	\$ 17.28	\$ 17.34	\$ 17.40

For Apprentices HIRED ON OR AFTER 04/01/2013:

One Half Year terms at the following percentage of journeyman's wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
45%	50%	55%	60%	65%	70%	75%	80%	85%	90%

Supplemental Benefits per hour worked

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 8.07	\$ 8.07	\$ 16.24	\$ 16.24	\$ 16.49	\$ 16.49	\$ 16.49	\$ 16.49	\$ 16.49	\$ 16.49

Teamster - Building / Heavy&Highway

12/01/2017

JOB DESCRIPTION Teamster - Building / Heavy&Highway

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

GROUP A: Straight Trucks (6-wheeler and 10-wheeler), A-frame, Tri-Axle, Winch, Dynamite Seeding, Mulching, Agitator, Water, Cement (all types), Suburban, Station Wagons, Cars, Pick Ups, any vehicle carrying materials of any kind.

GROUP B: Tractor & Trailers (all types).

GROUP BB: 14 Wheeler

GROUP C: Low Boy (carrying equipment).

GROUP CC: Light Tower, Attenuator Trucks

GROUP D: Fuel Trucks, Tire Trucks.

GROUP E: Off-road Equipment (over 40 tons): Athey Wagons, Belly Dumps, Articulated Dumps, Trailer Wagons.

GROUP F: Off-road Equipment (over 40 tons) Euclid,DJB.

GROUP G: Off-road Equipment (under 40 tons) Athey Wagons, Belly Articulated Dumps, Trailer Wagons.

GROUP H: Off-road Equipment(under 40 tons), Euclid.

GROUP HH: Off-road Equipment(under 40 tons) D.J.B.

GROUP I: Off-road Equipment(under 40 tons) Darts.

GROUP II: Off-road Equipment(under 40 tons) RXS.

WAGES:(per hour)

07/01/2017

GROUP A	\$ 40.52*
GROUP B	41.14*
GROUP BB	40.64*
GROUP C	43.27*
GROUP CC	40.52*
GROUP D	40.97*
GROUP E	41.52*
GROUP F	42.52*
GROUP G	41.27*
GROUP H	41.89*
GROUP HH	42.27*
GROUP I	42.02*
GROUP II	42.39*

* To calculate premium wage, subtract \$.20 from the hourly wage.

Note: Fuel truck operators on construction sites addit. \$5.00 per day.
For work on hazardous/toxic waste site addit. 20% of hourly rate.

Shift Differential:NYS DOT or other Governmental Agency contracts shall receive a shift differential of Fifteen(15%)percent above the wage rate

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Fridays and Saturdays may be used as make-up days at straight time when a day during the work week has been lost due to inclement weather.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour paid:
Journeyworker

First 40 hours	\$ 26.17
41st-45th hours	11.88
Over 45 hours	0.25

NOTE: Employees entitled to 1 week of paid vacation based on group classification after 90 days of employment.

OVERTIME PAY

See (B, E, P, R) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

8-456

Welder

12/01/2017

JOB DESCRIPTION Welder

DISTRICT 1

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuylar, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour 07/01/2017

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

- (AA) Time and one half of the hourly rate after 7 and one half hours per day
- (A) Time and one half of the hourly rate after 7 hours per day
- (B) Time and one half of the hourly rate after 8 hours per day
- (B1) Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday.
Double the hourly rate for all additional hours
- (B2) Time and one half of the hourly rate after 40 hours per week
- (C) Double the hourly rate after 7 hours per day
- (C1) Double the hourly rate after 7 and one half hours per day
- (D) Double the hourly rate after 8 hours per day
- (D1) Double the hourly rate after 9 hours per day
- (E) Time and one half of the hourly rate on Saturday
- (E1) Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
- (E2) Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E3) Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
- (E4) Saturday and Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E5) Double time after 8 hours on Saturdays
- (F) Time and one half of the hourly rate on Saturday and Sunday
- (G) Time and one half of the hourly rate on Saturday and Holidays
- (H) Time and one half of the hourly rate on Saturday, Sunday, and Holidays
- (I) Time and one half of the hourly rate on Sunday
- (J) Time and one half of the hourly rate on Sunday and Holidays
- (K) Time and one half of the hourly rate on Holidays
- (L) Double the hourly rate on Saturday
- (M) Double the hourly rate on Saturday and Sunday
- (N) Double the hourly rate on Saturday and Holidays
- (O) Double the hourly rate on Saturday, Sunday, and Holidays
- (P) Double the hourly rate on Sunday
- (Q) Double the hourly rate on Sunday and Holidays
- (R) Double the hourly rate on Holidays
- (S) Two and one half times the hourly rate for Holidays, if worked

- (S1) Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
- (T) Triple the hourly rate for Holidays, if worked
- (U) Four times the hourly rate for Holidays, if worked
- (V) Including benefits at SAME PREMIUM as shown for overtime
- (W) Time and one half for benefits on all overtime hours.

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

- (1) None
- (2) Labor Day
- (3) Memorial Day and Labor Day
- (4) Memorial Day and July 4th
- (5) Memorial Day, July 4th, and Labor Day
- (6) New Year's, Thanksgiving, and Christmas
- (7) Lincoln's Birthday, Washington's Birthday, and Veterans Day
- (8) Good Friday
- (9) Lincoln's Birthday
- (10) Washington's Birthday
- (11) Columbus Day
- (12) Election Day
- (13) Presidential Election Day
- (14) 1/2 Day on Presidential Election Day
- (15) Veterans Day
- (16) Day after Thanksgiving
- (17) July 4th
- (18) 1/2 Day before Christmas
- (19) 1/2 Day before New Years
- (20) Thanksgiving
- (21) New Year's Day
- (22) Christmas
- (23) Day before Christmas
- (24) Day before New Year's
- (25) Presidents' Day
- (26) Martin Luther King, Jr. Day
- (27) Memorial Day



**New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12240**

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: _____

(Check Only One)

Contracting Agency

Architect or Engineering Firm

Public Work District Office

Date: _____

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address (Check if new or change)

Telephone: ()

Fax: ()

E-Mail: _____

2. NY State Units (see Item 5)

01 DOT

02 OGS

03 Dormitory Authority

04 State University
Construction Fund

05 Mental Hygiene
Facilities Corp.

06 OTHER N.Y. STATE UNIT

07 City

08 Local School District

09 Special Local District, i.e.,
Fire, Sewer, Water District

10 Village

11 Town

12 County

13 Other Non-N.Y. State
(Describe)

3. SEND REPLY TO (check if new or change)
Name and complete address: _____

Telephone: ()

Fax: ()

E-Mail: _____

4. SERVICE REQUIRED. Check appropriate box and provide project information.

New Schedule of Wages and Supplements.

APPROXIMATE BID DATE : _____

Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR
THIS PROJECT : _____

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

1. New Building

2. Addition to Existing Structure

3. Heavy and Highway Construction (New and Repair)

4. New Sewer or Waterline

5. Other New Construction (Explain)

6. Other Reconstruction, Maintenance, Repair or Alteration

7. Demolition

8. Building Service Contract

8. OCCUPATION FOR PROJECT :

Construction (Building, Heavy
Highway/Sewer/Water)

Tunnel

Residential

Landscape Maintenance

Elevator maintenance

Exterminators, Fumigators

Fire Safety Director, NYC Only

Guards, Watchmen

Janitors, Porters, Cleaners,
Elevator Operators

Moving furniture and
equipment

Trash and refuse removal

Window cleaners

Other (Describe)

9. Has this project been reviewed for compliance with the Wicks Law involving separate bidding?

YES NO

10. Name and Title of Requester _____

Signature



NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

**LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE
AWARDED ANY PUBLIC WORK CONTRACT**

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements

NOTE: The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = NYS Dept. of Labor; NYC = New York City Comptroller's Office; AG = NYS Attorney General's Office; DA = County District Attorney's Office.

A list of those barred from bidding, or being awarded, any public work contract or subcontract with the State, under section 141-b of the Workers' Compensation Law, may be obtained at the following link, on the NYS DOL Website:

<https://dbr.labor.state.ny.us/EDList/searchPage.do>

NYS DOL Bureau of Public Work Debarment List 11/17/2017

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL		4618 FOSTER AVE LLC		C/O KAHAN & KAHAN 225 BROADWAY-SUITE 715NEW YORK NY 10007	02/05/2013	02/05/2018
DOL	DOL	****0996	A-1 CONSTRUCTION & RENOVATION INC		1973 81ST ST - SUITE A-5 BROOKLYN NY 11214	01/08/2015	01/08/2020
DOL	NYC		ABDUL KARIM		C/O NORTH AMERICAN IRON W 1560 DECATUR STREETRIDGWOOD NY 11385	05/15/2015	05/15/2020
DOL	DOL	****8488	ABELCRAFT OF NEW YORK CORP		640 ASHFORD AVENUE ARDSLEY NY 10502	08/27/2013	08/27/2018
DOL	DOL	****1219	ABSOLUTE GENERAL CONTRACTING INC		1229 AVENUE U BROOKLYN NY 11229	01/28/2013	01/28/2018
DOL	DOL	****4539	ACCOMPLISHED WALL SYSTEMS INC		112 OSCAWANA HEIGHTS ROAD PUTNAM VALLEY NY 10542	08/27/2013	08/27/2018
DOL	DOL	****8018	ACCURATE MECHANICAL LLC		9547 BUSTLETON AVENUE PHILADELPHIA PA 19115	02/05/2014	02/05/2019
DOL	DOL		ACCURATE MECHANICAL OF PHILADELPHIA LLC		9547 BUSTLETON AVENUE PHILADELPHIA PA 19115	02/05/2014	02/05/2019
DOL	DOL	****3344	ACT INC		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	NYC		ADRIANA SELA	C/O COLONIAL ROOFING COMPANY INC	247 48TH STREET BROOKLYN NY 11220	02/05/2014	02/05/2019
DOL	DOL	****1687	ADVANCED SAFETY SPRINKLER INC		261 MILL ROAD P O BOX 296EAST AURORA NY 14052	07/29/2015	07/29/2020
DOL	DOL	****2538	AGG MASONRY INC		160 72ND ST - SUITE 721 BROOKLYN NY 11209	03/19/2013	03/19/2018
DOL	DOL		AJ TORCHIA		10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	DOL		ALISHER KARIMOV		C/O AGG MASONRY INC 7105 3RD AVENUEBROOKLYN NY 11209	03/19/2013	03/19/2018
DOL	DOL	****3344	ALL CATASTROPHE CONSTRUCTION TEAM INC	ACT INC	6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL	****8740	ALLSTATE ENVIRONMENTAL CORP		C/O JOSE MONTAS 27 BUTLER PLACEYONKERS NY 10710	03/18/2011	03/19/2020
DOL	DOL		AMADEO J TORCHIA	TORCHIA'S HOME IMPROVEMEN T	10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	DOL	****4274	AMERICAN STEEL MECHANICAL INC		693 PAINTER STREET MEDIA PA 19063	02/20/2013	02/20/2018
DOL	DOL		ANDREW DIPAUL		C/O CONSOLIDATED INDUSTRI 2051 ROUTE 44/55MODENA NY 12548	12/11/2012	12/11/2017
DOL	NYC		ANDRZEJ WROBEL		24 CONGRESS LANE SOUTH RIVER NJ 08882	05/01/2013	05/01/2018
DOL	NYC		ANISUL ISLAM		C/O RELIANCE GENERAL CONS 644 OCEAN PARKWAYBROOKLYN NY 11230	09/02/2015	09/02/2020
DOL	DOL	****7004	ANNEX CONTRACTING LTD		3005 WYNSUM AVENUE MERRICK NY 11566	08/18/2014	08/18/2019
DOL	DOL	****7004	ANNEX GENERAL CONTRACTING INC		3005 WYNSUM AVENUE MERRICK NY 11566	08/18/2014	08/18/2019
DOL	DA		ANTHONY CARDINALE		58-48 59TH STREET MASPETH NY 11378	05/16/2012	05/08/2020
DOL	DOL		ANTHONY J MINGARELLI JR		C/O T & T CONCRETE INC 2560 HAMBURG TURNPIKELACKAWANNA NY 14218	07/08/2015	07/08/2020
DOL	DOL		ANTHONY PERGOLA		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10323	01/23/2017	01/23/2022
DOL	DOL	****3020	APCO CONTRACTING CORP		24 SOUTH MARYLAND AVENUE PORT WASHINGTON NY 11050	09/24/2012	09/02/2020
DOL	DOL	****3219	APOLLO CONSTRUCTION SERVICES CORP	APOLLO PAINTING CO	157 TIBBETTS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL		APOLLO PAINTING CO		157 TIBBETTS ROAD YONKERS NY 10705	03/12/2014	03/12/2019

NYS DOL Bureau of Public Work Debarment List 11/17/2017

Article 8

DOL	DOL	****3295	APOLLO PAINTING CORP		3 ALAN B SHEPART PLACE YONKERS NY 10705	03/12/2014	03/12/2019
DOL	AG	****0194	APPLIED CONSTRUCTION INC		46 RUGBY ROAD WESTBURY NY 11590	11/20/2013	11/20/2018
DOL	NYC	****8403	AQUA JET PAINTING CORP		10 VIKING DRIVE WEST ISLIP NY 11795	04/16/2014	04/16/2019
DOL	NYC	****9232	ARKAY CONSTRUCTION INC		102-104 GREYLOCK AVENUE BELLEVILLE NJ 07109	07/15/2015	07/15/2020
DOL	DOL	****3953	ASCAPE LANDSCAPE & CONSTRUCTION CORP		634 ROUTE 303 BLAUVELT NY 10913	07/26/2012	11/19/2018
DOL	NYC	****4779	ASTORIA GENERAL CONTRACTING CORP		35-34 31ST STREET LONG ISLAND CITY NY 11106	09/02/2015	09/02/2020
DOL	NYC	****7217	ASTRO COMMUNICATIONS OF NY CORP		79 ALEXANDER AVE- STE 36A BRONX NY 10454	10/30/2015	10/30/2020
DOL	NYC	****6046	ATLANTIC SUN CONSTRUCTION CORP		58-46 59TH AVENUE MASPETH NY 11378	05/08/2015	05/08/2020
DOL	NYC		AUDLEY O'BRIEN		1273 NORTH AVENUE/#1 CP NEW ROCHELLE NY 10804	04/07/2015	04/07/2020
DOL	DOL		AVIS R HILL		3510 HICKORY WALK LANE ELLENWOOD GA 32094	01/22/2015	01/22/2020
DOL	AG		AVTAR SINGH		116-24 127TH STREET SOUTH OZONE PARK NY 11420	12/22/2015	12/22/2020
DOL	AG		BALDEV SINGH		116-24 127TH STREET SOUTH OZONE PARK NY 11420	12/22/2015	12/22/2020
DOL	DOL		BARBARA CASSIDY		7 BLENIS PLACE VALHALLA NY 10595	04/02/2015	04/02/2020
DOL	DOL		BARRY KINNEY		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	NYC	****3915	BEACON RESTORATION INC		SUITE B-8 782 PELHAM PARKWAY SOUTHBRONX NY 10462	04/21/2016	04/21/2021
DOL	DOL		BEVERLY F WILLIAMS		1238 PRESIDENT STREET BROOKLYN NY 11225	11/18/2013	11/18/2018
DOL	DOL	****8551	BRANDY'S MASONRY		216 WESTBROOK STREET P O BOX 304SAYRE PA 18840	08/09/2016	08/09/2021
DOL	NYC	****6555	BROOKLYN WELDING CORP		1273 NORTH AVENUE/ #1 CP NEW ROCHELLE NY 10804	04/07/2015	04/07/2020
DOL	DOL	****1449	BRRESTORATION NY INC		140 ARCADIA AVENUE OSWEGO NY 13126	09/12/2016	09/12/2021
DOL	DOL		BRUCE MORSEY		C/O KENT HOLLOW SIDING LL 29A BRIDGE STREETNEW MILFORD CT 06776	01/15/2016	01/15/2021
DOL	DOL	****6156	C & J LANDSCAPING & MAINTENANCE INC		520 PINE HILL ROAD CHESTER NY 10940	06/23/2014	06/23/2019
DOL	DOL	****8809	C.B.E. CONTRACTING CORPORATION		310 MCGUINNESS BLVD GREENPOINT NY 11222	03/07/2017	03/07/2022
DOL	DOL		CARIBBEAN POOLS		C/O DOUGLAS L MALARKEY 64 VICTORIA DRIVEBINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	NYC	****9172	CASSIDY EXCAVATING INC		14 RAILROAD AVENUE VALHALLA NY 10595	05/15/2014	04/02/2020
DOL	DOL	****6745	CATSKILL FENCE INSTALLATIONS INC		5445 ROUTE 32 CATSKILL NY 12414	08/22/2014	08/22/2019
DOL	DOL	****8530	CAZ CONTRACTING CORP		37-11 35TH AVENUE LONG ISLAND CITY NY 11101	08/26/2013	08/26/2018
DOL	DOL	****8809	CBE CONTRACTING CORP		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	DOL	****5556	CERTIFIED INSTALLERS INC		113 N MAPLE AVENUE GREENSBURG PA 15601	02/21/2013	02/21/2018
DOL	DOL	****7655	CHAMPION CONSTRUCTION SERVICES CORP		2131 SCHENECTADY AVENUE BROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	NYC		CHARLES CASSIDY JR		14 RAILROAD AVENUE VALHALLA NY 10595	05/15/2014	04/02/2020
DOL	DOL		CHARLES ZIMMER JR		216 WESTBROOK STREET P O BOX 304SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL		CHRISTINE J HEARNE		C/O CJ-HEARNE CONSTRUCTIO 131 PONCE DE LEON AVE NEATLANTA GA 30308	12/01/2015	12/01/2020
DOL	DOL	****3360	CITY LIMITS GROUP INC		2279 HOLLERS AVENUE BRONX NY 10475	01/07/2014	06/23/2019
DOL	DOL	****0671	CJ-HEARNE CONSTRUCTION CO		SUITE 204 131 PONCE DE LEON AVENUEATLANTA GA 30308	12/01/2015	12/01/2020
DOL	NYC	****2905	COLONIAL ROOFING COMPANY INC		247 48TH STREET BROOKLYN NY 11220	02/05/2014	02/05/2019

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DOL	NYC	****3182	COLORTECH INC		5990 58TH AVENUE MASPETH NY 11378	11/18/2013	11/18/2018
DOL	DOL	****2703	CONKLIN'S TECH- MECHANICAL INC		5 PARKER AVENUE POUGHKEEPSIE NY 12601	03/25/2014	03/25/2019
DOL	DOL	****4175	CONSOLIDATED INDUSTRIAL SERVICES INC		2051 ROUTE 44/55 MODENA NY 12548	12/11/2012	01/28/2018
DOL	DOL		CONSTANTINOS ZERVAS		37-11 35TH AVENUE LONG ISLAND CITY NY 11101	08/26/2013	08/26/2018
DOL	NYC	****4468	CRAFT CONTRACTING GROUP INC		3256 BRUNER AVENUE BRONX NY 10469	07/29/2014	07/29/2019
DOL	NYC	****8507	CRAFT FENCE INC		3256 BRUNER AVENUE BRONX NY 10469	07/29/2014	07/29/2019
DOL	NYC	****2164	CREATIVE TRUCKING INC		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	DOL	****7761	D L MALARKEY CONSTRUCTION		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	****7888	D L MALARKEY CONSTRUCTION INC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	****5629	DAKA PLUMBING AND HEATING LLC		2561 ROUTE 55 POUGHQUAG NY 12570	02/19/2016	02/19/2021
DOL	DOL		DANICA IVANOSKI		61 WILLETT ST. PASSAIC NJ 07503	10/26/2016	10/26/2021
DOL	DOL		DARYL T RIEKS		C/O RIEKS CONTRACTING LLC 4804 GAHWILER RODAUBURN NY 13021	05/01/2015	05/01/2020
DOL	NYC	****7707	DASSLE CONTRACTING INC		213-37 39TH AVE/SUITE 120 BAYSIDE NY 11360	05/08/2015	05/08/2020
DOL	DOL		DAVID MARTINEZ		C/O EMPIRE TILE INC 6 TREMONT COURTHUNTINGTON STATION NY 11746	03/08/2016	03/08/2021
DOL	NYC		DAWN AVILA AKA DAWN BECHTOLD		1ST FLOOR STORE FRONT 88-10 LITTLE NECK PARKWAYFLORAL PARK NY 11001	06/24/2014	06/24/2019
DOL	NYC		DAWN BECHTOLD AKA DAWN AVILA		1ST FLOOR STORE FRONT 88-10 LITTLE NECK PARKWAYFLORAL PARK NY 11001	06/24/2014	06/24/2019
DOL	DOL		DEAN ROBBINS III		212 OXFORD WAY SCHENECTADY NY 12309	12/11/2012	09/16/2018
DOL	DOL		DEBBIE STURDEVANT		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	NYC	****3865	DECOMA BUILDING CORPORATION		134 EVERGREEN PL/STE 101 EAST ORANGE NJ 07018	12/30/2013	12/30/2018
DOL	DOL		DEDA GAZIVODAN		C/O DAKA PLUMBING AND H 2561 ROUTE 55POUGHQUAG NY 12570	02/19/2016	02/19/2021
DOL	DOL	****1446	DELTA CONTRACTING PAINTING AND DECORATING INC		437 SUNRISE HIGHWAY WEST BABYLON NY 11707	08/12/2013	08/12/2018
DOL	DOL	****3538	DELTA CONTRACTING PAINTING AND DESIGN INC		75 MCCULLOCH DRIVE DIX HILLS NY 11746	10/19/2010	08/12/2018
DOL	DOL		DENNIS SCHWANDTNER		C/O YES SERVICE AND REPAI 145 LODGE AVEHUNTINGTON STATION NY 11476	08/09/2016	08/09/2021
DOL	DOL	****9868	DESANTIS ENTERPRISES		161 OSWEGO RIVER ROAD PHOENIX NY 13135	09/24/2013	11/18/2018
DOL	DOL		DF CONTRACTORS OF ROCHESTER, INC.		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DF CONTRACTORS, INC.		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL	****9252	DI BERNARDO TILE AND MARBLE CO INC		15 WALKER WAY ALBANY NY 12205	03/21/2014	03/21/2019
DOL	DOL		DIANE DEEVER		731 WARWICK TURNPIKE HEWITT NJ 07421	06/25/2012	12/11/2017
DOL	NYC		DIMITRIOS KOUTSOUKOS		C/O ASTORIA GENERAL CONTR 35-34 31ST STREETLONG ISLAND CITY NY 11106	09/02/2015	09/02/2020
DOL	DOL	****3242	DONALD R. FORSAY	DF LAWN SERVICE	1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DONALD R. FORSAY		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DORIS SKODA		C/O APCO CONTRACTING CORP 24 SOUTH MARYLAND AVENUEPORT WASHINGTON NY 11050	09/24/2012	09/02/2020

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DOL	NYC	****7404	DOSANJH CONSTRUCTION CORP		9439 212TH STREET QUEENS VILLAGE NY 11428	02/25/2016	02/25/2021
DOL	DOL		DOUGLAS L MALARKEY	MALARKEY CONSTRUCTION	64 VICTORIA DRIVE B INGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	****6982	DUFOUR GROUP INC	DUFOUR MASONRY	353 WEST 56TH STREET #7M NEW YORK NY 10019	06/10/2014	06/10/2019
DOL	DOL		DUFOUR MASONRY		353 WEST 56TH ST #7M NEW YORK NY 10019	06/10/2014	06/10/2019
DOL	DOL		DUFOUR MASONRY & RESTORATION INC		353 WEST 56TH STREET #7M NEW YORK NY 10019	06/10/2014	06/10/2019
DOL	DOL	****5840	DYNA CONTRACTING INC		363 88TH STREET BROOKLYN NY 11209	11/18/2013	11/18/2018
DOL	DOL		E C WEBB		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL		EARL GALBREATH		640 ASHFORD AVENUE ARDSLEY NY 10502	08/27/2013	08/27/2018
DOL	DOL		EARL L WILSON	WILSON BROTHER DRYWALL CONTRACTORS	36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL	****1496	EAST COAST DRYWALL INC		1238 PRESIDENT STREET BROOKLYN NY 11225	11/18/2013	11/18/2018
DOL	NYC		EDWARD MENKEN		C/O AQUA JET PAINTING 10 VIKING DRIVEWEST ISLIP NY 11795	04/16/2014	04/16/2019
DOL	NYC	****0900	EF PRO CONTRACTING INC		147 BROOME AVENUE ATLANTIC BEACH NY 11509	03/03/2014	03/03/2019
DOL	NYC		EFSTRATIOS BERNARDIS		23-73 48TH STREET LONG ISLAND CITY NY 11103	04/24/2014	04/24/2019
DOL	DOL		ELIZABETH RAMADANI		C/O RAMADA CONSTRUCTION 80 SAVO LOOPSTATEN ISLAND NY 10309	01/07/2014	01/07/2019
DOL	DOL		ELLEN DESANTIS	DESANTIS ENTERPRISES	161 OSWEGO RIVER ROAD PHOENIX NY 13135	09/24/2013	11/18/2018
DOL	DOL	****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	AG		EMILIO FRANZA		90 JUNIUS STREET BROOKLYN NY 11212	01/23/2014	01/23/2019
DOL	DOL		EMPIRE CONCRETE SERVICES LLC		101 SULLYS TRAIL/SUITE 20 PITTSFORD NY 14534	11/18/2013	01/07/2019
DOL	DOL	****0511	EMPIRE CONCRETE SYSTEMS LLC		101 SULLYS TRAIL/ SUITE 2 PITTSFORD NY 14534	11/18/2013	01/07/2019
DOL	DOL	****2353	EMPIRE CONSTRUCTORS LLC		101 SULLYS TRAIL/SUITE 20 PITTSFORD NY 14534	11/18/2013	01/07/2019
DOL	DOL		EMPIRE PRECAST LLC		101 SULLYS TRAIL/SUITE 20 PITTSFORD NY 14534	11/18/2013	01/07/2019
DOL	DOL	****3270	EMPIRE TILE INC		6 TREMONT COURT HUNTINGTON STATION NY 11746	03/08/2016	03/08/2021
DOL	DOL		ERIKA BARNETT		253 BEACH BREEZE LANE UNIT BARVERNE NY 11692	02/05/2013	02/05/2018
DOL	DOL		ESTEVEES & FRAGA CONSTRUCTION CO INC		986 MADISON AVENUE PATERSON NJ 07501	01/03/2013	01/03/2018
DOL	DOL		ESTEVEES & FRAGA INC		986 MADISON AVENUE PATERSON NJ 07501	01/03/2013	01/03/2018
DOL	NYC		EVERTON CARLESS		134 EVERGREEN PL/STE 101 EAST ORANGE NJ 07018	12/30/2013	12/30/2018
DOL	DOL	****7403	F & B PAINTING CONTRACTING INC		2 PARKVIEW AVENUE HARRISON NY 10604	09/26/2016	09/26/2021
DOL	DOL		F KALAFATIS		2279 HOLLERS AVENUE BRONX NY 10475	01/07/2014	06/23/2019
DOL	DOL		FANTASTIC PAINTING		493 LANSING ROAD FULTONVILLE NY 12072	11/18/2013	11/18/2018
DOL	DOL		FAY MATTHEW		C/O CHAMPION CONSTRUCTION 2131 SCHENECTADY AVENUEBROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		FAZIA GINA ALI-MOHAMMED	C/O CHAMPION CONSTRUCTION	2131 SCHENECTADY AVENUE BROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL	****1311	FLOZ-ON PAINTING & DECORATING INC		12 DUNDERBERG ROAD TOMKINS NY 10986	10/16/2013	10/16/2018
DOL	DOL	****8961	FLOZ-ON PAINTING INC		12 DUNDERBERG ROAD TOMKINS NY 10986	10/16/2013	10/16/2018

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DOL	DOL		FMS		4 LEGHORN COURT NEW YORK NY 11746	11/28/2012	11/28/2017
DOL	DOL		FRAN MICELI		2279 HOLLERS AVENUE BRONX NY 10475	01/07/2014	06/23/2019
DOL	DOL		FRANCES KALAFATIS		2279 HOLLERS AVENUE BRONX NY 10475	01/07/2014	06/23/2019
DOL	DOL		FRANCES KALAFATIS-MICELI		2279 HOLLERS AVENUE BRONX NY 10475	01/07/2014	06/23/2019
DOL	DOL		FRANK BENEDETTO		C/O F & B PAINTING CONTRA 2 PARKVIEW AVENUE HARRISON NY 10604	09/26/2016	09/26/2021
DOL	DOL		FRANK DEMARTINO		101-61 99TH STREET OZONE PARK NY 11416	02/15/2017	02/15/2022
DOL	DOL		FRANK DEMARTINO		101-61 99TH STREET OZONE PARK NY 11416	02/15/2017	02/15/2022
DOL	DOL		FRANK J MERCANDO		134 MURRAY AVENUE YONKERS NY 10704	12/11/2009	02/03/2019
DOL	DOL		FRANK MICELI JR	C/O FRANK MICELI JR CONTRACTIN G INC	19 CLIFF STREET NEW ROCHELLE NY 10801	10/16/2013	10/16/2018
DOL	DOL	*****1321	FRANK MICELI JR CONTRACTING INC		19 CLIFF STREET NEW ROCHELLE NY 10801	10/16/2013	10/16/2018
DOL	DOL	*****2724	FRESH START PAINTING CORP		157 TIBBETS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL		G FUCCI CONSTRUCTION SERVICES		3 ALAN B SHEPARD PLACE YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL	*****6767	G FUCCI PAINTING INC		C/O SPIEGEL & UTRERA 1 MAIDEN LANE - 5TH FL NEW YORK NY 10038	03/12/2014	03/12/2019
DOL	DOL	*****4546	GAF PAINTING LLC		157 TIBBETS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL		GALINDA ROTENBERG		C/O GMDV TRANS INC 67-48 182ND STREET FRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	DOL		GARDEN STATE PAINTING		157 TIBBETS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL		GARY MCDOWELL	GM CONSTRUCTI ON & LAWN CARE SERVICE	76 PLEASANT STREET WELLSVILLE NY 14895	06/11/2013	06/11/2018
DOL	DOL		GEORGE DI BERNARDO		C/O DI BERNARDO TILE 15 WALKER WAY ALBANY NY 12205	03/21/2014	03/21/2019
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DOL	*****1075	GLOBAL TANK CONSTRUCTION LLC		P O BOX 1238 SALINA OK 74365	11/28/2012	11/28/2017
DOL	DOL	*****0878	GM CONSTRUCTION & LAWN CARE SERVICE		76 PLEASANT STREET WELLSVILLE NY 14895	06/11/2013	06/11/2018
DOL	DOL	*****5674	GMDV TRANS INC		67-48 182ND STREET FRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	DOL	*****0090	GOLDS FLOORING INSTALLATIONS INC		25 HAMILTON ROAD MONTICELLO NY 12701	10/16/2013	10/16/2018
DOL	DOL		GREGORY A FUCCI		C/O PAF PAINTING SERVICES 157 TIBBETS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL		GREGORY FUCCI JR		C/O APOLLO CONSTRUCTION 157 TIBBETS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL	*****9456	GUILLO CONTRACTING CORP		P O BOX 229 CALVERTON NY 11933	07/08/2013	07/08/2018
DOL	NYC	*****0346	H N H CONTRACTORS CORP		4558 BROADWAY # 6 NEW YORK NY 10040	08/04/2014	08/04/2019
DOL	DOL		HALSSAM FOSTOK		5 HANSEN PLACE WAYNE NJ 07470	09/18/2013	09/18/2018
DOL	NYC		HAMEEDUL HASAN		240 HOME STREET TEANECK NJ 07666	08/04/2014	08/04/2019
DOL	AG	*****9918	HARA ELECTRIC CORP		2461 47TH STREET ASTORIA NY 11103	09/26/2013	09/26/2018
DOL	NYC		HARMEL SINGH		15 CLINTON LANE HICKSVILLE NY 11801	02/25/2016	02/25/2021
DOL	NYC		HAROLD KUEMMEL		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	AG		HARVINDER SINGH PAUL		90 JUNIUS STREET BROOKLYN NY 11212	01/23/2014	01/23/2019

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DOL	DOL		HENRY VAN DALRYMPLE		2663 LANTERN LANE ATLANTA GA 30349	12/01/2015	12/01/2020
DOL	DOL	****6370	HILLIANO CONSTRUCTION & ELECTRICAL INC		354 MAGNOLIA STREET ROCHESTER NY 14611	01/22/2015	01/22/2020
DOL	DOL	****8282	IDEMA DEVELOPMENT INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL	****8282	IDEMA GENERAL CONTRACTORS INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL	****7001	INTEGRATED CONSTRUCTION & POWER SYSTEMS INC		SUITE 100 2105 W GENESEE STREETS YRACUSE NY 13219	01/06/2016	01/06/2021
DOL	DOL		ISABEL FRAGA		C/O THREE FRIENDS CONSTR 986 MADISON AVENUE PATERSON NJ 07501	01/03/2013	01/03/2018
DOL	AG	****0000	J A M CONSTRUCTION CORP		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL	****7598	J M RICH LLC		P O BOX 268 STILLWATER NY 12170	09/16/2013	03/21/2019
DOL	DOL	****3478	J N P CONSTRUCTION CORP		50 LOUIS COURT P O BOX 1907 SOUTH HACKENSACK NY 07606	03/21/2014	03/21/2019
DOL	DOL		J N RICH LLC		P O BOX 268 STILLWATER NY 12170	09/16/2013	03/21/2019
DOL	DOL	****4910	J V MAGIC TOUCH CORPORATION		94-25 57TH AVENUE, APT 5G ELMHURST NY 11373	01/12/2015	01/12/2020
DOL	DOL		JACQUELINE HOWE		C/O FLOZ-ON PAINTING INC 12 DUNDERBERG ROAD TOMKINS NY 10986	10/16/2013	10/16/2018
DOL	DOL	****8627	JAG I LLC		635 LUZERNE ROAD QUEENSBURY NY 12804	09/16/2013	09/16/2018
DOL	DOL	****2868	JAG INDUSTRIES INC		175 BROAD ST - SUITE 320 GLENS FALLS NY 12801	09/16/2013	09/16/2018
DOL	DOL		JAMES B RHYNDERS		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		JAMES BOYCE		C/O EMPIRE CONCRETE SYST 101 SULLYS TRAIL/SUITE 20 PITTSFORD NY 14534	11/18/2013	01/07/2019
DOL	DOL		JAMES E RHYNDERS		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	AG		JAMES FALCONE		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL		JAMES RHYNDERS SR		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		JAMES SICKAU		3090 SHIRLEY ROAD NORTH COLLINS NY 14111	04/19/2011	07/08/2020
DOL	DOL		JASON M RICH		P O BOX 268 STILLWATER NY 12170	09/16/2013	03/21/2019
DOL	DOL		JASON W MILLIMAN		C/O ROCHESTER ACOUSTICAL P O BOX 799 HILTON NY 14468	02/19/2016	02/19/2021
DOL	DOL		JAY PRESUTTI		C/O CONSOLIDATED INDUSTRI 2051 ROUTE 44/55 MODENA NY 12548	01/28/2013	01/28/2018
DOL	DOL		JEFF P BRADLEY		520 PINE HILL ROAD CHESTER NY 10940	06/23/2014	06/23/2019
DOL	NYC		JEFFREY CASSIDY		14 RAILROAD AVENUE VALHALLA NY 10595	05/15/2014	04/02/2020
DOL	DOL		JERALD HOWE		C/O FLOZ-ON PAINTING INC 12 DUNDERBERG ROAD TOMKINS NY 10986	10/16/2013	10/16/2018
DOL	DOL		JEROME LACITIGNOLA		C/O CATSKILL FENCE INSTAL 5445 ROUTE 32 CATSKILL NY 12414	08/22/2014	08/22/2019
DOL	DOL		JESSICA WHITESIDE		C/O BRRESTORATION NY INC 140 ARCADIA AVENUE OSWEGO NY 13126	09/12/2016	09/12/2021
DOL	DOL		JOHN DESCUL		437 SUNRISE HIGHWAY A WEST BABYLON NY 11704	08/12/2013	08/12/2018
DOL	DOL		JOHN H LEE	JOHN LEE QUALITY PAVING	67 WILER ROAD HILTON NY 14468	01/28/2013	01/28/2018
DOL	DOL	****1749	JOHN LEE QUALITY PAVING		67 WILER ROAD HILTON NY 14468	01/28/2013	01/28/2018

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DOL	DOL		JON E DEYOUNG		261 MILL ROAD P O BOX 296 EAST AURORA NY 14052	07/29/2015	07/29/2020
DOL	DOL		JORGE VILLALOBOS		94-25 57TH AVENUE - APT 5 ELMHURST NY 11373	01/12/2015	01/12/2020
DOL	DOL		JOSE MONTAS		27 BUTLER PLACE YONKERS NY 10710	03/18/2011	03/19/2020
DOL	AG		JOSEPH FALCONE		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL	****9273	JOSEPH M LOVETRO		P O BOX 812 BUFFALO NY 14220	08/09/2016	08/09/2021
DOL	DOL		JOSEPH MARTONE		112 OSCAWANA HEIGHTS ROAD PUTNAM VALLEY NY 10542	08/27/2013	08/27/2018
DOL	DOL		JOSHUA DEBOWSKY		9547 BUSTLETON AVENUE PHILADELPHIA PA 19115	02/05/2014	02/05/2019
DOL	DOL		JOYA MUSCOLINO		10 ST CHARLES STREET THORNWOOD NY 10594	09/03/2013	09/03/2018
DOL	DOL		JUANA MARTINEZ		C/O LEAD CONSTRUCTION 27 BUTLER PLACE YONKERS NY 10710	03/19/2015	03/19/2020
DOL	DOL	****4340	JUBCO SITE DEVELOPMENT LLC		462 LAKEVIEW AVENUE VALHALLA NY 10595	12/16/2013	12/16/2018
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL	****5062	K R F SITE DEVELOPMENT INC		375 LAKE SHORE DRIVE PUTNAM VALLEY NY 10579	01/23/2017	01/23/2022
DOL	DOL		KAREN HARTMAN		C/O GUILLO CONTRACTING P O BOX 229 CALVERTON NY 11933	07/08/2013	07/08/2018
DOL	NYC		KATHLEEN SELA	C/O COLONIAL ROOFING COMPANY INC	247 48TH STREET BROOKLYN NY 11220	02/05/2014	02/05/2019
DOL	DOL		KEITH SCHEPIS		C/O KJS HAULING AND HOME 95 MAPLE AVENUE NEW CITY NY 10956	04/15/2013	04/15/2018
DOL	DOL		KEN DEEVER		731 WARWICK TURNPIKE HEWITT NJ 07421	06/25/2012	12/11/2017
DOL	DOL		KENNETH FIORENTINO		375 LAKE SHORE DRIVE PUTNAM VALLEY NY 10579	01/23/2017	01/23/2022
DOL	DOL	****9732	KENT HOLLOW SIDING LLC		29A BRIDGE STREET NEW MILFORD CT 06776	01/15/2016	01/15/2021
DOL	DOL		KEVIN BABCOCK JR		P O BOX 46 THOMPSON RIDGE NY 10985	08/22/2014	08/22/2019
DOL	DOL		KEVIN M BABCOCK		P O BOX 46 THOMPSON RIDGE NY 10985	08/22/2014	08/22/2019
DOL	DOL		KIM SOROCENSKI		C/O SOLUTION MATTERS INC 198 NORWOOD ROADPORT JEFFERSON NY 11776	11/19/2015	11/19/2020
DOL	DOL	****2463	KJS HAULING AND HOME IMPROVEMENT INC		95 MAPLE AVENUE NEW CITY NY 10956	04/15/2013	04/15/2018
DOL	AG		KOSTAS "GUS" ANDRIKOPOULOS		2461 47TH STREET ASTORIA NY 11103	09/26/2013	09/26/2018
DOL	DA	****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL	****6224	LAKESIDE FIRE SPRINKLERS LLC		125 CHAUTAUQUA AVENUE LAKEWOOD NY 14750	06/24/2015	06/24/2020
DOL	AG	****4643	LALO DRYWALL, INC.		221 OLD FORD ROAD NEW PLATZ NY 12561	05/20/2016	05/20/2021
DOL	DOL	****4505	LARAPINTA ASSOCIATES INC		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	DOL		LAURI MARTONE		112 OSCAWANA HEIGHTS ROAD PUTNAM VALLEY NY 10542	08/27/2013	08/27/2018
DOL	DOL		LAVERN GLAVE		C/O RAW POWER ELECTRIC 3 PARK CIRCLE MIDDLETOWN NY 10940	09/15/2014	09/15/2019
DOL	DOL		LAWRENCE J RUGGLES		P O BOX 371 ROUND LAKE NY 12151	05/12/2014	05/12/2019
DOL	DOL	****1364	LEAD CONSTRUCTION SERVICES INC		3 ALAN B SHEPARD PLACE YONKERS NY 10705	03/19/2015	03/19/2020
DOL	DOL	****4388	LEN.J CONSTRUCTION LLC		PO BOX 10007 ALBANY NY 12201	08/14/2017	08/14/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	01/30/2022

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DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	01/30/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	AG		LEONID FRIDMAN		APT 5 200 BRIGHTON, 15TH STBROOKLYN NY 11235	01/23/2014	01/23/2019
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	08/14/2017	08/14/2022
DOL	DOL		LINDSEY R CRILL		143 FILLMORE AVENUE BUFFALO NY 14210	01/08/2015	01/08/2020
DOL	DOL	****8453	LINPHILL ELECTRICAL CONTRACTORS INC		523 SOUTH 10TH AVENUE MOUNT VERNON NY 10553	01/07/2011	04/15/2018
DOL	DOL		LINVAL BROWN		523 SOUTH 10TH AVENUE MOUNT VERNON NY 10553	01/07/2011	04/15/2018
DOL	AG		LUIS MARTINEZ	LALO DRYWALL	211 MAIN ST. NEW PALTZ NY 12561	05/20/2016	05/20/2021
DOL	NYC	****2850	M A 2 FLAGS CONTRACTING CORP		25-18 100TH STREET EAST ELMHURST NY 11369	08/21/2013	08/21/2018
DOL	DOL		M ANVER BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	AG	****6957	M B DIN CONSTRUCTION INC		8831 20TH AVENUE/SUITE 6E BROOKLYN NY 11214	11/17/2015	11/17/2020
DOL	NYC	****6317	M S QUALITY CONSTRUCTION LLC		27 MAPLEWOOD AVENUE COLONIA NJ 07067	02/04/2015	02/04/2020
DOL	DOL		M. ANVER BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	NYC		MACIEJ SONTOWSKI		27 MAPLEWOOD AVENUE COLONIA NJ 07067	02/04/2015	02/04/2020
DOL	NYC	****9590	MACK GLASSNAUTH IRON WORKS INC		137 LIBERTY AVENUE BROOKLYN NY 11212	12/21/2015	12/21/2020
DOL	NYC	****3141	MACKKEY REED ELECTRIC INC		1ST FLOOR STORE FRONT 88-10 LITTLE NECK PARKWAYFLORAL PARK NY 11001	06/24/2014	06/24/2019
DOL	DOL	****1784	MADISON AVE CONSTRUCTION CORP		39 PENNY STREET WEST ISLIP NY 11795	11/02/2016	11/02/2021
DOL	DOL		MALARKEY'S BAR & GRILL LLC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	****0705	MALARKEY'S PUB & GRUB LLC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		MARIA ESTEVES AKA MARIA MARTINS		C/O THREE FRIENDS CONSTR 986 MADISON AVENUEPATERSON NJ 07501	01/03/2013	01/03/2018
DOL	DOL		MARIA MARTINS AKA MARIA ESTEVES		C/O THREE FRIENDS CONSTR 986 MADISON AVENUEPATERSON NJ 07501	01/03/2013	01/03/2018
DOL	DOL		MARIACHI'S PIZZERIA		C/O DOUGLAS L MALARKEY 64 VICTORIA DRIVEBINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL		MARK MIONIS		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL	****5533	MARQUISE CONSTRUCTION & DEVELOPMENT CORP		10 ST CHARLES STREET THORNWOOD NY 10594	09/03/2013	09/03/2018
DOL	DOL	****8810	MARQUISE CONSTRUCTION ASSOCIATES INC		20 BOSWELL ROAD PUTNAM VALLEY NY 10579	09/03/2013	09/03/2018
DOL	DOL	****1134	MARQUISE CONSTRUCTION CORP		10 ST CHARLES STREET THORNWOOD NY 10594	09/03/2013	09/03/2018

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DOL	DOL		MARVIN A STURDEVANT		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	DOL		MATTHEW IDEMA GENERAL CONTRACTORS INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL	****6416	MCCALL MASONRY		P O BOX 304 SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL	****9028	MCINTOSH INTERIORS LLC		8531 AVENUE B BROOKLYN NY 11236	02/05/2013	02/05/2018
DOL	DOL	****4259	MERCANDO CONTRACTING CO INC		134 MURRAY AVENUE YONKERS NY 10704	12/11/2009	02/03/2019
DOL	DOL	****0327	MERCANDO INDUSTRIES LLC		134 MURRAY AVENUE YONKERS NY 10704	12/11/2009	02/03/2019
DOL	NYC	****5330	METRO DUCT SYSTEMS INC		1219 ASTORIA BOULEVARD LONG ISLAND CITY NY 11102	04/16/2014	11/19/2020
DOL	DOL	****3368	MICEK CONSTRUCTION CO INC		20 CROSS STREET FALCONER NY 14733	12/02/2014	12/02/2019
DOL	DOL		MICHAEL A PASCARELLA		SUITE 100 2105 WEST GENESEE STREET SYRACUSE NY 13219	01/06/2016	01/06/2021
DOL	DOL	****9198	MICHAEL CZECHOWICZ	OCTAGON CO	37-11 35TH AVENUE-2ND FL LONG ISLAND CITY NY 11101	01/08/2013	01/08/2018
DOL	DOL		MICHAEL F LEARY JR		3813 SNOWDEN HILL ROADNEW HARTFORD NY 13413	06/19/2013	06/19/2018
DOL	DOL		MICHAEL F LEARY JR METAL STUD & DRYWALL		3813 SNOWDEN HILL ROAD NEW HARTFORD NY 13413	06/19/2013	06/19/2018
DOL	NYC		MICHAEL HIRSCH		C/O MZM CORP 163 S MAIN STREETNEW CITY NY 10956	01/28/2016	01/28/2021
DOL	DOL		MICHAEL KTISTAKIS		363 88TH STREET BROOKLYN NY 11209	11/18/2013	11/18/2018
DOL	DOL		MICHAEL MARGOLIN		4 LEGHORN COURT NEW YORK NY 11746	11/28/2012	11/28/2017
DOL	DOL		MICHAEL WILSON	WILSON BROTHER DRYWALL CONTRACTOR S	36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL		MICHELLE L BARBER		635 LUZERNE ROAD QUEENSBURY NY 12804	09/16/2013	09/16/2018
DOL	NYC		MIGUEL ACOSTA		25-18 100TH STREET EAST ELMHURST NY 11369	08/21/2013	08/21/2018
DOL	NYC		MILANCE HADZIC		22 CALIFORNIA AVE - STE 1 PATERSON NJ 07503	03/11/2015	03/11/2020
DOL	AG		MOHAMMAD RIAZ		46 RUGBY ROAD WESTBURY NY 11590	11/20/2013	11/20/2018
DOL	AG		MOHAMMED N CHATHA		8831 20TH AVENUE/SUITE 6E BROOKLYN NY 11214	11/17/2015	11/17/2020
DOL	DOL	****2737	MOUNTAIN'S AIR INC		2471 OCEAN AVENUE- STE 7A BROOKLYN NY 11229	09/24/2012	09/18/2020
DOL	DOL		MUHAMMAD BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	DOL		MUHAMMAD BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	DOL		MUHAMMAD PERVAIZ		C/O CHAMPION CONSTRUCTION 2131 SCHENECTADY AVENUEBROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		MUZAFFAR HUSSAIN		C/O ABSOLUTE GENERAL CONT 1129 AVENUE UBROOKLYN NY 11229	01/28/2013	01/28/2018
DOL	NYC	****3613	MZM CORP		163 S MAIN STREET NEW CITY NY 10956	01/28/2016	01/28/2021
DOL	NYC	****1284	NEW AMERICAN RESTORATION INC		22 CALIFORNIA AVE - STE 1 PATERSON NJ 07503	03/11/2015	03/11/2020
DOL	DA	****6988	NEW YORK INSULATION INC		58-48 59TH STREET MASPETH NY 11378	05/16/2012	05/08/2020
DOL	NYC	****4839	NEW YORK RIGGING CORP		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	DOL		NICHOLAS DEGREGORY JR	NJ DEGREGORY & COMPANY	1698 ROUTE 9 GLEN FALLS NY 12801	05/23/2013	05/23/2018
DOL	NYC		NICHOLAS PROVENZANO		147 BROOME AVENUE ATLANTIC BEACH NY 11509	03/03/2014	03/03/2019
DOL	NYC		NICHOLAS PROVENZANO		147 BROOME AVENUE ATLANTIC BEACH NY 11509	03/03/2014	03/03/2019

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DOL	DOL	****5279	NJ DEGREGORY & COMPANY		1698 ROUTE 9 GLENS FALLS NY 12801	05/23/2013	05/23/2018
DOL	DOL		NJ DEGREGORY & SONS CONSTRUCTION		1698 ROUTE 9 GLENS FALLS NY 12801	05/23/2013	05/23/2018
DOL	NYC	****1968	NORTH AMERICAN IRON WORKS INC		1560 DECATUR STREET RIDGWOOD NY 11385	05/15/2015	05/15/2020
DOL	DOL	****6966	NORTH COUNTRY DRYWALL AND PAINT		23167 COUNTY ROUTE 59 DEXTER NY 13634	10/24/2016	10/24/2021
DOL	DOL	****0065	NORTHEAST LANDSCAPE AND MASONRY ASSOC		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10523	01/23/2017	01/23/2022
DOL	DOL	****9198	OCTAGON CO		37-11 35TH AVENUE-2ND FL LONG ISLAND CITY NY 11101	01/08/2013	01/08/2018
DOL	NYC	****8337	OPTIMUM CONSTRUCTION INC		23-73 48TH STREET LONG ISLAND CITY NY 11103	04/24/2014	04/24/2019
DOL	NYC		ORSON ARROYO		C/O METRO DUCT SYSTEMS 12-19 ASTORIA BOULEVARDLONG ISLAND CITY NY 11102	04/16/2014	11/19/2020
DOL	DOL	****4546	PAF PAINTING CORP		161 TIBBETTS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL	****5242	PAF PAINTING SERVICES INC	GARDEN STATE PAINTING	157 TIBBETTS ROAD YONKERS NY 10103	03/12/2014	03/12/2019
DOL	DOL		PAF PAINTING SERVICES OF WESTCHESTER INC		C/O SPIEGEL & UTRERA 1 MAIDEN LANE - 5TH FLNEW YORK NY 10038	03/12/2014	03/12/2019
DOL	DOL	****8802	PAT'S HEATING AND AIR CONDITIONING LTD		P O BOX 371 ROUND LAKE NY 12151	05/12/2014	05/12/2019
DOL	DOL		PATRICIA M RUGGLES		P O BOX 371 ROUND LAKE NY 12151	05/12/2014	05/12/2019
DOL	DOL		PAUL VERNA		C/O AMERICAN STEEL MECHA 693 PAINTER STREETMEDIA PA 19063	02/20/2013	02/20/2018
DOL	DOL		PETER M PERGOLA		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10523	01/23/2017	01/23/2022
DOL	NYC		PETER TRITARIS		5990 58TH AVENUE MASPETH NY 11378	11/18/2013	11/18/2018
DOL	DOL		PIERRE LAPORT		224 COUNTY HIGHWAY 138 BROADALBIN NY 12025	03/07/2017	03/07/2022
DOL	DOL	****1543	PJ LAPORT FLOORING INC		224 COUNTY HIGHWAY 138 BROADALBIN NY 12025	03/07/2017	03/07/2022
DOL	DOL	****2989	PROFESSIONAL ESTIMATING & BUSINESS CORP		157 TIBBETTS ROAD YONKERS NY 10705	03/12/2014	03/12/2019
DOL	DOL	****6895	PROLINE CONCRETE OF WNY INC		3090 SHIRLEY ROAD NORTH COLLINS NY 14111	04/19/2011	07/08/2020
DOL	DA	****6817	QUADRANT METAL BUILDINGS LLC		2740 SW MARTIN DOWNS BLVD PALM CITY FL 34990	08/25/2016	08/25/2021
DOL	DOL	****0015	RAMADA CONSTRUCTION CORP		80 SAVO LOOP STATEN ISLAND NY 10309	01/07/2014	01/07/2019
DOL	NYC		RAMESHWAR ASU		137 LIBERTY AVENUE BROOKLYN NY 11212	12/21/2015	12/21/2020
DOL	DOL		RANA A KAHN		1973 81ST ST - SUITE A-5 BROOKLYN NY 11214	01/08/2015	01/08/2020
DOL	NYC		RANTIK PARIKH		13 LORIANN ROAD WARREN NJ 07059	07/15/2015	07/15/2020
DOL	DOL	****2633	RAW POWER ELECTRIC CORP		3 PARK PLACE MIDDLETOWN NY 10940	09/16/2013	09/15/2019
DOL	NYC		RAYMOND PEARSON		P O BOX 957 PORT JEFFERSON STA NY 11776	03/12/2014	03/12/2019
DOL	DOL		REBECCA THORNE		113 N MAPLE AVENUE GREENSBURG PA 15601	02/21/2013	02/21/2018
DOL	DOL		REGINALD WARREN		C/O RAW POWER ELECTRIC 3 PARK CIRCLEMIDDLETOWN NY 10940	09/15/2014	09/15/2019
DOL	NYC	****3461	RELIANCE GENERAL CONSTRUCTION INC		644 OCEAN PARKWAY BROOKLYN NY 11230	09/02/2015	09/02/2020
DOL	DOL		REVOLUTIONARY FLOORS LLC		P O BOX 268 STILLWATER NY 12170	09/16/2013	03/21/2019
DOL	DOL		RHINO CONCRETE LLC		101 SULLYS TRAIL/SUITE 20 PITTSFORD NY 14534	11/18/2013	01/07/2019
DOL	DA		RIANN MULLER		2740 SW MARTIN DOWNS BLVD PALM CITY FL 34990	08/25/2016	08/25/2021

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DOL	DOL		RICHARD WILSON		C/O DUFOUR GROUP INC 353 WEST 56TH STREET #7MNEW YORK NY 10019	06/10/2014	06/10/2019
DOL	DOL	****8618	RIEKS CONTRACTING LLC		4804 GAHWILER ROAD AUBURN NY 13021	05/01/2015	05/01/2020
DOL	DOL		ROBBYE BISSEAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL	****1855	ROBERT D BISHOP JR	ROBERT D BISHOP JR	P O BOX 112 MORRISONVILLE NY 12962	07/15/2014	07/15/2019
DOL	DOL		ROBERT D BISHOP JR		P O BOX 112 MORRISONVILLE NY 12962	07/15/2014	07/15/2019
DOL	NYC		ROBERT GUIDO		3256 BRUNER AVENUE BRONX NY 10469	07/29/2014	07/29/2019
DOL	DOL		ROBERT L EVANS		128A NORTH STAMFORD ROAD STAMFORD CT 06903	05/23/2013	05/23/2018
DOL	DOL		ROBERT TORDELLA		125 CHAUTAUQUA AVENUE LAKEWOOD NY 14750	06/24/2015	06/24/2020
DOL	DOL	****3859	ROCHESTER ACOUSTICAL CORP		P O BOX 799 HILTON NY 14468	02/19/2016	02/19/2021
DOL	NYC		RODNEY SCOTT		201 HEMPSTEAD AVENUE WEST HEMPSTEAD NY 11552	10/30/2015	10/30/2020
DOL	DOL		ROMEO WARREN		C/O RAW POWER ELECTR CORP 3 PARK PLACEMIDDLETOWN NY 10940	09/16/2013	09/15/2019
DOL	DOL		ROSS J MUSCOLINO		10 ST CHARLES STREET THORNWOOD NY 10594	09/03/2013	09/03/2018
DOL	DOL		RYAN ALBIE		21 S HOWELLS POINT ROAD BELLPORT NY 11713	02/21/2017	02/21/2022
DOL	DOL	****3347	RYAN ALBIE CONTRACTING INC		21 S HOWELLS POINT ROAD BELLPORT NY 11713	02/21/2017	02/21/2022
DOL	DOL		S & S ELECTRIC		235 BROADWAY SCHENECTADY NY 12306	06/19/2013	06/19/2018
DOL	NYC		SABIR MUHAMMED		SUITE B-8 782 PELHAM PARKWAY SOUTHBRONX NY 10462	04/21/2016	04/21/2021
DOL	NYC		SAEED HASAN		4558 BROADWAY #6 NEW YORK NY 10040	08/04/2014	08/04/2019
DOL	DOL	****4923	SCHENLEY CONSTRUCTION INC		731 WARWICK TURNPIKE HEWITT NJ 07421	06/25/2012	12/11/2017
DOL	NYC	****2117	SCOTT ELECTRICAL LLC		201 HEMPSTEAD AVENUE WEST HEMPSTEAD NY 11552	10/30/2015	10/30/2020
DOL	DOL		SCOTT LEONARD	GLOBAL TANK CONSTRUCTI ON LLC	P O BOX 1238 SALINA OK 74365	11/28/2012	11/28/2017
DOL	DOL	****9751	SCW CONSTRUCTION		544 OLD ROUTE 23 ACRE NY 12405	02/14/2017	02/14/2022
DOL	DOL		SEAKCO CONSTRUCTION COMPANY LLC		128A NORTH STAMFORD ROAD STAMFORD CT 06903	05/23/2013	05/23/2018
DOL	DOL	****9030	SEAKCO NEW YORK LLC	SEAKCO CONSTRUCTI ON COMPANY	128A NORTH STAMFORD ROAD STAMFORD CT 06903	05/23/2013	05/23/2018
DOL	DOL		SEAN BURBAGE	C/O SEAN BURBAGE CORP	445 ROOSA GAP ROAD BLOOMINGBURG NY 12721	04/14/2014	04/14/2019
DOL	DOL	****6586	SEAN BURBAGE CORP		445 ROOSA GAP ROAD BLOOMINGBURG NY 12721	04/14/2014	04/14/2019
DOL	AG		SERGIO RAYMUNDO		109 DUBOIS RD. NEW PALTZ NY 12561	05/20/2016	05/20/2021
DOL	DOL	****6904	SIGNING STAR LIMITED LIABILITY COMPANY		5 HANSEN PLACE WAYNE NJ 07470	09/18/2013	09/18/2018
DOL	DOL	****4025	SOLUTION MATTERS INC		198 NORWOOD ROAD PORT JEFFERSON NY 11776	11/19/2015	11/19/2020
DOL	NYC	****4934	SPHINX CONTRACTING CORP		240 HOME STREET TEANECK NJ 07666	08/04/2014	08/04/2019
DOL	DOL		SPORTSCRAFTERS INC		113 N MAPLE AVENUE GREENSBURG PA 15601	02/21/2013	02/21/2018
DOL	DOL	****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL		STEPHEN BIANCHI		462 LAKEVIEW AVENUE VALHALLA NY 10595	12/16/2013	12/16/2018
DOL	DOL	****9751	STEPHEN C WAGAR		544 OLD ROUTE 23 ACRE NY 12405	02/14/2017	02/14/2022
DOL	DOL		STEPHEON SHELDON	FANTASTIC PAINTING	493 LANSING ROAD FULTONVILLE NY 12072	11/18/2013	11/18/2018

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DOL	DOL		STEVEN P SUCATO		15-68 208TH STREET BAYSIDE NY 11360	06/23/2016	06/23/2021
DOL	DOL		STEVEN SAGGESE		3005 WYNSUM AVENUE MERRICK NY 11566	08/18/2014	08/18/2019
DOL	DOL		STEVEN TESTA		50 SALEM STREET - BLDG B LYNNFIELD MA 01940	01/23/2017	01/23/2022
DOL	DOL		STUART CHAITIN		634 ROUTE 303 BLAUVET NY 10913	07/26/2012	11/19/2018
DOL	NYC	****9432	SUBLINK LTD		346 THIRD AVENUE PELHAM NY 10803	11/19/2015	11/19/2020
DOL	DOL	****3210	SUPER SWEEP	FMS	4 LEGHORN COURT NEW YORK NY 11746	11/28/2012	11/28/2017
DOL	DOL		SUZANNE G GOLD	C/O GOLDS FLOORING INSTALLATION S INC	25 HAMILTON ROAD MONTICELLO NY 12701	10/16/2013	10/16/2018
DOL	DOL	****7441	T & T CONCRETE INC		2560 HAMBURG TURNPIKE P O BOX 367LACKAWANNA NY 14218	07/08/2015	07/08/2020
DOL	DOL	****9676	T D CONTRACTORS CORP	T D CONTRACTOR S INC	113 N MAPLE AVENUE GREENSBURG PA 15601	02/21/2013	02/21/2018
DOL	DOL		T D CONTRACTORS INC		113 N MAPLE AVENUE GREENSBURG PA 15601	02/21/2013	02/21/2018
DOL	DOL	****7417	TADCO CONSTRUCTION		101-61 99TH STREET OZONE PARK NY 11416	02/15/2017	02/15/2022
DOL	DOL		TADCO CONSTRUCTION		101-61 99TH STREET OZONE PARK NY 11416	02/15/2017	02/15/2022
DOL	DOL	****7417	TADCO CONSTRUCTION CORP		101-61 99TH STREET OZONE PARK NY 11416	02/15/2017	02/15/2022
DOL	DOL		TAMMY LACITIGNOLA		C/O CATSKILL FENCE INSTAL 5445 ROUTE 32CATSKILL NY 12414	08/22/2014	08/22/2019
DOL	DOL	****9852	TAP STEEL INC		ROUTE 26 3101 P O BOX 457CONSTABLEVILLE NY 13325	01/28/2016	01/28/2021
DOL	DOL		TECH-MECHANICAL FAB DC INC		5 PARKER AVENUE POUGHKEEPSIE NY 12601	03/25/2014	03/25/2019
DOL	DOL	****5570	TESTA CORP		50 SALEM STREET - BLDG B LYNNFIELD MA 01940	01/23/2017	01/23/2022
DOL	DOL	****0887	THE BRINSON PAINTING CORPORATION		72 TAUNTON PLACE BUFFALO NY 14216	04/14/2015	04/14/2020
DOL	DOL	****8174	THE DALRYMPLE CORPORATION		UNIT 278 541 10TH STREET NWTALANTA GA 30318	12/01/2015	12/01/2020
DOL	DOL	****8174	THE DALRYMPLE GROUP LLC		289 JONESBORO RD/ STE 216 MCDONOUGH GA 30253	12/01/2015	12/01/2020
DOL	DOL		THE THORNE GROUP INC		113 N MAPLE AVENUE GREENSBURG PA 15601	02/21/2013	02/21/2018
DOL	DOL	****2070	THE UNIVERSAL GROUP OF NEW YORK INC		212 OXFORD WAY SCHENECTADY NY 12309	12/11/2012	09/16/2018
DOL	DOL	****9243	THE WELCOME MAT PROPERTY MANAGEMENT LLC		P O BOX 268 STILLWATER NY 12170	09/16/2013	03/21/2019
DOL	DOL		THOMAS DESANTIS	DESANTIS ENTERPRISES	161 OSWEGO RIVER ROAD PHOENIX NY 13135	09/24/2013	11/18/2018
DOL	NYC		THOMAS SCARINCI		130-43 92ND AVENUE RICHMOND HILLS NY 11418	11/27/2013	11/27/2018
DOL	DOL	****2734	THREE FRIENDS CONSTRUCTION CORP		986 MADISON AVENUE PATERSON NJ 07501	01/03/2013	01/03/2018
DOL	NYC	****6253	THUNDER BROTHERS CORP		24 CONGRESS LANE SOUTH RIVER NJ 08882	05/01/2013	05/01/2018
DOL	DOL		TIMOTHY A PALUCK		C/O TAP STEEL INC RTE 26 3101/ P O BOX 457CONSTABLEVILLE NY 13325	01/28/2016	01/28/2021
DOL	DOL		TIMOTHY F BARBER		635 LUZERNE ROAD QUEENSBURY NY 12804	09/16/2013	09/16/2018
DOL	NYC	****1523	TM MECHANICAL CORP		130-43 92ND AVENUE RICHMOND HILLS NY 11418	11/27/2013	11/27/2018
DOL	DOL	****0600	TOMSON ALLOYS RECYCLING INC		143 FILLMORE AVENUE BUFFALO NY 14210	01/08/2015	01/08/2020
DOL	DOL	****3453	TORCHIA'S HOME IMPROVEMENT		10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	DOL	****6914	TRI-COUNTY RESTORATIONS & CONSTRUCTION INC		13 SUMMERSET DRIVE WALKKILL NY 12589	08/22/2014	08/22/2019
DOL	DOL		TRI-COUNTY RESTORATIONS INC		392 ROCK CUT ROAD WALDEN NY 12586	08/22/2014	08/22/2019

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DOL	DOL	****8311	TRIPLE B FABRICATING, INC.		61 WILLETT ST. PASSAIC NJ 07503	10/26/2016	10/26/2021
DOL	DOL	****9407	TURBO GROUP INC		15-68 208TH STREET BAYSIDE NY 11360	06/23/2016	06/23/2021
DOL	AG	****6490	UNIVERSAL STEEL FABRICATORS INC		90 JUNIUS STREET BROOKLYN NY 11212	01/23/2014	01/23/2019
DOL	NYC	****7174	V&R CONTRACTING		P O BOX 957 PORT JEFFERSON STA NY 11776	03/12/2014	03/12/2019
DOL	NYC		VALERIE VISCONTI		346 THIRD AVENUE PELHAM NY 10803	11/19/2015	11/19/2020
DOL	NYC		VEAP SELA	C/O COLONIAL ROOFING COMPANY INC	247 48TH STREET BROOKLYN NY 11220	02/05/2014	02/05/2019
DOL	NYC		VICK CONSTRUCTION		21 DAREWOOD LANE VALLEY STREAM NY 11581	12/31/2013	12/31/2018
DOL	NYC		VICKRAM MANGRU	VICK CONSTRUCTI ON	21 DAREWOOD LANE VALLEY STREAM NY 11581	12/31/2013	12/31/2018
DOL	DOL		VICTOR ROTENBERG		C/O GMDV TRANS INC 67048 182ND STREETFRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	NYC		VINCENT PIZZITOLA		P O BOX 957 PORT JEFFERSON STA NY 11776	03/12/2014	03/12/2019
DOL	DOL		WAYNE LIVINGSTON JR	NORTH COUNTRY DRYWALL AND PAINT	23167 COUNTY ROUTE 59 DEXTER NY 13634	10/24/2016	10/24/2021
DOL	DOL		WESLEY J STAROBA		206 TALLY HO COURT SCHENECTADY NY 12303	06/19/2013	06/19/2018
DOL	DOL	****0078	WESLEY J STAROBA INC	S & S ELECTRIC	235 BROADWAY SCHENECTADY NY 12306	06/19/2013	06/19/2018
DOL	DOL		WILLIAM CONKLIN		5 PARKER AVENUE POUGHKEEPSIE NY 12601	03/25/2014	03/25/2019
DOL	DOL		WILLIAM DEAK		C/O MADISON AVE CONSTR CO 39 PENNY STREETWEST ISLIP NY 11795	11/02/2016	11/02/2021
DOL	DOL		WILLIAM MAZZELLA		134 MURRAY AVENUE YONKERS NY 10704	02/03/2014	02/03/2019
DOL	DOL		WILLIAM THORNE		113 N MAPLE AVENUE GREENSBURG PA 15601	02/21/2013	02/21/2018
DOL	DOL		WILLIE BRINSON		72 TAUNTON PLACE BUFFALO NY 14216	04/14/2015	04/14/2020
DOL	DOL	****6195	WILSON BROTHER DRYWALL CONTRACTORS		36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL	****7345	YES SERVICE AND REPAIRS CORPORATION		145 LODGE AVE HUNTINGTON STATION NY 11476	08/09/2016	08/09/2021
DOL	DOL		YURIY IVANIN		C/O MOUNTAIN'S AIR INC 2471 OCEAN AVENUE-STE 7ABROOKLYN NY 11229	09/24/2012	09/18/2020

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Work covered by Contract Documents.
- B. Contractor's use of site.
- C. Limits of work area.
- D. Construction permits.
- E. Owner occupancy.
- F. Sequence of work.
- G. Connections to existing facilities.
- H. Alteration project procedures.
- I. Cutting and patching.
- J. Facility outages.
- K. Continuity of service plan.
- L. Requests to work outside normal working hours.

1.02. PROJECT – WORK COVERED BY CONTRACT DOCUMENTS

- A. Work covered by the Contract Documents is described in the Agreement.
- B. Work not specifically identified in the Bid Item Descriptions, but nevertheless required in the Contract Documents, shall be performed as shown and/or specified.
- C. Work of the several prime contracts comprises the project for the construction of the Town of Yorktown Pump Station Upgrade Program - Walden Woods, Jefferson Valley and Jefferson Park.

1.03. CONTRACTS

- A. Perform Work of each Prime Contract under separate lump sum contracts with the Owner.
- B. Work of each separate Contract is identified in the following Articles in the Contract Documents.

1.04. ADMINISTRATIVE AND PROCEDURAL SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Section 01019 - Contract Considerations.

- B. Section 01026 - Lump Sum Items (Bid Item Descriptions).
- C. Section 01039 - Coordination
- D. Section 01300 - Submittals
- E. Section 01310 - Progress Schedules
- F. Section 01380 - Construction Documentation
- G. Section 01400 - Quality Control
- H. Section 01420 - Special Inspections
- I. Section 01500 - Temporary Facilities
- J. Section 01540 - Temporary Pumping
- K. Section 01600 - Materials and Equipment
- L. Section 01640 - Equipment-General
- M. Section 01660 - Testing and Startup
- N. Section 01700 - Record Documents

1.05. TEMPORARY FACILITIES AND SERVICES SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Section 01500 – Temporary Facilities
- B. Section 01540 – Temporary Pumping

1.06. CONTRACT NO. 1 - GENERAL CONSTRUCTION

- A. Provide administrative and procedural Work under the sections listed above.
- B. Provide temporary facilities and services under the sections listed above.
- C. Provide those construction facilities and temporary controls identified in Section 01500 which are required to be provided by the General Contractor.
- D. Prepare, coordinate and revise Master Construction Progress Schedule as required under Section 01300, Submittals.
- E. Provide construction documentation of project as required under Section 01380, Construction Documentation.
- F. Conduct testing of project components as required under Section 01660, Testing and Startup.
- G. Perform Work identified in Bid Item Description pages for this Contract under Section 01026, Lump Sum Items (Bid Item Descriptions).
- H. Work of this Contract not specifically identified in the Bid Item Descriptions, but nevertheless required in the Contract Documents, shall be performed as shown and/or specified.

1.07. CONTRACT NO. 2 – ELECTRICAL

- A. Provide administrative and procedural Work under the Sections listed above.
- B. Provide temporary facilities and services under the Sections listed above.
- C. Provide those construction facilities and temporary controls identified in Section 01500, Temporary Facilities, which are required to be provided by the Electrical Contractor.
- D. Perform Work identified in Bid Item Description pages for this Contract under Section 01026, Lump Sum Items (Bid Item Descriptions)..
- E. Work of this Contract not specifically identified in the Bid Item Descriptions, but nevertheless required in the Contract Documents, shall be performed as shown and/or specified.

1.08. CONTRACT NO. 3 – HVAC

- A. Provide administrative and procedural work under the sections listed above.
- B. Provide temporary facilities and services under the sections listed above.
- C. Provide those construction facilities and temporary controls identified in Section 01500 which are required to be provided by the Heating, Ventilating, and Air Conditioning Contractor.
- D. Perform Work identified in Bid Item Description pages for this Contract under Section 01026.
- E. Work of this Contract not specifically identified in the Bid Item Descriptions, but nevertheless required in the Contract Documents, shall be performed as shown and/or specified.

1.09. OWNER-FURNISHED PRODUCTS

- A. Owner's Responsibilities
 - 1. Arrange for and deliver Owner-reviewed shop drawings and samples to Contractor.
 - 2. Arrange and pay for delivery of items to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities
 - 1. Review Owner reviewed shop drawings and samples.
 - 2. Receive and unload items at Site; inspect for completeness or damage, jointly with Owner.
 - 3. Handle, store, install, and finish products.
 - 4. Repair or replace items damaged after receipt.

1.10. CONTRACTOR USE OF SITE

- A. Limit use of site to allow:
 - 1. Owner occupancy and/or partial utilization.
 - 2. Work by others and work by Owner.

1.11. LIMITS OF WORK AREA

- A. Confine construction operations within the Contract Limits, labeled as Limits of Disturbance, shown on the Drawings.
- B. Storage of equipment and materials, or erection and use of sheds outside of the Contract Limits, if such areas are the property of Owner, shall be used only with Owner's approval. Such storage or temporary structures, even within the Contract Limits, shall be confined to Owner's property and shall not be placed on properties designated as easements or rights-of-way.
- C. Where storage of equipment, materials, job trailers, etc. are proposed outside the approved limits of disturbance, obtain permits including erosion and sedimentation control plan approval for those areas at no additional cost to Owner.

1.12. OWNER OCCUPANCY

- A. The Owner will occupy the site during the entire period of construction for the conduct of normal operations.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the work to accommodate Owner occupancy.

1.13. SEQUENCE OF WORK

- A. General
 - 1. Provide an intended sequence of construction in accordance with Section 01310, Progress Schedule.
 - 2. Contractor shall be solely responsible for the means, manpower, methods, techniques, sequences and procedures of construction unless specifically identified in the Contract Documents.
 - 3. Contractor shall be responsible for sequencing and coordinating the work in accordance with the Contract Documents.
 - 4. Contractor shall provide temporary facilities to maintain continuous operation of all existing facilities and utilities unless scheduled facility shutdowns are identified in the Contract Documents
 - 5. Work shall be performed in a manner that minimizes impact to normal operation of existing facilities and utilities.
 - 6. Contractor's operations shall not cause Owner to violate operating permit requirements.

7. Clean all tankage used by the Contractor to divert or store flow within 24 hours of use.
8. If Contractor's operations cause Owner to receive a notice of violation for a sewage spill or erosion and sedimentation practices, all costs including fines, legal notices, mailings, administrative tasks, and engineering associated with resolving the notice shall be borne by Contractor.

B. Sequence Constraints

1. No buried plastic piping connections to new structures shall be allowed until a minimum of 45 days following completion of major structural and masonry components to allow initial settling to occur.
2. Contractor shall provide verification to Owner and Engineer that equipment for the Walden Woods and Jefferson Park Pump Stations have been purchased and delivered to the site or stored in an insured facility prior to the pump station being taken out of service.
3. Temporary bypass pumping system shall not be removed until the new system has been successfully started up in accordance with the governing standard.
4. Contractor shall have on hand all materials, labor, tools, and equipment necessary to accomplish work on process systems or components to be interrupted before temporary isolation of these components begins.
5. Begin work on temporarily isolated pump station immediately after isolation and expedite work so that components can be returned to service as soon as possible.
6. Contractor shall construct or provide secure temporary enclosures to protect existing equipment and bypass pumping equipment. Existing mechanical and electrical systems (pumping, controls, heating and ventilating, treatment, emergency power, etc.) must be kept in service until bypass pumping begins. Temporary enclosures must prevent access by unauthorized personnel.
7. Contractor shall provide temporary connections to any electrically powered equipment and critical control devices necessary to assure continued operation during the alterations of existing components.
8. General Contractor shall provide a complete bypass pumping system, including standby pumps, backup generator system, and alarms with communication to Town of Yorktown alarm systems. Contractor shall pay for temporary electric service and connections required for the bypass pumping systems, as well as for all fuel and electric costs for bypass pump system.
9. Normal operations of the existing facilities will be performed by the Owner. After facilities are removed from operation, the operation and maintenance of temporary facilities during the bypass pumping operation will be the responsibility of the Contractor.
10. Furnish and install temporary bypass pumping equipment including pumps, piping, bulkheads, etc., to maintain the existing operation. The temporary systems shall have the same degree of redundancy as the permanent system.

11. Provide temporary electrical service to entire pump station (including the bypass pumping system) during construction of new work. Supplement existing on-site generation facilities with additional temporary capacity as required to support all standard and emergency power requirements throughout the construction period.

C. Suggested Sequence of General Construction

1. Walden Woods – During equipment replacement and associated improvements, Contractor will maintain pump station operations at all times. All costs associated with maintaining each station at all times will be borne by Contractor.
 - a. Install new pump station adjacent to the existing station.
 - b. Set up and operate bypass pumping system.
 - c. Demolish existing station and ancillary equipment.
2. Jefferson Park – During equipment replacement and associated improvements, Contractor will maintain pump station operations at all times. All costs associated with maintaining each station at all times will be borne by Contractor.
 - a. Install new pump station adjacent to the existing station.
 - b. Set up and operate bypass pumping system.
 - c. Demolish existing station and ancillary equipment.
3. Jefferson Valley – During equipment replacement and associated improvements, Contractor will maintain pump station operations at all times. All costs associated with maintaining the station at all times will be borne by Contractor.
 - a. Install new wet well structure and associated equipment.
 - b. Demolish existing horizontal centrifugal pumps.
 - c. Install new horizontal centrifugal pumps.
 - d. Building improvements.

D. Suggested Sequence of Electrical Construction

1. Electrical work shall generally follow the sequence of construction for the General construction. That is, when one equipment item is being upgraded, the electrical work shall also be upgraded for that same item.
2. Provide sequential demolition of electrical work to be removed.
3. Provide sequential installation of new electrical work.

- E. Suggested Sequence of HVAC Construction - HVAC work shall generally follow the sequence of construction for the General construction. That is, when one equipment item is being upgraded, the electrical work shall also be upgraded for that same item.

1.14. OPERATION OF EXISTING FACILITIES

- A. Normal operations of the existing facilities will be performed by Owner. Only Owner's staff is allowed to operate existing facilities including equipment, valves, gates, motor controls, etc.
 - 1. Provide Owner and Engineer a minimum of five working days written notice of necessary operation of existing valves, pumps, or equipment to facilitate construction activities.
 - 2. Contractor's activities shall not disrupt Owner's access to operate and maintain existing equipment and facilities. Contractor shall furnish any temporary access required, including ladders, platforms, grating, walkways, and awnings, which shall comply with OSHA laws and regulations, for necessary plant operations.
 - 3. Contractor's operations shall not disrupt truck access for the delivery or hauling of materials and suppliers to and from the Site.

1.15. CONNECTIONS TO EXISTING FACILITIES

- A. Contractor shall provide all cutting and patching required for connection to existing facilities.
- B. Temporary connections to existing facilities are covered in Section 01500, Temporary Facilities.
- C. General Contractor shall provide all openings, chases, etc., to fit its own work and that of other Contractors. All such openings or chases shown on the Contract Drawings, or reasonably implied thereby, or as confirmed or modified by approved Shop Drawings, or shown on manufacturer's erection drawings, shall be provided by General Contractor.
- D. Where pipes or conduits are to pass through slabs or walls, or where equipment frames or supports are to be installed as an integral part of an opening, the sleeves opening forms or frames shall be furnished by the installer of the pipes, conduits or equipment, but shall be installed by General Contractor. Where hanger inserts, anchor bolts and similar items are to be installed as an integral part of a slab or wall, they shall be furnished by the installer of the pipe or other equipment requiring the same, but shall be installed by General Contractor.
- E. When requested by General Contractor, the installer of the pipes, conduit or equipment, including those Contractors who require openings or chases in slabs and walls for passage of ducts, mounting of equipment, etc., shall furnish all necessary information, instructions and materials to effect accurate installation of the required openings, chases, sleeves, frames, inserts, etc. When such items are secured in position, and just prior to construction of the surrounding slab or wall, the Contractor for whom the items are installed shall ascertain the proper number, locations and settings thereof, and General Contractor shall schedule its operations so as to provide a reasonable opportunity and time interval for such inspection.
- F. After installation of the pipe, conduit or duct is completed, the installer shall be responsible for sealing the annular space around the installed pipe, conduit or duct in accordance Laws and Regulations.
- G. Cost resulting from correction of defective, ill-timed or incorrectly located work, or for subsequent work which becomes necessary because of omitted openings, chases, sleeves, frames, inserts, etc, shall be borne by the Contractor responsible therefore. To this end, no Contractor shall arbitrarily cut, drill, alter, damage or otherwise endanger the work of another Contractor. The nature and extent of any corrective or additional work shall be subject to the approval of the Engineer following consultation with the Contractors involved.

- H. General Contractor shall be responsible for all equipment and housekeeping pads and shall coordinate locations, sizes, and orientation with the installer. Coordination shall include verification of actual required size. Contractor shall not rely solely on the sizes shown on the Drawings.
- I. Temporary connections to existing facilities are covered in Section 01500, Temporary Facilities.

1.16. ALTERATION PROJECT PROCEDURES

- A. Materials - As specified in individual specification sections, match existing products and work for patching and extending work.
- B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- C. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition.
- D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- E. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.
- F. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.
- G. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Engineer.
- H. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- I. Finish surfaces as specified in individual specification sections.

1.17. CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affects:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install or correct ill-timed work.
 - 3. Remove and replace defective and non-conforming work.
 - 4. Remove samples of installed work for testing.

5. Provide openings in elements of work for penetrations of mechanical and electrical work.
- D. Execute work by methods which will avoid damage to other work, and provide proper surfaces to receive patching and finishing.
- E. Cut rigid materials using masonry saw or core drill.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- J. Identify any hazardous substance or condition exposed during the Work to Engineer in writing for decision or remedy.

1.18. FACILITY OUTAGES

- A. General
 1. Provide a minimum of 30 working days written notice to Owner and Engineer prior to actual date of scheduled outage.
 2. All associated work that can be completed on a system without taking a unit or process out of service shall be completed prior to the outage to minimize down time.
 3. Have all required materials, labor, tools, and equipment on site at the required locations and available for use prior to beginning an outage.
 4. Provide all temporary facilities required for outages, including bypassing pumping, in accordance with Sections 01500, Temporary Facilities, and 01540, Temporary Pumping.
 5. Outages cannot be scheduled to begin on a Friday or day before a scheduled holiday.
 6. When temporary shutdowns are planned utilizing tankage with finite storage volumes and/or for limited timeframes, backup bypass pumping systems shall be on site and immediately available for use during shutdowns in case facilities cannot be brought back on-line within the required time limits.
 7. Begin work on temporarily isolated facilities immediately after isolation and expedite.
 8. During scheduled outages, complete all associated work within time frames and constraints identified in Contract Documents and the approved Continuity of Service Plan, including testing and startup.
 9. The General Contractor shall be responsible for taking existing facilities off-line, draining and cleaning existing tanks, and removing liquid and solids from existing tanks, wet wells, and other water holding structures as required for new work. Owner will designate locations on Site for liquid and solids removed from the existing

facilities to be pumped and/or hauled by Contractor. Contractor is responsible for final washdown and cleaning of existing facilities to the degree required to perform associated work.

- B. Scheduled Outages - Contractor will be allowed to schedule facility outages identified herein.

1.19. CONTINUITY OF SERVICE PLAN

- A. Submit in accordance with the procedures described in Section 01300, Submittals.
- B. Submit plans for the continuity of utility service and plant operations no later than 30 days prior to each planned interruption.
- C. Plans shall include:
 - 1. Approximate dates and times of scheduled interruption of service.
 - 2. Estimated period of outage.
 - 3. List of existing equipment and facilities that will be affected by the outage.
 - 4. Proposed sequence of equipment and facility shutdown and startup.
 - 5. Contractor personnel responsible for overseeing operations.
- D. Plans must be approved by Owner and Engineer prior to proceeding with outage. Revisions to Continuity of Service Plans after initial approval shall be resubmitted to Owner and Engineer at least 14 days prior to scheduled outage and must be approved by Owner and Engineer prior to proceeding with outage.

1.20. REQUESTS TO WORK OUTSIDE OF NORMAL WORKING HOURS

- A. Submit requests to work outside normal working hours at least one week in advance. Requests to work outside normal working hours must be approved in advance by Owner and Engineer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01019

CONTRACT CONSIDERATIONS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Cash allowances.
- B. Schedule of Values.
- C. Application for Payment.
- D. Change procedures.

1.02. DEFINITIONS

- A. Mobilization - Mobilization includes, but is not limited to, performance of preparatory construction operations, including the movement of personnel and equipment to the Project Site; application, fee payment, and acquisition of all required permits (i.e. erosion and sediment control plans, temporary and permanent building and trade permits, utility connections, etc.); and the establishment of Engineer's and Contractor's offices, buildings, and other facilities required at the Site in order to begin work on a substantial phase of the Contract. The cost of insurance and bonds.

1.03. CASH ALLOWANCES

- A. Engineer Responsibilities
 - 1. Consult with Contractor for consideration and selection of products.
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
- B. Contractor Responsibilities
 - 1. Assist Owner and/or Engineer in selection of products.
 - 2. Obtain proposals from suppliers and offer recommendations.
 - 3. On notification of selection by Engineer, execute purchase agreement with designated supplier.
 - 4. Arrange for and process shop drawings and samples. Arrange for delivery.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Notify Owner and Engineer immediately of missing components, damage, defects, and/or any other items relating to delivery that could impact Contractor's obligations.
 - 6. Submit receipts and documentation substantiating costs with Application for Payment.

1.04. SCHEDULE OF VALUES

- A. Submit three hard copies of Schedule of Values and one electronic copy in Microsoft Excel of Schedule of Values in accordance with the time frames identified in General and Supplementary Conditions.
- B. Line items shall be subdivided into the Bid Items shown on the Bid Form.
- C. The sum of all line items in the Schedule of Values shall equal the Total Bid Price included on the Bid Form.
- D. Each line item shall include a directly proportional amount of the Contractor's overhead and profit.
- E. Schedule of Values shall serve as a breakdown of Work used to establish progress payments. Progress payments for lump sum items will be made based on the percentages of completion of the work items included in the Schedule of Values for each lump sum item. Progress payments for Unit Price Work will be based on actual quantities of work performed. Progress payments for Contingent Unit Price work will only be made if work is authorized by Owner and/Engineer. Progress payments for Allowances will be made as described elsewhere in the Contract Documents.
- F. For Lump Sum Bid Items, the following Format shall be followed when developing the Schedule of Values.
 - 1. If Mobilization is not identified in the Bid Form as a separate Bid Item, Contractor may include in the Schedule of Values a line item for Mobilization as part of a Lump Sum Bid Item.
 - a. Lump sum line item shall include all work described in the definition of mobilization included herein.
 - b. Costs for bonds and insurance shall be included in the lump sum mobilization line item.
 - c. When Contractor has made utility connections, installed Contractor's field offices, Owner's and/or Engineer's field offices, and all other facilities required to begin work on a substantial portion of the Project, a payment of 50 percent of the lump sum mobilization Bid item will be made provided Contractor has already satisfied the requirements of General Condition Article GC-2.07. The remaining 50 percent will be prorated over the next five monthly progress payments.
 - d. Mobilization cost shall not be greater than 5 percent of the Total Bid Price.
 - 2. Included separate line items for demobilization and Contract closeout.
 - 3. Site work shall be subdivided into itemized quantities and unit costs for all individual construction components. Items shall be separated according to specification section titles listed in the Table of Contents.
 - a. Site work shall not include earthwork (such as excavation) or structural work (such as foundations) specific to a particular structure or process.
 - b. Include erosion and sediment control under site work.

- c. Include bypass pumping under site work and include daily, weekly, or monthly unit costs for providing and operating the bypass pumping system(s).
 - d. Include dewatering under site work and include daily costs for each structure.
 - e. Include off-site hauling of fill material under site work.
 - f. Include site restoration.
 - g. Include yard piping and ductbanks.
 - 1) Yard piping and ductbanks shall be subdivided into itemized quantities and unit costs for individual components.
 - 2) Identify major yard piping by pipe diameter and material as individual line items (i.e., 12-inch ductile iron pipe) and by specific pipe segments where possible (i.e., 12-inch ductile iron pipe from pumping station to storage tank). Minor yard piping components not exceeding 5 percent of overall yard piping costs may be identified as lump sum items.
 - 3) Identify major ductbanks by specific segments where possible (i.e., ductbank from control building to filters).
 - 4) Piping and ductbank costs shall be stated as cost per unit length, based on the number of linear feet for each piping system estimated by Contractor.
 - 5) Piping and ductbank installation costs may include labor, excavation, bedding, encasement, and/or backfill if desired.
 - h. Include valves and hydrants based on valve type and size.
4. Each major construction component such as a structure or building (i.e. pumping station, filter, control building, etc.) shall have its own subsection and shall be subdivided into line items for individual construction components itemized by unit costs and quantities. Include yard piping, earthwork, or foundations specific to the major construction component with that construction component (i.e. excavation for a pumping station). Items shall be separated according to Specification section titles listed in the Table of Contents. Contractor may provide further divisions within each specification section if desired or needed for clarity.
- a. For all mechanical equipment, each item shall be separated into the following two distinct payment items:
 - 1) Furnish equipment
 - 2) Install equipment
 - b. Separate line items shall be included for testing and startup including:
 - 1) Preliminary Field Testing.
 - 2) Functional Testing.

- 3) System Demonstration Testing.
 - 4) Startup.
 - 5) Troubleshooting.
 - 6) Training.
5. Electrical, instrumentation, and controls should be listed under the major construction component (structure or building) in which it is installed. Major electrical components not located in a specific structure or building, such as substations or emergency generators, may have their own line items under the category of "Major Power Distribution".
 6. Revise Schedule of Values to include executed Change Orders with each Application for Payment. List each Proposed Change Order (PCO) that is incorporated into executed Change Orders.

1.05. APPLICATIONS FOR PAYMENT

- A. Submit three original signature versions and one electronic copy of each application on forms furnished by Engineer.
- B. Content and Format – Approved Schedule of Values will be used to list items in the Application for Payment. Certification by Contractor must accompany each application.
- C. Payment period shall be monthly.
- D. Attach required documents and Contractor's backup data, including updated schedule and all invoices for stored materials.
- E. Contractor must have all record documents as identified in General Conditions Article 6.12 current and up to date prior to submitting Applications for Payment.

1.06. CHANGE PROCEDURES

- A. Supplementing the General Conditions and Supplementary Conditions, Engineer may issue a Proposal Request or Notice of Change which includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a proposal to perform the indicated work indicating a proposed adjustment in Contract Price and Contract Times within seven days.
- B. Contractor may propose changes by submitting a request for change to Engineer, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any required substitutions in accordance with Section 01600, Materials and Equipment.
- C. Lump Sum/Price Change Order - Based on Proposal Request or Notice of Change and Contractor's fixed or estimated price quotation.

- D. Work Change Directive - Engineer may issue a directive, on EJCDC C-700 Work Change Directive signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Price or Contract Time. Promptly execute the change.
- E. Time and Material Change Order - Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Engineer will determine the change allowable in Contract Price and Contract Time as provided in the Contract Documents.
- F. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- G. Change Order Forms - EJCDC Form C-941.
- H. Execution of Change Orders - Engineer will issue Change Orders for signatures of parties in the following order: Engineer, Contractor, Owner.

1.07. STANDARD FORMS

- A. Use the following standard forms attached to this section:
 - 1. Contractor's Application for Payment.
 - 2. Certificate of Substantial Completion.
 - 3. Work Change Directive.
 - 4. Change Order.
 - 5. Field Order.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

**Application For Payment
Change Order Summary**

Number	Additions	Deductions	
Approved Change Orders			1. ORIGINAL CONTRACT PRICE \$ _____
			2. Net change by Change Orders \$ _____
			3. Current Contract Price (Line 1 ± 2) \$ _____
			4. TOTAL COMPLETED AND STORED TO DATE (Column F on Progress Estimate)..... \$ _____
			5. RETAINAGE:
			a. X _____ Work Completed..... \$ _____
			b. X _____ Stored Material..... \$ _____
			c. Total Retainage (Line 5a + Line 5b)..... \$ _____
			6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c) \$ _____
			7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application) \$ _____
			8. AMOUNT DUE THIS APPLICATION \$ _____
			9. BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate + Line 5 above)..... \$ _____
TOTALS			
	NET CHANGE BY CHANGE ORDERS		

Contractor's Certification	
<p>The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.</p>	
By:	Date:

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ (Engineer) _____ (Date)

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ (Owner) _____ (Date)

Approved by: _____ (Funding Agency (if applicable)) _____ (Date)

Certificate of Substantial Completion

Project:	
Owner:	Owner's Contract No.:
Contract:	Engineer's Project No.:

This [tentative] [definitive] Certificate of Substantial Completion applies to:

- All Work under the Contract Documents: The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

- Amended Responsibilities Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

The following documents are attached to and made part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer

Date

Accepted by Contractor

Date

Accepted by Owner

Date

Change Order

No. _____

Date of Issuance: _____ Effective Date: _____

Project:	Owner:	Owner's Contract No.:
Contract:	Date of Contract:	
Contractor:	Engineer's Project No.:	

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments (list documents supporting change):

CHANGE IN CONTRACT PRICE:

Original Contract Price:
\$ _____

[Increase] [Decrease] from previously approved
Change Orders No. _____ to No. _____:
\$ _____

Contract Price prior to this Change Order:
\$ _____

[Increase] [Decrease] of this Change Order:
\$ _____

Contract Price incorporating this Change Order:
\$ _____

CHANGE IN CONTRACT TIMES:

Original Contract Times: Working days Calendar days
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

[Increase] [Decrease] from previously approved Change Orders
No. _____ to No. _____:
Substantial completion (days): _____
Ready for final payment (days): _____

Contract Times prior to this Change Order:
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

[Increase] [Decrease] of this Change Order:
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

Contract Times with all approved Change Orders:
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

RECOMMENDED:
By: _____
Engineer (Authorized Signature)

ACCEPTED:
By: _____
Owner (Authorized Signature)

ACCEPTED:
By: _____
Contractor (Authorized Signature)

Date: _____

Date: _____

Date: _____

Approved by Funding Agency (if applicable):

Date: _____

Change Order

Instructions

A. GENERAL INFORMATION

This document was developed to provide a uniform format for handling contract changes that affect Contract Price or Contract Times. Changes that have been initiated by a Work Change Directive must be incorporated into a subsequent Change Order if they affect Price or Times.

Changes that affect Contract Price or Contract Times should be promptly covered by a Change Order. The practice of accumulating Change Orders to reduce the administrative burden may lead to unnecessary disputes.

If Milestones have been listed in the Agreement, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Times, a Field Order should be used.

B. COMPLETING THE CHANGE ORDER FORM

Engineer normally initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Owner or Contractor for approval, depending on whether the Change Order is a true order to the Contractor or the formalization of a negotiated agreement for a previously performed change. After approval by one contracting party, all copies should be sent to the other party for approval. Engineer should make distribution of executed copies after approval by both parties.

If a change only applies to price or to times, cross out the part of the tabulation that does not apply.

Field Order

No. _____

Date of Issuance: _____ Effective Date: _____

Project:	Owner:	Owner's Contract No.:
Contract:		Date of Contract:
Contractor:		Engineer's Project No.:

Attention:

You are hereby directed to promptly execute this Field Order issued in accordance with General Conditions Paragraph 9.04.A, for minor changes in the Work without changes in Contract Price or Contract Times. If you consider that a change in Contract Price or Contract Times is required, please notify the Engineer immediately and before proceeding with this Work.

Reference: _____
(Specification Section(s)) (Drawing(s) / Detail(s))

Description:

Attachments:

Engineer:

Receipt Acknowledged by Contractor: _____ **Date:** _____

Copy to Owner

SECTION 01026

LUMP SUM ITEMS
(BID ITEM DESCRIPTIONS)

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Price make-up.
- B. Elements of Bid Item Description page.
- C. List of lump sum items.
- D. Bid Item Descriptions - Attached pages.

1.02. RELATED SECTIONS

- A. Bid Form – Schedule of Prices
- B. Section 01010 – SUMMARY OF WORK: Identification of work common to all separate contracts.

1.03. PRICE MAKE-UP

- A. Lump sum prices bid by Contractor are deemed to be full compensation for all required labor, products, tools, equipment, plant, transportation, testing, inspection, services, incidentals, administrative procedures, applicable taxes, permit fees, overhead, profit, and other miscellaneous expenses.

1.04. ELEMENTS OF BID ITEM DESCRIPTION PAGE

- A. Identification of lump sum item, as set forth in the Bid Form.
- B. Brief statement of work involved in the item.
- C. Listing of components of work which make-up the item including reference to the Section(s) covering each component.
- D. Cross-references to associated work not included in the item.

1.05. LIST OF LUMP SUM ITEMS - CONTRACT NO. 1 - GENERAL

Bid Item No. and Title		Bid Item Description Number
1.	General Construction	A-1
2.	General Construction – Jefferson Park	E-1

1.06. LIST OF LUMP SUM ITEMS - CONTRACT NO. 2 - ELECTRICAL

Bid Item No. and Title		Bid Item Description Number
------------------------	--	-----------------------------

3.	Electrical Construction	A-2
4.	Electrical Construction – Jefferson Park	E-2

1.07. BID ITEM DESCRIPTIONS

- A. Bid Item Description pages are attached at the end of this specification section.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

LUMP SUM ITEM

BID ITEM A-1

GENERAL CONSTRUCTION

- A. DESCRIPTION Under this item, furnish all materials and equipment, labor, tools, and construct the general construction work as called for in the Contract Documents and as outlined below.
- B. WORK INCLUDED UNDER THIS ITEM Division 1 specifications
Division 2 specifications
Division 3 specifications
Division 5 specifications
Division 6 specifications
Division 7 specifications
Division 8 specifications
Division 9 specifications
Division 11 specifications
Division 15 specifications
Division 17 specifications
- C. ASSOCIATED WORK NOT INCLUDED UNDER THIS ITEM Work Required Under all other Bid Items
- D. METHOD OF PAYMENT Payment will be made on a lump sum basis in accordance with the Contractor's Schedule of Values which shall include, as a minimum, all items listed herein under "B" broken down into sufficient detail for Engineer to adequately review progress payment amounts.

LUMP SUM ITEM

BID ITEM E-1

GENERAL CONSTRUCTION – JEFFERSON PARK

- A. DESCRIPTION Under this item, furnish all materials and equipment, labor, tools, and construct the general construction work as called for in the Contract Documents and as outlined below.

- B. WORK INCLUDED UNDER THIS ITEM
 - Division 1 specifications
 - Division 2 specifications
 - Division 3 specifications
 - Division 5 specifications
 - Division 6 specifications
 - Division 7 specifications
 - Division 8 specifications
 - Division 9 specifications
 - Division 11 specifications
 - Division 15 specifications
 - Division 17 specifications

- C. ASSOCIATED WORK NOT INCLUDED UNDER THIS ITEM Work Required Under all other Bid Items

- D. METHOD OF PAYMENT Payment will be made on a lump sum basis in accordance with the Contractor's Schedule of Values which shall include, as a minimum, all items listed herein under "B" broken down into sufficient detail for Engineer to adequately review progress payment amounts.

LUMP SUM ITEM

BID ITEM A-2

ELECTRICAL CONSTRUCTION

- A. DESCRIPTION Under this item, furnish all materials and equipment, labor, tools, and construct the electrical construction work as called for in the Contract Documents and as outlined below.
- B. WORK INCLUDED UNDER THIS ITEM Division 1 specifications
Demolition (Section 02030)
Division 11 specifications
Electrical Work (Division 16 and 17 specifications)
Wiring of Equipment Provided by Contract Nos. 1 and 3
- C. ASSOCIATED WORK NOT INCLUDED UNDER THIS ITEM Work Required Under all other Bid Items
- D. METHOD OF PAYMENT Payment will be made on a lump sum basis in accordance with the Contractor's Schedule of Values which shall include, as a minimum, all items listed herein under "B" broken down into sufficient detail for Engineer to adequately review progress payment amounts.

LUMP SUM ITEM

BID ITEM E-2

ELECTRICAL CONSTRUCTION – JEFFERSON PARK

- A. DESCRIPTION Under this item, furnish all materials and equipment, labor, tools, and construct the electrical construction work as called for in the Contract Documents and as outlined below.

- B. WORK INCLUDED UNDER THIS ITEM Division 1 specifications
Demolition (Section 02030)
Division 11 specifications
Electrical Work (Division 16 and 17 specifications)
Wiring of Equipment Provided by Contract Nos. 1 and 3

- C. ASSOCIATED WORK NOT INCLUDED UNDER THIS ITEM Work Required Under all other Bid Items

- D. METHOD OF PAYMENT Payment will be made on a lump sum basis in accordance with the Contractor's Schedule of Values which shall include, as a minimum, all items listed herein under "B" broken down into sufficient detail for Engineer to adequately review progress payment amounts.

SECTION 01039

COORDINATION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Coordination.
- B. Openings, chases, sleeves, inserts, etc.
- C. Field engineering.
- D. Preconstruction conference.
- E. Site mobilization conference.
- F. Progress meetings.
- G. Preinstallation conferences.
- H. Startup conference.
- I. Alternation project procedures.
- J. Cutting and patching.

1.02. RELATED SECTIONS

- A. General Conditions
 - 1. Article 2; Paragraph 2.06: Preconstruction Conference; Designation of Authorized Representatives.
 - 2. Article 2; Paragraph 2.07: Initial Acceptance of Schedules.
 - 3. Article 4; Paragraph 4.05: Reference Points.
 - 4. Article 6; Paragraph 6.02: Labor; Working Hours.
 - 5. Article 6; Paragraph 6.06.D: Coordination of Subcontractor's Work.
 - 6. Article 7; Paragraphs 7.01.B and 7.01.C: Work by Other Contractors.
 - 7. Article 7; Paragraph 7.02: Coordination of Project.
- B. Supplementary Conditions - Refer to appropriate "SC" paragraphs which supplement or modify the above numbered paragraphs of the General Conditions.
 - 1. Paragraph SC-7.03: Claims Between Contractors

1.03. COORDINATION

- A. Coordinate scheduled work sequences and related operations beforehand with appropriate local, county, or state officials and agencies including affected property owners, when Project is to be located in or adjacent to a public right-of-way.
- B. Coordinate scheduling, submittals, and Work of the various Specification sections to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean up of work of separate sections in preparation for Substantial Completion and for portions of work designated for Owner's partial utilization.
- G. After Owner use of facilities, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.04. FIELD ENGINEERING

- A. Control datum for survey work is that provided by Engineer as shown on the Drawings.
- B. Engineer reserves right to inspect or check results of Contractor field engineering services specified herein for conformance with the Contract Documents.
- C. Contractor shall provide field engineering services as follows:
 - 1. Employ a land surveyor licensed in the State of New York and acceptable to Engineer.
 - 2. Protect all control and reference points. Accurately replace any such point which is damaged or moved.
 - 3. Provide correct lines, grades, locations and elevations for construction of all project components.
 - 4. Provide correct information for preparation of Project record documents.
 - 5. Submit a copy of a registered site drawing and certificate signed by the land surveyor who provided field engineering services that the locations and elevations of the work are in conformance with the Contract Documents.

1.05. PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule a conference after the Effective Date of Agreement.

B. Attendance Required - Owner, Engineer, and each prime Contractor.

C. Agenda

1. Distribution of extra sets of Contract Documents.
2. Submission of list of Subcontractors, list of products, Schedule of Submittals, Schedule of Values, and Progress Schedule.
3. Designation of personnel representing the parties in contract and Engineer.
4. Procedures and processing of field decisions, submittals, substitutions, Applications for Payments, proposal requests, Change Orders and Contract closeout procedures.
5. Scheduling.
6. Scheduling activities of testing laboratory.
7. Requirements of regulatory agencies.
8. Use of premises by Owner and Contractor.
9. Temporary facilities to be provided by Owner, and by Contractor.
10. Procedures for testing.
11. Procedures for maintaining record documents.
12. Maintenance of vehicular traffic detours, flagmen, etc.
13. Periodic cleanup of site.
14. Notification of utilities' owners.

D. Engineer will record minutes and distribute copies to participants.

1.06. PROGRESS MEETINGS

A. Engineer will schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within five days to participants, and those affected by decisions made.

C. Attendance Required - Owner, Engineer, job superintendent of each prime Contractor, major Subcontractors and Suppliers, as appropriate to agenda topics for each meeting.

D. Agenda

1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.

4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

1.07. PREINSTALLATION CONFERENCES

- A. When required in individual specification Section, General Contractor shall convene a preinstallation conference at site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Engineer four days in advance of meeting date.
- D. Prepare agenda, preside at conference, record minutes, and distribute copies within two days after conference to participants, with two copies to Engineer.
- E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. ALTERATION PROJECT PROCEDURES

- A. Materials - As specified in product sections; match existing products and work for patching and extending work.
- B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- C. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition.

- D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- E. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.
- F. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.
- G. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Engineer review.
- H. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- I. Finish surfaces as specified in individual product sections.

3.02. CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affects:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install or correct ill-timed work.
 - 3. Remove and replace defective and non-conforming work.
 - 4. Remove samples of installed work for testing.
 - 5. Provide openings in elements of work for penetrations of mechanical and electrical Work.
 - 6. Seal all new, existing, and unused openings to be watertight under submergence up to the 100-year flood elevation (ABFE 1 percent) plus 30 inches freeboard.
- D. Execute work by methods which will avoid damage to other work, and provide proper surfaces to receive patching and finishing.
- E. Cut rigid materials using masonry saw or core drill.

- F. Restore work watertight with new products in accordance with requirements of Contract Documents.
- G. Fit work watertight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, and floor construction; completely seal all voids watertight under submerged conditions up to the 100-year flood elevation (ABFE 1 percent) plus 30 inches freeboard.
- I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- J. Identify any hazardous substance or condition exposed during the Work to the Engineer in writing for decision or remedy.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Submittal procedures.
- B. Proposed products list.
- C. Product data.
- D. Review of submittals.
- E. Schedule of submittals.
- F. Shop drawings.
- G. Samples.
- H. Manufacturer's instructions.

1.02. RELATED SECTIONS

- A. General Conditions.
- B. Supplementary Conditions.
- C. Section 15170 - MOTORS

1.03. SUBMITTAL PROCEDURES

- A. Transmit each required submittal using Engineer-accepted form.
- B. Number the submittals as follows:
 - 1. First: Specification section number.
 - 2. Submittal number within the Specification section.
 - 3. Review cycle number.
 - 4. Title of submittal.
 - 5. For example:
 - a. 15073-01-01 – Field lock gaskets for DIP (first review cycle)
 - b. 15073-01-02 - Field lock gaskets for DIP (second review cycle)
 - c. 15073-02-01 – Flange pipe and fittings (first review cycle)

- d. 15073-02-02 – Flange pipe and fittings (second review cycle)
 - e. 15073-02-03 – Flange pipe and fittings (third review cycle)
- C. Identify Project, Contractor, Subcontractor, and Supplier; pertinent Drawing number and detail number(s), and Specification sections, as appropriate.
- D. Apply stamp, signed or initialed providing certification required by General Condition Article 6.17.C.2. At a minimum, stamp shall include the following information:
1. Submittal Number _____
 2. Deviations: None _____; As Listed _____
 3. Reference Specification Section _____
 4. Reference Drawing Number _____
 5. Space Requirement: As Designed _____ Different, As Listed _____
 6. Representation is made to Owner and Engineer that Contractor has satisfied the requirements of General Conditions Article 6.17.C.1.a through d, associated Supplementary Conditions, and that the Contractor hereby approves this submittal.
Contractor _____
Signature _____
Date _____
Date _____
- E. Schedule submittals to expedite the Project, and deliver to parties in the quantities and at the locations identified during the preconstruction conference.
- F. Identify deviations from Contract Documents in accordance with General Conditions Article 6.17.C.3.
- G. Identify product and/or system limitations which may be detrimental to successful performance of the completed Work.
- H. Identify space requirements which differ from those designed and/or shown on the Contract Documents.
- I. Provide space for Contractor and Engineer review stamps.
- J. Revise and resubmit in accordance with General Conditions Article 6.17.E. Identify all changes made since previous submittal in a cover letter or memorandum.
- K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- L. Submittals not required will not be recognized or processed.
- M. Items shall not be fabricated or delivered without fully approved Shop Drawings.
- N. Ensure no associated work begins until associated Shop Drawings are fully approved.
- O. Fabrication prior to receiving an “Approved” or “Approved as Corrected – No Resubmittal Required” is at Contractor’s risk.

1.04. PROPOSED PRODUCTS LIST

- A. Within 10 days after date indicated in the Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product, and appropriate specification section number.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.05. PRODUCT DATA

- A. Submit five copies to Engineer, three copies of which will be retained by the Engineer.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this project.
- C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. After review and approval by Engineer, distribute in accordance with Article 1.03. Provide copies for required record documents described in Section 01700, Record Documents.

1.06. REVIEW OF SUBMITTALS

- A. Review of submittals will be in accordance with General Conditions Article 6.17.D.
- B. Review Times
 - 1. No less than 28 days shall be allowed for Engineer's review of submittals and resubmittals unless otherwise specified in the Contract Documents.
 - 2. No less than 45 days shall be allowed for Engineer's review of Division 17 submittals and all other items including PLC-based control systems.
- C. Review Codes
 - 1. Approved
 - 2. Approved as Corrected – No Resubmittal Required
 - 3. Approved as Corrected – Resubmit Written Responses and Requested Information
 - 4. Revise and Resubmit
 - 5. Not Approved
 - 6. Informational Purposes Only
- D. Payment will not be made for any items requiring submittals until no further submittals are required for the item.

1.07. SCHEDULE OF SUBMITTALS

- A. Submit three copies of preliminary Schedule of Submittals in accordance with General Conditions Article 2.05.

- B. Revise and resubmit until acceptable to Engineer.

1.08. SHOP DRAWINGS

- A. Provide information in accordance with General Conditions Article 6.17 as supplemented herein and as required by individual Specification sections.
- B. Shop Drawing submittals shall include all descriptive data, performance characteristics, material specifications, spare parts list, drawings, piping diagrams, wiring schematics, and shall be complete and accurate to indicate item-by-item compliance with the Contract Documents.
- C. Shop Drawings shall be drawn at scales matching those on the Drawings depicting the same items.
- D. All catalog cuts, manufacturer's specifications, drawings, and verbal descriptions shall be clearly marked to allow identification of the specific products used.
- E. If the submittal deviates from the requirements of the Specifications in any way, it shall be clearly marked in the submittal with the justifying reason stated for evaluation by Engineer.
- F. Electrical and control submittals shall include a verbal description of the functions, metering equipment, alarm points, alarm sequences, and any other specific features provided.
- G. Electric motor submittals shall be in accordance with Section 15170, Motors.
- H. All electrical equipment submittals shall be in accordance with Division 16, Electrical Specifications.
- I. Submit five opaque reproductions to Engineer, three copies of which will be retained by the Engineer.

1.09. SAMPLES

- A. Provide in accordance with General Conditions Article 6.17 as supplemented herein and as required by individual specification sections.
- B. Submit Samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- C. Submit Samples of finishes from the full range of manufacturers' standard colors in custom colors selected, textures, and patterns for Engineer's selection.
- D. Include identification on each Sample, with full project information.
- E. Submit the number or samples specified in individual specification sections, one of which will be retained by Engineer.
- F. Reviewed samples which may be used in the Work are indicated in individual specification sections.

1.10. MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, in quantities specified for shop drawings.
- B. When specified in Section 01640, Equipment-General, submit five copies of manufacturer's operation and maintenance instructions for equipment supplied under this Contract to the Engineer in the quantities and locations identified in Section 01640, Equipment-General.
- C. Identify conflicts between manufacturers' instructions and Contract Documents.
- D. Indicate that that material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- E. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01310
PROGRESS SCHEDULE

PART 1 GENERAL

1.01. SUMMARY

- A. This specification section covers the development and utilization of the Progress Schedule. In the event of conflicts or discrepancies with any other provisions of the Contract Documents relating to such, this section shall govern.

1.02. DEFINITIONS

- A. Terms used herein shall be in accordance with the definitions set forth in the Associated General Contractor's of America (GCA) publication, "Construction Planning & Scheduling".

1.03. BASIC REQUIREMENTS

- A. Schedule and monitor all Work using Critical Path Method (CPM) techniques. Scheduling software shall be Primavera P3 or Microsoft Project. Progress Schedule shall be maintained throughout entire Contract and shall be used by Contractor to schedule, plan, organize, and execute the Work.
- B. Progress Schedule shall:
 - 1. Comply with Contract Times identified in the Agreement.
 - 2. Reflect all mandated sequencing identified in Contract Documents.
 - 3. Include adequate time for Engineer's review of submittals. Under no circumstances will the Progress Schedule be allowed to include Engineer review times shorter than those prescribed in Section 01300, Submittals and individual specification sections. The need for resubmittals based on Engineer's review will not entitle Contractor to Contract Time extensions and the Progress Schedule must include adequate time for resubmittals.
 - 4. Include time required by Contract Documents based on work days lost due to inclement weather.
 - 5. Progress Schedule shall include adequate time for testing and Startup.
- C. Each activity, except Notice to Proceed, shall have at least one predecessor. Each activity, except final completion, shall have at least one successor.
- D. Construction activities shall have a maximum duration of 20 work days. All durations shall be developed based on definitive manpower and resource planning.
- E. Float is not for the exclusive benefit of the Owner or Contractor and must be used in the best interest of the Project in order to maintain Contract Times. Contractor will not be allowed to sequester float through such strategies as extended activity durations, extensive crew/resource sequencing, etc.

1.04. QUALITY ASSURANCE

- A. Retain the services of an independent CPM scheduler to provide all scheduling services required for this Contract.
- B. Utilize a qualified CPM scheduler to provide all scheduling services required for this Contract.
- C. CPM scheduler shall be skilled in the time and cost application of CPM scheduling techniques for multi-disciplined construction projects.
- D. CPM scheduler shall have a minimum of five years experience in preparing CPM schedules for projects of similar size and complexity.
- E. Engineer reserves the right to reject proposed CPM scheduler if, in the Engineer's opinion, the proposed CPM scheduler does not meet the qualifications specified herein. Engineer will notify Contractor in writing of decision concerning acceptability of proposed CPM scheduler within 14 days of receipt of proposed CPM scheduler qualifications submittal. If Engineer rejects proposed CPM scheduler, resubmit another proposed CPM scheduler within seven days of receipt of Engineer's rejection notice. Such rejection by Engineer does not release Contractor from its obligations under this Contract and will not entitle Contractor to an adjustment of Contract Price and/or Contract Times.

1.05. SUBMITTALS

- A. Submit the following in accordance with the procedures identified in Section 01300, Submittals:
 - 1. CPM scheduler's qualifications within ten days of Notice of Award including:
 - a. Name and address of proposed CPM scheduler.
 - b. Sufficient information showing proposed CPM scheduler's qualifications including:
 - 1) List of prior construction projects of similar size and complexity.
 - 2) At least one sample network analysis demonstrating complete project planning similar to those required under this Contract, prepared by, or under the direction of, the proposed CPM scheduler.
 - 3) Letter from proposed CPM scheduler indicated they have reviewed this Specification section and understand the requirements specified herein.
 - 2. Preliminary 90-Day Progress Schedule:
 - a. Submit one electronic version on compact disc and three 22-inch x 34-inch hard copies of bar chart within time frame identified in General Conditions Article 2.05.A.1.
 - b. Bar chart shall show the following for each activity:
 - 1) Activity ID
 - 2) Activity description

- 3) Original duration
- 4) Early start
- 5) Early finish
- 6) Late start
- 7) Late finish

3. Detailed Baseline Progress Schedule:

- a. Submit one electronic version on compact disc and three 22-inch x 34-inch hard copies of bar chart within 30 days after acceptance of preliminary Progress Schedule.
- b. Bar chart shall clearly identify the critical path and shall provide a tabulated listing of the following for each activity:
 - 1) Activity ID
 - 2) Activity description
 - 3) Original duration
 - 4) Percent complete
 - 5) Remaining duration
 - 6) Early start
 - 7) Early finish
 - 8) Late start
 - 9) Late finish
 - 10) Total float
- c. Prepare manhour versus time (in months) plot with an early finish manhour curve and a late finish manhour curve. Early finish manhour curve and late finish manhour curve shall be the early finish and late finish manhour curve of the approved Baseline Progress Schedule and shall not be updated after the baseline schedule is approved without prior approval of Engineer. The actual manhour curve shall be updated and submitted with each Application for Payment Application. Submit three copies of a man-hour curve plotting man-hours versus time in months.

4. Monthly Updates

- a. After acceptance of the baseline Progress Schedule, submit monthly updates with each Application for Payment. The cutoff date for each monthly update shall be mutually agreed upon by Engineer and Contractor prior to submittal of first monthly update.

- b. Submit one electronic version on compact disc and three 22-inch x 34-inch hard copies of bar chart.
 - c. The monthly updates shall include, but not be limited to, three copies of a tabulated listing all activities showing the following:
 - 1) Activity ID
 - 2) Activity description
 - 3) Original duration
 - 4) Percent complete
 - 5) Remaining duration
 - 6) Early start or actual start Early finish or actual finish
 - 7) Late start or actual start
 - 8) Late finish or actual finish
 - 9) Total float
 - d. Written report including the following:
 - 1) Summary of Work accomplished during period
 - 2) Summary of Work to be accomplished during next period
 - 3) Milestone comparison chart
 - 4) Critical path analysis
 - 5) Analysis of work paths with less than 20 days total float
 - 6) Analysis of time lost or gained during the period
 - 7) Identification of problem areas
 - 8) Identification of issues potentially having an adverse impact on the Progress Schedule
- B. Engineer's review of Progress Schedule submissions is solely to determine if Progress Schedule has been prepared in accordance with Contract Documents. Such acceptance will not impose on Engineer and/or Owner responsibility for the Progress Schedule, sequencing of Work, progress of Work, nor will it interfere with and/or relieve Contractor full responsibility for the Progress Schedule, means, methods, and sequence of construction when not specifically dictated by the Contract Documents.
- C. Should Contractor fail to provide submittals, and/or revised submittals, within the time frames prescribed, Contractor will be in default and Owner is not obligated to provide progress payments to Contractor until such time as acceptability of submittals can be verified.

1.06. PROGRESS SCHEDULE ARCHITECTURE

- A. Each activity in the Progress Schedule shall include:
 - 1. A unique activity identification (ID) number
 - 2. Activity description
 - 3. Original Duration
 - 4. Responsibility code assigning activities to Contractor, Subcontractors, Engineer, Owner, or other entity.
 - 5. Manpower loading for all construction activities.
- B. Calendars: At a minimum, establish the following calendars:
 - 1. Work day calendar excluding all holidays identified in the Contract Documents
 - 2. Calendar days for activities with durations based on calendar days
 - 3. Seasonal calendars covering all seasonally constrained activities.

1.07. PRELIMINARY 90-DAY PROGRESS SCHEDULE

- A. Include the following:
 - 1. Detailed activities with associated logic for first 90 days after Notice to Proceed. The Preliminary 90-Day Progress Schedule shall include, but not be limited to, mobilization, sitework, demolition, key procurement activities (i.e., submissions, approvals, fabrication and delivery) and all other work that will occur in the first 90 days after Notice to Proceed.
 - 2. The balance of the Work shall be shown in a summary log and shall include a summary of activities for construction of each proposed system. Include clear water testing, startup, and post-startup performance tests defined in Section 01660, Testing and Startup.

1.08. DETAILED BASELINE PROGRESS SCHEDULE

- A. Baseline Progress Schedule shall include no activity progress.
- B. Incorporate 90-day preliminary Progress Schedule.
- C. Provide sufficient detail to allow use for planning, scheduling, and control all Work included in Contract. The degree of detail shall be to the satisfaction of the Engineer, and shall account for the following Project specific items:
 - 1. Structural breakdown of project.
 - 2. Required phasing.
 - 3. Milestones.
 - 4. Trades involved.

5. Maintaining operation of existing facilities.
 6. Subcontractor work plans.
 7. Crew flows and sizes.
 8. Access to Site and work areas.
 9. Identification of coordination between Contractor, subcontractors, and suppliers.
 10. Testing and startup.
 11. Partial utilization by Owner.
- D. In addition to a breakdown of physical construction activities specified herein, include activities for the following:
1. Submittals
 2. Engineer's review of submittals
 3. Fabrication and delivery of materials and equipment
 4. Finish milestone activity for all Functional Tests associated with a given System (see Section 01660, Testing and Startup, for definition).
 5. Separate activities for loading/debugging application software for each System. Amount of time Contractor shall allow for these activities shall be no less than that defined in the Division 17 specifications.
- E. Update to include any revisions to the System Delivery Plan identified in Section 01660, Testing and Startup.
- F. The accepted baseline Progress Schedule will form the basis of the first monthly update.

1.09. SCHEDULING MEETINGS

- A. Attend monthly meetings with Engineer one week prior to submitting monthly Progress Schedule updates.
- B. Review proposed activity progress completed during the period, current status of the Project, planned work for the next period, and areas where Contractor needs to coordinate with Owner and/or Engineer.

1.10. REVISIONS

- A. Engineer will be the custodian of all official versions of the Progress Schedule including the 90-Day Preliminary Progress Schedule, the baseline Progress Schedule, and each acceptable subsequent monthly update included with Applications for Payment.
- B. The Owner, Engineer, and Contractor shall have the right to propose revisions to the Progress Schedule if it is deemed to be in the best interest of the Project.

- C. All Owner, Engineer, and Contractor proposed revisions must be submitted to each party no later than seven days prior to the date by which Contractor must submit monthly updates in order for proposed revisions to be considered for that update.
- D. Objections to Proposed Revisions
 - 1. If Owner, Engineer, and/or Contractor object to proposed revisions made by any other party, the objecting party shall provide written notice to each other party within seven days of receipt of proposed revisions, stating objections.
 - 2. Proposed revisions that are not mutually agreeable shall be discussed at the monthly scheduling meetings.
- E. Engineer shall have final say on acceptance or rejection of all proposed Progress Schedule revisions based solely on requirements of the Contract Documents.
- F. All Engineer accepted revisions will be incorporated into the next Progress Schedule update.

1.11. RECOVERY SCHEDULES

- A. If Contractor fails to achieve planned progress, as indicated in the Progress Schedule, and lack of progress delays the critical path or an intermediate Milestone by more than 10 work days, submit a proposed recovery schedule to Engineer identifying how Contractor will recover lost time.
- B. Failure to submit a recovery schedule and failure to cooperate with the Owner and/or Engineer in the recovery schedule process shall allow Owner the right to order Contractor to increase manpower to recover lost time, without adjustment to the Contract Price. Furthermore, Owner has the right to withhold progress payments until such time as Contractor's progress is brought into compliance with Progress Schedule.

1.12. DELAYS AND EXTENSIONS OF CONTRACT TIMES

- A. When Contractor believes that Contract Times will be delayed by circumstances outside of its control, Contractor shall include with its notice of Claim, a forward looking Time Impact Analysis (TIA) identifying the anticipated impact to Contract Times. Forward looking Time Impact Analysis shall include the following;
 - 1. A fragnet prepared using the Progress Schedule submitted with the most recent Application for Payment.
 - 2. A report identifying all new activities included with the fragnet and all proposed logic changes associated with the fragnet.
 - 3. Summary of all requested extensions to Contract Times.
 - 4. Cause of the delay, actions Contractor proposes to take to minimize delays, and actions Contractor proposes for Owner and/or Engineer to minimize delays.
- B. Engineer will review each forward looking TIA after submission. If acceptable to Engineer, Engineer will provide written notice to Owner within 14 days of submission, copying Contractor on correspondence, recommending that the fragnet should be incorporated into the Progress Schedule and a Change Order should be issued providing requested extension of Contract Times. Owner will provide written notice to Contractor within 14 days of receipt of Engineer's recommendation, either concurring or denying Engineer's recommendation.

- C. If a forward looking TIA submittal is not acceptable to Engineer, Engineer will provide written notice to Contractor identifying deficiencies with TIA. Contractor will have 7 days from receipt of Engineer's written notice to submit a revised TIA addressing deficiencies.
- D. Contract Time extensions will only be considered for events that impact Contract Times as demonstrated by acceptable forward looking TIAs.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01380

CONSTRUCTION DOCUMENTATION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Construction photographs.

1.02. DESCRIPTION

- A. Take construction record photographs prior to mobilization and periodically during the course of the work.
- B. General Contractor shall provide construction documentation in specified in this section unless otherwise noted.

1.03. CONSTRUCTION PHOTOGRAPHS

- A. Digital construction photographs shall be taken at each of the major stages on construction listed below and shall be furnished to Engineer and Owner with each Application for Payment.
 - 1. Site before mobilization.
 - 2. Completion of underground facilities prior to backfilling.
 - 3. Completion of site clearing for each structure.
 - 4. Completion of excavations for each structure.
 - 5. Completion of reinforcing and formwork prior to concrete pours.
 - 6. Completion of foundations of each structure.
 - 7. Completion of framing of each structure.
 - 8. Completion of enclosure for each structure.
 - 9. Interior of tanks prior to filling with liquid.
 - 10. Installation of all interior and exposed exterior piping, equipment, and electrical components.
 - 11. Testing of all piping, equipment, and systems.
 - 12. Completion of site restoration and landscaping.
- B. Views and Quantities Required
 - 1. At least 24 pre-construction photographs.
 - 2. Two views of each item.

3. At least two views from different angles of overall project site weekly.
 4. Four prints of each view.
 5. At least 24 completed post-construction photographs.
- C. Camera used for digital photography shall be a 5.0 megapixel or greater.
- D. Electronic Copies
1. Maintain database of pictures for the entire length of the project.
 2. Each month, provide two CDs with electronic versions of all prints taken in the past month.
 3. Provide two CDs with electronic versions of all prints taken in during the course of the Project (in .jpg format) with final Application for Payment.
 4. All electronic copies of photos shall be in .jpg format. All electronic copies of photos shall be arranged on CDs by date and subject. Each .jpg photo file name shall include the subject description and date.

1.04. REUSE OF CONSTRUCTION DOCUMENTATION

- A. All construction documentation furnished to Owner shall become the property of the Owner and cannot be copyright or otherwise protected in a manner that prevents free reuse by either the Owner and/or Engineer.

PART 2 PRODUCTS

2.01. PRINTS

- A. Digital Progress Photos
1. Printer
 - a. Printer shall be designed to print digital photos.
 - b. Printer shall have a minimum 4800 x 1200 dpi resolution.
 2. Color Prints
 - a. Paper - Single weight, smooth, photo-quality paper.
 - b. Finish - Smooth matte-finish.
 - c. Size - 8-inch x 10-inch.
 - d. Enclosure - Each print shall be provided in an acid-free plastic sleeve, three hole punched, for insertion into a three ring binder. Provide a suitable quantity of three-ring binders for containing all prints, labeled on the front and spine of the binder with the name and Owner's Contract number.
 3. Identify each print on front, listing:

- a. Name and Owner's contract number.
- b. Subject and orientation of view (for example, "Aeration Tank Foundation, looking north").
- c. Date and time of exposure.
- d. Contractor's numbered identification of exposure (i.e., December 2009, Photo #1).

PART 3 EXECUTION

3.01. DELIVERY OF PRINTS

- A. Preconstruction photos and negatives shall accompany the first Application for Payment. This Application for Payment will not be approved without receipt of such materials.
- B. Monthly construction photos (in both print and CD format) shall accompany each monthly Application for Payment. Monthly Applications for Payment will not be approved without receipt of such materials.
- C. Final construction photos and negatives shall accompany the final Application for Payment. This Application for Payment will not be approved without receipt of such materials.

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. References and standards.
- C. Tolerances.
- D. Field samples.
- E. Mock-up.
- F. Inspection and testing services.
- G. Testing by Contractor.
- H. Manufacturers' field services and reports.

1.02. RELATED SECTIONS

- A. General Conditions.
- B. Supplementary Conditions.

1.03. QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply fully with manufacturers' instructions.
- C. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.
- D. If manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Comply with specified standards as a minimum quality for the Work except when code requirements or equipment manufacturer requires more stringent standards.
- F. Perform Work by persons qualified to produce workmanship of specified quality.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion and disfigurement.

1.04. REFERENCES AND STANDARDS

- A. For products and workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified and/or are required by applicable codes.
- B. Obtain copies of standards where required by individual specification sections.
- C. If specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

1.05. TOLERANCES

- A. Monitor fabrication and installation tolerance control to produce acceptable work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. If manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.06. FIELD SAMPLES

- A. Furnish field Samples at the site as required by individual specification sections.
- B. Acceptable samples represent a quality level for the work.
- C. Where field sample is specified in individual specification sections to be removed, clear area after field Sample has been accepted by Engineer.

1.07. MOCK-UP

- A. Tests will be performed under provisions identified in this section and as identified in the individual specification sections.
- B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Where mock-up is specified in individual specification sections to be removed, mock-up shall remain until Engineer provides notice to Contractor that it is acceptable to remove mock-up.
- D. Accepted mock-ups shall be a comparison standard for quality required for the remaining work.

1.08. TESTS AND INSPECTIONS

- A. Contractor shall employ and pay for the services of an independent testing laboratory to perform inspections, tests, and approvals indicated in General Conditions Article 13.03.B, including those which may be so specified elsewhere in the Contract Documents.
- B. Independent testing laboratory will:
 - 1. Perform inspections, tests, and other services specified in the individual specification sections and as required by Engineer and Owner.

2. Perform inspecting, testing, and source quality control which may occur on or off project site, as required by Engineer or Owner.
3. Prepare and submit reports to the Engineer, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents. Engineer will forward copy of report(s) to Contractor.
4. Contractor shall:
 - a. Cooperate with independent firm; furnish samples of materials; furnish design mix, equipment, tools, storage and assistance as requested.
 - b. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
 - c. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's own use.
- C. Retesting required because of non-conformance to specified requirements shall be performed, on instructions by the Engineer, by the same independent firm which performed the initial tests and inspections, whether employed by Owner or Contractor.
- D. Payment for retesting will be the Contractor's cost with no change in the contract price.

1.09. TESTING BY CONTRACTOR

- A. Furnish required labor, facilities, tools, equipment, compressed air, water and electric power for tests, and:
 1. Conduct hydrostatic and/or pressure tests on installed utilities, process piping, and tanks in accordance with individual sections of the specifications.
 2. Pay all costs associated with such tests.

1.10. MANUFACTURERS' FIELD SERVICES

- A. Manufacturer field services for equipment are specified in Section 01640, Equipment—General.
- B. When additional manufacturer services are specified in other individual specification sections, require material or product suppliers or manufacturers to provide qualified personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, testing and adjusting and start-up as applicable, and to initiate instructions when necessary.
- C. Report observations, site conditions, or instructions given to applicators or installers, that are supplemental or contrary to manufacturers' written instructions.
- D. Submit report to Engineer in duplicate within 30 days of observation.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01420

SPECIAL INSPECTIONS

PART 1 GENERAL

1.01. DEFINITIONS

- A. Building Official - Individual responsible for enforcing the Building Code.
- B. Inspector - Individual or firm responsible for performing specific inspections as part of the Special Inspection program.
- C. Special Inspector - Individual or firm responsible for managing and coordinating the inspection and testing program. The Special Inspector will often perform required inspections and tests. The Special Inspector has no control over the Contractor's means and methods of construction, does not have the authority to stop work, and is not responsible for Site safety or compliance with OSHA regulations.
- D. Testing Laboratory - Firm responsible for performing specific inspections and/or tests as part of the Special Inspection program.

1.02. ROLES AND RESPONSIBILITIES

- A. Contractor – The entity that is responsible for construction of the buildings and systems including coordination and direction of all Subcontractors, fabricators, and material Suppliers. The Contractor is responsible for completing the Work in compliance with the Contract Documents and the Building Code. The Special Inspection program does not relieve the Contractor of their responsibility to perform quality control. The Contractor is responsible for means and methods of construction and site safety. The Contractor is also responsible for scheduling of inspections and tests as well as providing safe access to others for completing these inspections and tests. The Contractor is responsible to take corrective actions to comply with the Contract Documents and to remedy identified deficiencies. The Contractor is responsible for other testing services required in the Contract Documents and not part of the Special Inspection program such as required for material submittals, etc.
- B. Engineer - Design professional in responsible charge of structural and other systems that require special inspection and testing.

1.03. GENERAL REQUIREMENTS

- A. Special inspections and structural testing will be in accordance with Chapter 17 of the International Building Code.
- B. The program of special inspection and testing is a quality assurance program intended to ensure that the Work is performed in accordance with the Contract Documents.
- C. This Specification section is intended to inform Contractor of Owner's quality assurance program and the extent of the Contractor's responsibilities.

1.04. SCHEDULE OF INSPECTIONS AND TESTS

- A. Required inspections and tests include, but are not limited to, those listed in the "Statement of Special Inspections," and as stated in the individual Specification sections.

1.05. QUALIFICATIONS

- A. The Special Inspector, Testing Laboratory, and individual technicians will be approved by the Building Official.
- B. The Testing Laboratory will maintain a full time licensed professional engineer on staff who will certify all test reports initiated by the Testing Laboratory. This Engineer will be in responsible charge of the field and laboratory testing operations.

1.06. SUBMITTALS

- A. Inspectors and Testing Laboratory will disclose any past or present business relationship or potential conflict of interest with Contractor whose work will be inspected or tested.

1.07. PAYMENT

- A. Owner will engage and pay for the services of the Special Inspector, agents of the Special Inspector, and Testing Laboratory.
- B. Contractor shall be responsible for the travel expenses of the Special Inspector and/or Testing Laboratory for materials requiring special inspections that are fabricated in a plant more than 100 miles from the Site.
- C. Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents.

1.08. CONTRACTOR RESPONSIBILITIES

- A. Cooperate with the Special Inspector, his agents, and the Testing Laboratory so that the special inspections and testing may be performed without hindrance.
- B. Review the "Statement of Special Inspections" to coordinate and schedule inspections and tests. Notify the Special Inspector and/or Testing Laboratory at least 48 hours in advance of a required inspection or test.
- C. Uninspected work that required inspection may be rejected solely on that basis.
- D. Provide incidental labor and facilities (ladders, scaffolding, lights, safety equipment, etc.) to provide access to the work to be inspected or tested, to obtain and handle samples at the Site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- E. Keep at the Site the latest set of Drawings, field sketches, approved Shop Drawings, and Specifications for use by the Special Inspector and testing laboratory.
- F. The special inspection program shall in no way relieve Contractor of its obligation to perform Work in accordance with the Contract Documents and from implementing its own quality control program.
- G. All work that is to be subjected to special inspections shall first be reviewed by Contractor's quality control personnel.
- H. Contractor shall be solely responsible for construction site safety.

1.09. LIMITS OF AUTHORITY

- A. The Special Inspector or Testing Laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.
- C. The Special Inspector and/or Testing Laboratory have no authority to stop work.

1.10. STATEMENT OF SPECIAL INSPECTIONS

- A. The "Statement of Special Inspections" has been prepared by the Engineer and is attached for reference at the end of this section.

1.11. RECORDS AND REPORTS

- A. Daily reports shall be prepared by the Inspector for each inspection or test. Reports shall include:
 - 1. Date of inspection or test.
 - 2. Name of inspector or technician.
 - 3. Location of specific areas tested or inspected.
 - 4. Description of test or inspection and results.
 - 5. Applicable standard(s).
 - 6. Signature of inspector or technician.
- B. Discrepancies from the Contract Documents will be reported to Contractor by the Special Inspector. The Inspector's reports will document discrepancies identified and any corrective action taken by the Contractor. If the discrepancies are not corrected within the same day as identified, the Special Inspector will notify the Engineer and Building Official and post a list of discrepancies at the Project Site.
- C. At the completion of the Work requiring Special Inspections, each inspection agency and Testing Laboratory will provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed. This statement will itemize any discrepancies that were not corrected or resolved.

1.12. FINAL REPORT OF SPECIAL INSPECTIONS

- A. The "Final Report of Special Inspections" will be completed by the Special Inspector and submitted to the Engineer and Building Official prior to the issuance of a Certificate of Use and Occupancy.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION



STATEMENT OF SPECIAL INSPECTIONS

Project:	
Location:	
Owner:	
Engineer:	

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this Project as well as the name of the Special Inspector and the identity of other approved agencies to be retained for conducting these inspections and tests. This Statement of Special Inspections encompasses the following disciplines:

- Structural Mechanical/Electrical/Plumbing
 Architectural Other: _____

The Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official and Engineer. Discovered discrepancies will be brought to the immediate attention of Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and Engineer. The Special Inspection program does not relieve Contractor of their responsibilities.

Interim reports will be submitted to the Building Official and Engineer.

A Final Report of Special Inspections documenting completion of all required Special Inspections will be submitted at completion of the project.

Means and methods of construction, including site safety, are solely the responsibility of the Contractor.

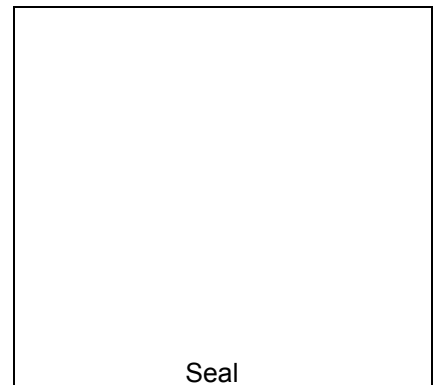
Interim Report Frequency: To be determined Per attached schedule

Prepared by:

(Type Name)

Signature

Date



Owner's Authorization:

Building Official's Acceptance:

Signature

Date

Signature

Date



LIST OF INSPECTION AND TESTING AGENCIES

This Statement of Special Inspections/Quality Assurance Plan includes the following building systems:

- | | |
|--|--|
| <input checked="" type="checkbox"/> Soils and Foundations | <input type="checkbox"/> Spray Fire Resistant Material |
| <input checked="" type="checkbox"/> Cast-in-Place Concrete | <input type="checkbox"/> Wood Construction |
| <input type="checkbox"/> Precast Concrete | <input type="checkbox"/> Exterior Insulation and Finish System |
| <input type="checkbox"/> Masonry | <input type="checkbox"/> Mechanical and Electrical Systems |
| <input type="checkbox"/> Structural Steel | <input type="checkbox"/> Architectural Systems |
| <input type="checkbox"/> Cold-Formed Steel Framing | <input type="checkbox"/> Special Cases |

Special Inspection Agencies	Firm	Address, Telephone, Email
1. Special Inspector	To Be Determined	
2. Inspector		
3. Inspector		
4. Testing Agency	To Be Determined	
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies will be engaged by Owner or the Owner's Agent, and not by Contractor or Subcontractor whose work is to be inspected or tested.



Quality Assurance for Seismic Resistance	
Seismic Design Category	B
Quality Assurance Plan Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Description of seismic force resisting system and designated seismic systems.	<input checked="" type="checkbox"/> Not required <input type="checkbox"/> See description below

Quality Assurance for Wind Requirements	
Basic Wind Speed (3 second gust)	100
Wind Exposure Category	B
Quality Assurance Plan Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Description of wind force resisting system and designated wind resisting components.	<input type="checkbox"/> Not required <input type="checkbox"/> See description below

Statement of Responsibility	
Each Contractor responsible for the construction or fabrication of a system or component designated above must submit a Statement of Responsibility.	<input checked="" type="checkbox"/> Not required <input type="checkbox"/> Required



SCHEDULE OF REQUIRED SPECIAL INSPECTIONS

Structure Name	Description of Component(s) to be Inspected or Tested	Inspection Type	Item Number(s)
Jefferson Valley Pump Station	Backfill below foundations	Soils and Foundations	All
	Cast-In-Place Concrete	Concrete Construction	1, 4, 5, 7, 11
Walden Woods and Jefferson Park Pump Stations	Backfill below foundations	Soils and Foundations	All
	Cast-In-Place Concrete	Concrete Construction	1, 4, 5, 7, 11



SOILS AND FOUNDATIONS SPECIAL INSPECTIONS

Item and Description	Agency	Frequency		Scope	Referenced Specification
		C	P		
1. Structural Fill Material Perform classification and testing of controlled fill materials.			✓	Test fill material in accordance with ASTM and the Contract Documents. Perform sieve tests (ASTM D422 and D1140) and modified Proctor tests (ASTM D1557) of each source of fill material.	Section 02223
4. Excavations Verify excavations below all foundations and slabs-on-grade.			✓	Verify excavations are extended to proper depth and have reached proper material. Verify removal of unsuitable material. Inspect preparation of subgrade prior to placement of controlled fill.	Section 02222
5. Controlled Structural Fill Placement Verify use of approved materials, lift thicknesses, and densities during placement and compaction of controlled fill.		✓		Inspect placement, lift thickness, and compaction of controlled fill. Test density of each lift of fill by nuclear methods (ASTM D2922). Verify extent and slope of fill placement.	Section 02228
6. Shallow Foundations Verify materials below footings are adequate to achieve the design bearing capacity.			✓	Inspect soils below footings for consistency with geotechnical report.	Geotechnical Report



CAST-IN-PLACE CONCRETE SPECIAL INSPECTIONS

Item and Description	Agency	Frequency		Scope	Referenced Specification
		C	P		
1. Verify Mix Design a. Material certification. b. Verifying use of required design mix. c. Check water-cement ratio.			✓	Review of concrete mix design submittal for conformance with specifications.	Section 03001
		✓		Review concrete batch tickets and verify compliance with approved mix design.	
		✓		Verify that water added at the side does not exceed that allowed by the mix design.	
2. Reinforcement Installation Inspection of reinforcement type and placement.			✓	Inspect size, grade, spacing, cover, and positioning of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect lap, splices, [and mechanical splices]. Verify that bars are adequately tied and supported on chairs or bolsters.	Section 03001
3. Post-Installed Anchors Inspection of anchors installed in hardened concrete.			✓	Inspect size, location, and embedment of anchor rods. Verify drilled holes are of adequate diameter and depth, and are cleaned in accordance with product specifications.	Section 03001
4. Form Work Inspect erected formwork prior to concrete placement.			✓	Inspect formwork for shape, location, and dimensions of the concrete member being formed.	Section 03001
5. Concrete Placement Inspect concrete placement for proper application techniques.		✓		Verify that concrete conveyance, free-fall, and depositing avoids segregation. Verify that concrete is properly consolidated.	Section 03001
6. Sampling and Testing of Concrete At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests and determine the temperature of the concrete.		✓		Test concrete compressive strength (ASTM C31 and C39), slump (ASTM C143), air-content (ASTM C231 or C173), and temperature (ASTM C1064).	Section 03001
7. Curing and Protection Inspection for maintenance of specified curing temperature and techniques.			✓	Inspect curing, cold weather protection, and hot weather protection procedures.	Section 03001
8. Verify Concrete Strength Verify strength of in-place concrete prior to inducing loads.			✓	Verify cast concrete is of adequate strength:	Section 03001
			✓	<ul style="list-style-type: none"> • Prior to removal of form work that supports cast concrete components (beams and slabs). • Prior to backfilling and/or loading of cast concrete components (walls). 	



WOOD CONSTRUCTION SPECIAL INSPECTIONS

Item and Description	Agency	Frequency		Scope	Referenced Specification
		C	P		
1. Plant Certification/ Quality Control Procedures			✓	The fabricator shall submit evidence of current certification by the appropriate organization: <ul style="list-style-type: none"> • Precast/Prestressed Concrete Institute (PCI) • National Precast Concrete Association (NPCA) • Architectural Precast Association (APA) 	Section 03001
2. Embedded Items Verify embedded items are pre-installed in precast members.			✓	Inspect embedded items that should be installed in the precast members. Verify embedded items are fully embedded in sound concrete.	Section 03001
3. Connections Inspect connections of precast members.			✓	Verify connections of adjoining precast members are in accordance with manufacturer's details. Verify connections of precast members to structural/building elements are in accordance with Contract Documents.	Section 03001
4. Post-Installed Anchors Inspection of anchors installed in hardened concrete.			✓	Inspect size, location, and embedment of anchor rods. Verify drilled holes are of adequate diameter and depth, and are cleaned in accordance with product specifications.	Section 03001

SECTION 01500

TEMPORARY FACILITIES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Continuity of service.
- B. Temporary Controls - Barriers, enclosures and fencing, protection of the Work, water control, and pollution controls.
- C. Construction Facilities - Access roads, parking, maintenance of traffic, progress cleaning, and temporary buildings.

1.02. RELATED SECTIONS

- A. General Conditions.

1.03. BARRIERS

- A. General Contractor shall provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition. Maintain Owner access to all areas of pump stations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.
- D. Protect vehicles, stored materials, Site and structures from damage.
- E. Supplement barriers with suitable signs, railings and night lights, as necessary to conform with governing authorities and regulations.

1.04. FENCING

- A. General Contractor shall install temporary construction fencing around work area. Temporary fence shall be at least 6 feet high.

1.05. WATER CONTROL

- A. General Contractor shall grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect Site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.06. PROTECTION OF INSTALLED WORK

- A. Each Contractor shall protect its installed work from damage and deterioration due to construction activities, traffic, birds, pests, vermin, wild-life, pets, pedestrians, visitors,

vandals, dust, vapors, floods, precipitation, driving rain, wind, snow storms, melting temperatures, or freezing temperatures; provide special protection where specified in individual Specification sections.

- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic over landscaped areas. Provide adequate barriers, directional signs, and/or guards, if necessary to provide adequate protection of landscaped areas.
- G. Owner reserves right to order that additional protective measures be taken beyond those proposed by Contractors, to safeguard the existing facilities and work at no additional cost to Owner.

1.07. SECURITY

- A. General Contractor shall provide security and facilities to protect its work, and that of other contractors including existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate security measures taken with Owner's own security program.

1.08. ACCESS ROADS

- A. General Contractor shall provide and maintain temporary access roads to site as follows:
 - 1. Construct roads on Owner's property to connect public thoroughfare(s) with construction area.
 - 2. Extend and relocate roads as work progress requires. Provide detours as necessary for unimpeded traffic flow.
 - 3. Roads shall be free for use by all personnel involved in Project, and be adequate for transportation of persons, materials, equipment and products to construction area.
 - 4. Maintain roads in serviceable condition, free of obstructions, potholes, ponded water, debris, accumulated snow and ice, until completion of project or until permanent access roads are installed.
- B. When no longer required, remove roads and restore disturbed areas to original Site conditions Existing on-site roads may be used for construction traffic as approved by Owner. Contractor shall restore damaged roads.

1.09. PARKING

- A. General Contractor shall arrange for temporary gravel or paved surface parking areas to accommodate all construction personnel involved with project.
- B. When Site space is not adequate, General Contractor shall provide additional off-site parking.

1.10. MAINTENANCE OF TRAFFIC

- A. General Contractor shall maintain and regulate traffic within contract limits in accordance with applicable state, county, and local regulations.
- B. Conduct operations so as to maintain access for vehicular and pedestrian traffic to and from properties adjoining or adjacent to those streets and roads affected by construction activities, and to subject the public to a minimum of delay and inconvenience.
- C. Erect suitable signs and barricades including warning lights at night, to alert traveling public. Provide watchmen and flagmen as necessary to maintain and regulate traffic.
- D. Provide flagmen, to direct and regulate traffic on heavily traveled thoroughfares on which traffic will be subject to delays or detours caused by construction operations.
- E. Plan operations so that access to any dwelling, building or hospital is assured in case of fire or other emergency. Review with and obtain approval from local fire and police departments regarding anticipated detours and obstructions to traffic flow which could hinder passage of fire apparatus, ambulance or otherwise.
- F. Not more than one block nor more than one cross-street intersection may be torn up, obstructed or closed to travel at one time without permission of the Owner. If the project involves pipe-laying operations, and if more than one pipe-laying crew is operating at separate locations in the work area, this requirement shall apply to each crew's operation, but shall be consistent with traffic maintenance procedures required by the Owner.
- G. When the normal route of vehicular access to any property must be temporarily obstructed, notify the affected property owner at least 24 hours in advance of intended operations at the location. The route shall subsequently be re-opened not later than one day following the start of construction at that location, unless special arrangements have been made with property owner. Vehicular access to hospitals, schools, fire and police departments must be provided at all times.
- H. General Contractor shall comply with requirements of Department of Transportation agencies having jurisdiction:
 - 1. Where the Work is in or encroaches upon a public right-of-way, such as a road, Contractor shall perform the Work in strict compliance with the rules, regulations, requirements, and staff decisions of all applicable Department of Transportation agencies having jurisdiction.
 - 2. Strict adherence to the latest edition of the Work Area Protection Manual and Land Use Permit Regulations (or equivalent documents in the Project area) is required.
 - 3. Frequent inspections of Work conditions by staff of agencies having jurisdiction should be anticipated by Contractor.

4. Compliance with the requirements of the agencies having jurisdiction shall be the sole responsibility of the Contractor with the determination of compliance at the sole discretion of the staff of agencies having jurisdiction.
5. Failure to comply with the requirements of agencies having jurisdiction will result in full-time or part-time inspection by the staff of the agencies having jurisdiction.
6. Charges for these inspections will be based on the policies of the agencies having jurisdiction as determined solely by the agencies having jurisdiction.
7. Whenever charges are incurred, these charges will be invoiced to the Owner. The Owner will invoice the Contractor for these charges plus a 20 percent administrative fee. The Contractor shall pay these invoices no less frequently than monthly.
8. Contractor shall not be granted Substantial Completion until all of these invoices are paid by the Contractor to the Owner.
9. No additional claim for increased Cost or extension of time shall be allowed in the event these requirements are imposed by agencies having jurisdiction.

1.11. PROGRESS CLEANING

- A. General Contractor shall maintain areas free of waste materials, debris, and rubbish. Maintain Site and structures in a clean and orderly condition, as follows:
 1. Remove debris and rubbish from pipe chases, plenums, attics, crawlspaces, and other closed or remote spaces, prior to enclosing the space.
 2. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
 3. Collect and remove waste materials, debris, and rubbish from Site periodically and dispose off-site.
- B. Each Contractor shall store unused tools and equipment at its yard or base of operations.

1.12. POLLUTION CONTROLS

- A. Dust Control
 1. Each Contractor shall execute work by methods to minimize raising dust from construction operations.
 2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
 3. Wash down disturbed areas daily.
 4. Implement best management practices in accordance with requirements of agencies have jurisdiction over dust control.
- B. Erosion and sediment control shall be provided in accordance with the Contract Documents and the requirements of governing regulatory agencies.
 1. General Contractor shall plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas.

2. Minimize amount of bare soil exposed at one time.
 3. Provide temporary measures such as berms, dikes, and drains, to regulate water flow and prevent soil erosion.
 4. Periodically inspect earthwork in disturbed areas to detect evidence of erosion and sedimentation; promptly apply corrective measures.
 5. Implement best management practices in accordance with requirements of agencies have jurisdiction over erosion and sediment control.
- C. Noise Control
1. All construction equipment and tools exhibiting potential noise nuisance shall be provided with noise muffling devices.
 2. Confine use of such equipment and tools during regular working hours.
 3. Implement best management practices in accordance with requirements of agencies having jurisdiction over noise control.
- D. Pollutants Control - Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.13. REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Respective Contractors responsible for temporary utilities, facilities, and controls shall remove temporary utilities, equipment, facilities, controls, materials, prior to Final Application for Payment.
- B. Remove temporary barriers, enclosures, etc. in concert with completion of those segments of work which no longer require such measures.
- C. Remove temporary underground installations to a minimum depth of 2 feet.
- D. Clean and repair damage caused by installation or use of temporary work.
- E. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.14. CONTRACTOR'S FIELD OFFICE

- A. Provide weather tight field office with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack, drawing display table, and filing cabinets for Contractor's use.

1.15. ENGINEER'S FIELD OFFICE

- A. Provide and maintain a weathertight field office for exclusive use of Engineer with lighting, electrical outlets (one for each wall), permanent heating, cooling and ventilating equipment, and equipped with the following sturdy furniture:
 1. One standard size desk, 3-foot x 5-foot, with rolling padded desk chair and at least three drawers.

2. Two Drafting Tables – 39 inches x 72 inches x 36 inches high with one equipment drawer.
 3. One drafting table stool.
 4. Two 3-foot x 6-foot folding table.
 5. One plan rack to hold a minimum of six sets of project drawings.
 6. Three standard four-drawer legal-size metal filing cabinets with locks and keys.
 7. Ten folding chairs.
 8. One 8-foot x 30-inch folding leg table.
 9. One fire extinguisher.
 10. Two wastebaskets.
 11. One coat rack.
 12. Two tackboards, 36 inches x 30 inches.
 13. One heavy-duty, metal three-hole punch.
 14. One 10-inch outdoor type thermometer.
 15. One rain gauge.
 16. One water cooler (provide refills as required throughout project).
 17. One refrigerator, minimum of 4.0 cubic feet, with freezer minimum of 1.0 cubic feet.
 18. One microwave oven, 0.8 cubic feet, 800 watt minimum.
 19. Heavy-duty wall shelving 20 sq. ft. minimum.
 20. One digital camera with 2.0 megapixels or greater.
- B. Engineer's field office shall be ready for occupancy within 10 days following Notice to Proceed. Mobile field office trailer is acceptable if it contains the required facilities. At a minimum, provide the following:
1. Minimum Field Office Size - 400 square feet.
 2. Equip windows and doors with locking devices to prevent unauthorized entry. Provide three sets of keys to Owner.
 3. Provide horizontal mini-blinds for all windows.
 4. Hot and cold water connected to the facilities potable water system.
 5. Bathroom with elongated toilet and sink with hot and cold water.
 6. Telecommunications services identified in this section.

- C. Computer Workstation - Provide computer workstation, printer, and networking equipment. Requirements for the computer equipment will be provided by Engineer. Submit proposed order, including price, before purchasing computer equipment.
- D. Install 24-inch x 30-inch sign on outside wall as determined by Engineer. Paint sign white with blue, 3-inch high lettering, neatly arranged, to read: "Field Office."
- E. Arrange for offices to be cleaned at least once every week. Restroom supplies shall be provided for the duration of the Contract.
- F. Locate the office a minimum distance of 30 feet from existing and new structures. Engineer's office to be erected at location approved by Engineer, and shall not be disturbed, moved or interrupted without the Engineer's approval.
- G. On completion of the contract, remove the field office from the site.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01540

TEMPORARY PUMPING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Furnishing, installing, and testing temporary pumping systems.

1.02. GENERAL

- A. Provide all materials, labor, equipment, power, maintenance, associated items, and superintendence to implement temporary pumping systems for diverting flow as required to maintain continuous operation of existing facilities prior to successful startup of new facilities. Section 01010, Summary of Work, identifies specified facility outages that may require temporary pumping. Provide all additional temporary pumping systems needed to meet Contractor's means and methods at no additional cost to Owner.

1.03. RELATED SECTIONS

- A. Section 02205 – PROTECTION OF EXISTING FACILITIES
- B. Section 02225 – TRENCHING
- C. Section 02740 – SEWAGE FORCEMAINS
- D. Section 15060 – INSIDE PROCESS PIPING
- E. Section 02769 - BYPASS PUMPING

1.04. SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300, Submittals, as supplemented herein.
- B. Submit a specific detailed description of each proposed temporary pumping system at least 30 days prior to intended use. The submittal shall include, but not be limited to, the following:
 - 1. A written description of the plan.
 - 2. Quantity, capacity, and location of all pumping equipment.
 - 3. Pump performance curves and head capacity curves demonstrating the capability to meet all required flows.
 - 4. The size, type and routing of all suction and discharge piping and the means of connecting the system.
 - 5. Description of controls and emergency power source.
- C. Engineer's review will be limited to verification of compliance with performance requirements only. Owner will review temporary pumping system submittals with respect to maintenance of plant operations.

1.05. TEMPORARY PUMPING COORDINATION MEETING

- A. After Owner and Engineer review of temporary pumping system submittal(s), and at least 14 days prior to intended use, schedule a coordination meeting with the Owner, Engineer, Contractor, and Subcontractor or temporary pump Supplier, if applicable.
- B. No temporary pumping shall take place until after satisfactory completion of the associated coordination meeting.

1.06. PERFORMANCE REQUIREMENTS

- A. Design the installation and operation of temporary pumping systems in accordance with Laws and Regulations, including local noise and light ordinances.
- B. Provide fuel supply for 48 hours of operation on site and stored in accordance with Laws and Regulations. Assume responsibility for all spills and regulatory fines due to failure of the temporary pumping system.
- C. Designed to pump peak required flow with largest unit out of service.
- D. Provide a backup pump on-site and ready for operation of the same capacity as the largest temporary bypass pump. In addition, one of the following two conditions must be met:
 - 1. The temporary pumping system must be manned continuously (24 hours per day, 7 days per week) during operation by a representative of the Contractor trained and certified by the pump supplier. In the event of a pump failure, the Owner shall be notified within 15 minutes and the temporary backup pump shall be placed into service within 1 hour of the pump failure.
 - 2. As an alternative, install, test, and maintain remote telemetry to monitor operation of the temporary pump(s) and the wet well level(s). Notify Owner within 15 minutes of a pump and/or system failure. Report to site within 30 minutes of a pump and/or system failure, and place the temporary backup pump in service within 1 hour of a pump and/or system failure.
 - 3. For temporary pumping system with automatic backup pump operation, report to site within 30 minutes of a pump failure to ensure the automatic backup system is operating properly.
- E. Temporary pumping systems shall be equipped with noise reduction features that limit the noise output to 65 dbA within 50 feet of the equipment or to 60 dbA at the nearest residence property line, whichever is less.
- F. Provide variable frequency drives where required to meet temporary pumping requirements.
- G. See Section 01010, Summary of Work, for facility outage requirements and constraints.

1.07. SPECIAL PRECAUTIONS

- A. Contractor is responsible for fines levied on Owner by state, federal, and/or other agencies due to spills caused by failure of temporary pumping systems.
- B. Provide Jersey barriers in all locations where temporary pumps, piping, and other accessories are located in roadways, driveways, and other vehicle-accessed areas.

- C. Provide security fencing for all temporary pumps where not located within a secured area.

PART 2 PRODUCTS

2.01. PUMPS

- A. The pumps and drives shall be rated for continuous duty and shall be capable of pumping the required flow ranges without surging, cavitation, or vibration. Where required pumping rates are not specified, coordinate with Engineer to determine required pumping range prior submitting associated shop drawings. Pumps shall not overload drivers at any point on the pump operating curve. Pumps shall be suitable for use with the material being pumped. Pumps shall be a self contained units designed for temporary use.
- B. Pumps shall either have fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system, or they shall be submersible.
- C. The pumps shall be diesel powered or powered by a diesel powered generator.
- D. Provide the necessary start/stop and level controls for each pump.

2.02. PIPING

- A. In order to prevent the accidental spillage, all temporary piping must be constructed of rigid or semi-rigid pipe with positive, leak proof connections. All pipe materials and joints for temporary piping systems must be accepted by Engineer prior to use.
- B. Pipe 12 inches and larger shall be ductile iron or fused joint high density polyethylene pipe to provide a leak proof piping system. Flanged joints shall be used for exposed or submerged ductile iron pipe. Pipe joints shall be accepted by Engineer prior to use for temporary ductile iron pipe.
- C. Provide heat tracing of temporary piping as required to prevent freezing.

2.03. TEMPORARY PLUGS

- A. Provide temporary plugs, as required, for successful operation of the temporary pumping systems.
- B. Plugs shall be inflatable and designed for the specific purpose of providing temporary plugging of active pipes
- C. All plugs shall be firmly attached to a stationary object at ground level by a steel cable in order to prevent loss of plugs in pipelines.

2.04. PIPE SUPPORTS

- A. Pipe supports shall be provided by the temporary piping supplier for all piping that is elevated above the ground.
- B. Pipe support design shall be by the temporary pipe supplier and spacing shall be in requirements included in Contract Documents for permanent piping.
- C. Pipe support type and location shall be indicated in the shop drawing submittals.

PART 3 EXECUTION

3.01. GENERAL REQUIREMENTS

- A. Install, operate and maintain temporary pumping systems and appurtenances, including but not limited to, associated piping, valves, instrumentation, controls, and accessories, in accordance with the manufacturer's instructions. Provide all oil, fuel, grease, lubricants, tools, and spare parts required for operation and maintenance of the temporary pumping systems for the duration of use. Remove all temporary pumping systems and appurtenances equipment following the completion of temporary pumping.
- B. Contractor is responsible for proper operation of complete temporary pumping systems.
- C. Adequate hoisting equipment for each pump and accessory shall be maintained on the Site.
- D. Provide hay bales and tarping systems to enclose all exterior pumps and engines to further reduce noise levels.
- E. Demonstrate all temporary pumping systems to Owner and/or Engineer for conformance with the Contract Documents prior to use. Measure the noise output during the demonstration phase and provide the results to Engineer.
- F. Temporary pumping systems shall be placed in service a minimum of 72 hours before any work requiring use of the temporary pumping system may begin. Demonstrate continuous trouble-free operation for entire 72-hour period.
- G. Temporary pumping systems shall remain operable until all components of new work requiring temporary pumping systems have successfully completed all required testing. Once activated, do not decommission without prior approval of the Owner and Engineer.
- H. Once written permission is issued by the Engineer, remove all components of the temporary pumping systems. After removal of temporary pumping systems, perform all restoration work to the satisfaction of the Owner.
- I. Take precautions to prevent spills when cutting pipelines or decommissioning existing piping.

END OF SECTION

SECTION 01600
MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Products.
- B. Shipping and handling.
- C. Storage and protection.
- D. Substitutes.

1.02. PRODUCTS

- A. Products - Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the work. Products may also include existing materials or components required for reuse
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for components being replaced.

1.03. SHIPPING AND HANDLING

- A. Arrange deliveries in accordance with the progress schedule.
- B. Coordinate deliveries to avoid conflicts with work, conditions at the site, work of other Contractors, work of Owner, and availability of personnel and handling equipment.
- C. Transport by methods to avoid product damage.
- D. Deliver in manufacturer's unopened containers or packaging, dry, with identifying labels intact and legible.
- E. Provide equipment and personnel to handle products by methods to prevent soiling and damage.
- F. Protect sensitive equipment and finishes against impact, abrasion and other damage.
- G. Promptly inspect shipments to assure compliance with requirements, correct quantities, and identify damage.

1.04. STORAGE AND PROTECTION

- A. Store and protect in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive items in weathertight, climate controlled enclosures in an environment favorable to item.

- B. For exterior storage of fabricated items, place on sloped supports, above ground.
- C. Provide bonded offsite storage and protection when storage and protection cannot be provided on Site.
- D. Cover items subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store items by methods that prevent soiling, disfigurement, and damage.
- G. Arrange storage to permit access for inspection. Periodically inspect to assure items are undamaged and are maintained in acceptable conditions.

1.05. SUBSTITUTES

- A. Submit three copies of requests for substitution to Engineer including all items required by General Conditions Article 6.05. Each submittal shall be provided with a transmittal letter stating "REQUEST FOR SUBSTITUTION" and identifying the specific item for which the substitution is being requested.
- B. Limit each request to one proposed substitute item.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01640
EQUIPMENT-GENERAL

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Submittals.
- B. Performance affidavits.
- C. Equipment design.
- D. Spare parts.
- E. Equipment identification.
- F. Standardization of grease fittings.
- G. Shop tests.
- H. Installation of equipment.
- I. Services of manufacturer's representative.
- J. Operation and maintenance manuals.
- K. Lubrication.
- L. Guarantees.
- M. Schedule of Manufacturer's Services.

1.02. RELATED SECTIONS

- A. Section 05500 - MISCELLANEOUS FABRICATIONS

1.03. SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300, Submittals.
- B. Submit performance affidavits prior to, or with shop drawings.
- C. Installation Certificates.
- D. Certification of Equipment Compliance.
- E. Operations and Maintenance Manuals.
- F. Training Plans
 - 1. Submit no less than 30 days prior to proposed date for training in accordance with procedures identified in Section 01300, Submittals.

- 2. Training plan must be approved by Engineer prior to scheduling actual date for training.
 - 3. Provide syllabus with sufficient detail to establish content of training, duration of each topic, and demonstrate adequate content to train Owner's staff on proper operation and maintenance of equipment.
- G. DVD recordings of training sessions.
 - H. Written training reports.
 - I. Guarantees

1.04. PERFORMANCE AFFIDAVITS

- A. Provide performance affidavits for items listed in the Schedule of Manufacturer's Services, included at the end of this section, and as required in the individual Specifications sections.
- B. Performance affidavits shall be developed by each manufacturer and shall certify to Contractor and Owner, jointly, that manufacturer has examined the Contract Documents and that the equipment, apparatus, process, or system will meet the performance requirements set forth in the Contract Documents in every way. Equipment design, manufacturing, and assembly specifications are an integral part of the performance requirements.
- C. Shop drawings will not be reviewed prior to receipt by Engineer of an acceptable performance affidavit.
- D. The performance affidavit shall be signed by an officer (vice president or higher) of the basic corporation, partnership or company manufacturing the equipment, and witnessed by a notary public.
- E. Performance affidavits shall be in the following format:

Addressed to: (Contractor) and (Owner)

Reference: Contract No. _____

(Project) _____

Text (manufacturer's name) has examined the Contract Documents and verified that the (product) meets in every way the performance and design requirements set forth in Specification Section(s) _____ of the Contract Documents and related Drawings."

Signature: Corporate officers shall be vice president or higher (unless statement authorizing signature is attached).

Notary: Signature(s) must be notarized.

1.05. EQUIPMENT DESIGN

- A. Equipment and appurtenances shall be designed in conformity with ANSI, ASME, IEEE, NEMA and other generally accepted applicable standards.

- B. Equipment and appurtenances shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, shipping, handling, installation, all conditions of operation, and as required by the Contract Documents.
- C. All bearings and moving parts shall be adequately protected by bushings or other approved means against wear, and provisions shall be made for adequate lubrication by readily accessible devices.
- D. Details shall be designed for appearance as well as function. Protruding members, joints, corners, gear covers, etc., shall be finished in appearance. All exposed welds on machinery shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.
- E. Machinery parts shall conform within allowable tolerances to the dimensions shown on the Shop Drawings. The corresponding parts of identical machines shall be made interchangeable.
- F. All machinery and equipment shall be safeguarded in accordance with the safety codes of the ANSI, OSHA, and local laws and regulations. All rotating shafts, couplings, and other moving parts of equipment shall be provided with suitable protective guards of sheet metal or wire mesh neatly and rigidly supported. Guards shall be removable to provide access for repairs.
- G. Details promoting maintenance, ease of replacing parts, and lubrication shall be a prime consideration in design.
- H. Products shall be designed for corrosion resistance and shall not be constructed of materials which may prohibit ease of maintenance due to corrosion. All fasteners on areas requiring access for maintenance and lubrication shall be Type 316 stainless steel unless otherwise specified. Zinc- or cadmium-plated fasteners for these areas shall not be used.

1.06. SPARE PARTS

- A. Provide spare parts as required by individual specification sections.
- B. Provide spare parts that are identical and interchangeable with original parts.
- C. For each part (or group of small parts), provide a tag indicating the following:
 1. Name and associated tag number(s) of equipment.
 2. Name of the part.
 3. Manufacturer's name and the date of manufacture.
 4. Identification number of the part.

1.07. EQUIPMENT IDENTIFICATION

- A. Each piece of equipment shall be provided with a substantial brass or stainless steel nameplate, securely fastened in a conspicuous place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

1.08. STANDARDIZATION OF GREASE FITTINGS

- A. Provide grease fittings of the hydraulic type, Alemite #1600 Series or Lincoln.

- B. Coordinate grease fittings on all mechanical equipment to be compatible with a single type of grease gun.

1.09. SHOP TESTS

- A. Arrange shop tests of the equipment indicated in the Schedule of Manufacturer's Services and the individual Specification sections.
- B. Arrange for the Engineer to witness shop tests in the manufacturer's shop, if required by the individual Specification sections.
- C. Demonstrate equipment characteristics, including any specified pressure, duty, capacity, rating, efficiency, performance, function, and other special requirements, comply fully with the requirements of the Contract Documents and that the item will operate in the manner specified.
- D. Submit certified copies of the manufacturer's test data and interpreted results in accordance with the procedures identified in Section 01300, Submittals.

1.10. INSTALLATION OF EQUIPMENT

- A. Field modifications shall not be made without prior approval from Engineer.
- B. Provide all necessary guides, bearing plates, anchors, and attachment bolts, working drawings for installation, templates, and all other appurtenances necessary for the installation of the equipment specified.
- C. Anchor bolts shall be of size and strength suitable for purpose intended and shall be in accordance with Section 05500, Miscellaneous Fabrications, and the individual specification sections.
- D. Pipe sleeves or other means of adjusting anchor bolts shall be provided where indicated and where needed. Equipment shall be leveled by first using sitting nuts on the anchor bolts and then filling the space between the equipment base and concrete pedestal with grout. Where equipment bases (i.e., pumps) are installed with grout holes, those bases shall be totally filled with grout after successful completion of Functional Testing and prior to System Demonstration Testing.
- E. Provide equipment and housekeeping pads for equipment in accordance with the Drawings.
- F. Equipment pads shall be provided by the General Contractor. Coordinate with other Contractors before pad placement to confirm dimensions, location and anchor requirements.
- G. Water supply and drain piping connection shall be provided by the Plumbing Contractor.

1.11. SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. Arrange for the equipment manufacturer to furnish the services of a qualified representative where specified in the Schedule of Manufacturer's Services and the individual Specification sections. The manufacturer's representative shall visit the Site as many times as needed to fulfill its obligations required by the Contract Documents. The minimum number of days required for manufacturer services is listed in the Schedule of Manufacturer's Services.
- B. Contractor shall be responsible for any additional time required for the manufacturer's representative to resolve equipment installation and/or operation problems due to a lack of

coordination between the supplied equipment and the Contract Documents such as, but not limited to, dimensions, electrical problems or performance.

- C. Arrange for the equipment representative to visit the site on occasions after startup and during the first year of operation if required by the individual Specification sections. The purpose of these visits shall be to review equipment operation, assist the operators in correcting operational problems and basic inspection of the equipment.
- D. Manufacturer's representative shall assist and supervise Contractor during installation, testing, and operation of equipment where specified in the Schedule of Manufacturer's Services and the individual specification sections.
- E. Manufacturer's representative shall provide all certificates specified in the Manufacturer's Services and the individual specification sections.
 - 1. Installation Certificate - Submit one copy to both Owner and Engineer of manufacturer representative's Installation Certificate indicating that the manufacturer's representative has inspected the installation and that the equipment provided by their organization has been properly installed, aligned, lubricated, and is ready for operation.
 - 2. Certification of Equipment Compliance - Submit one copy to both Owner and Engineer of manufacturer representative's written Certification of Equipment Compliance indicating that the manufacturer's representative has witnessed the Functional Test for the equipment provided by their organization, final adjustments to the equipment have been made, the equipment has been tested to their satisfaction, and the equipment meets all performance and testing requirements included in the Contract Documents, excluding testing to be performed either during or after Startup.
- F. Testing Reports
 - 1. Functional Test Reports - Submit one copy to both Owner and Engineer of manufacturer representative's written Functional Test reports including performance test results unless otherwise noted.
 - 2. Performance Testing During or After Startup - When the Contract Documents require performance testing to be conducted during or after Startup, submit one copy of performance test results with an updated Certification of Equipment Compliance as previously specified.
- G. Training
 - 1. Manufacturer shall provide services of qualified, factory trained, operations and maintenance personnel to instruct Owner personnel in proper care, operation, and maintenance of equipment. At a minimum, training shall include:
 - a. Theory of operation
 - b. Actual operation
 - c. Mechanical maintenance
 - d. Electrical maintenance
 - e. Instrumentation and alarms

- f. Optimization of operation
 - g. Safe operating and working practices and operation of safety devices
 - h. Troubleshooting
 - i. Demonstration of equipment startup procedures, operation, and shutdown procedures using equipment installed under this contract.
2. Training sessions shall be conducted at the site on weekdays between the hours of 8:00 a.m. and 2:00 p.m. Actual times, locations, and durations of training sessions shall be approved by Owner.
 3. Trainer shall provide all materials and training manuals required for training in quantities required by Owner.
 4. Contractor shall hire a professional video production firm to digitally record and produce video from all training sessions. All videos shall be clear in picture and sound quality and free from shake or vibration. Videos should be edited to include dates of training, subject matter, trainer's name and affiliation, and length of video on the title credits and shall be edited to remove any gaps from the program. Unacceptable training videos should be rerecorded and reproduced.
 5. Provide one digital DVD recording of each training session to both Owner and Engineer. DVDs and cases shall be labeled with project name, equipment description, date of training, trainer's name and affiliation.
 6. Trainer shall develop a written report for each training session. At a minimum, reports shall summarize training sessions, indicate any problems that may have been encountered during operation of equipment, and include a sign-in sheet identifying all attendees. Contractor shall submit one copy of each training report to both Owner and Engineer.

1.12. OPERATION AND MAINTENANCE MANUALS

A. General

1. Submit operation and maintenance manuals as required by the Schedule of Manufacturer's Services, and the individual specification sections in accordance with the procedures identified in Section 01300, Submittals.
2. Prior to completion of the work, and at least 30 days prior to the 50 percent payment, submit for Engineer's review three copies of all preliminary draft operation and maintenance manuals. Preliminary draft operations and maintenance manuals may be submitted separately for individual items.
3. Prior to completion of the Work, and at least 60 days prior to the 85 percent payment, submit for Engineer's review three copies of all final draft operation and maintenance manuals. Preliminary draft operations and maintenance manuals may be submitted separately for individual items.
 - a. All comments generated by Engineer during review of preliminary draft operation and maintenance manuals must be adequately addressed prior to submission of final draft operation and maintenance manuals. Final draft operation and maintenance manuals shall be complete in their entirety

except for specific information related to testing and startup. Final draft operations and maintenance manuals must be approved by Engineer prior to the following:

- 1) Training of associated items.
 - 2) System Demonstration Testing.
4. Prior to final payment, provide five copies of the final operation and maintenance manual. The final operation and maintenance manual shall include all required operations and maintenance information consolidated into one manual with multiple volumes. The final operation and maintenance manual shall include testing and Startup results where applicable.
- B. Manual Preparation - Manuals shall include operation and maintenance information on all systems and items of equipment. The data shall consist of catalogs, brochures, bulletins, charts, schedules, approved Shop Drawings corrected to as-built conditions and assembly drawings and wiring diagrams describing location, operation, maintenance, lubrication, operating weight, lubrication charts and schedules showing manufacturer's recommended lubricants for each rotating or reciprocating unit, and other information necessary for Owner to establish effective operating and maintenance programs. The following shall also be included:
1. Title page giving name and location of facility, Drawing number where shown, and Specification section where described.
 2. Equipment cover sheet listing the supplied equipment manufacturer's name, brand name, model numbers, serial numbers, equipment installer (provide contact name, address, phone and fax numbers, and e-mail address), equipment Supplier (provide contact name, address, phone and fax numbers, and e-mail address), and equipment manufacturer (provide contact name, address, phone and fax numbers, e-mail address, and website address),
 3. Performance curves for all pumps and equipment.
 4. Approved shop drawings of each piece of equipment.
 5. Manufacturer's cut sheets and dimensional drawings of each piece of equipment, and details of all replacement parts.
 6. Manufacturer's erection, operation, and maintenance instructions for all equipment and apparatus, and complete listing of nameplate data.
 7. Complete electrical and control schematics with labeled terminations for all individual pieces of equipment and systems including one line diagrams, schematic or elementary diagrams, and interconnection and terminal board identification diagrams.
 8. Complete piping and interconnecting drawings.
 9. Complete parts list with parts assembly drawings (preferably by exploded view), names and addresses of spare parts suppliers, recommended list of spare parts to be kept "in stock" and sample order forms. Lead time requirements for ordering parts shall be estimated.

10. Instructions with easily understood schematics or diagrams for disassembling and assembling equipment for overhaul and repair.
11. Shop testing results where applicable.
12. Manufacturer's Installation Certificate.
13. Manufacturer's Certificate of Equipment Compliance.
14. Field testing/performance reports where applicable.
15. Manufacturer's equipment warranty.
16. Information not applicable to a specific piece of equipment installed on this Project shall be removed from or crossed out on the submissions.
17. Illegible data due to any cause, including poor copy quality or reduction, will not be accepted. Manuals with illegible data will be rejected and returned for correction.

C. Organization - O&M manuals shall be organized as follows:

1. All instructions shall be bound into a series of identical three or four inch, heavy-duty, three ring binders, all black covers with transparent exterior leaves for inserting cover pages. Where necessary, more than one binder may be used to assemble the data. When two or more binders are used, each book or volume shall be titled to indicate its particular book or volume number and the total number of volumes per set (i.e., Volume 2 of 12). The Contractor shall plan manual content and shall "break" the data between volumes at reasonable locations so no loss in continuity of data presentation occurs.
2. Information shall be organized by Specification section, each covering an individual equipment item.
3. Sections shall be listed in a Table of Contents at the front of each volume.
4. Binders shall be Vernon Line Royal No. R-6372 or R-372, Sparco Brand Slanted Ring Presentation Binder 68140, Universal D-Ring View Binder 20747, K&M Division VS11-40, or equal. Pages shall be linen reinforced on the binding edge.
5. Shop drawings 24 inches by 36 inches in size shall be folded to approximately 12 inches by 9 inches with drawing title box exposed along either edge. Shop Drawings descriptive of a single item of equipment shall be grouped together. All Shop Drawings shall be placed in accordion-type folders similar to File Pocket No. 74CG (9-1/2 inches by 14-3/4 inches) as manufactured by the Cooke and Cobb Company, or equal, and fully indexed on the outside of the folders in a neat and uniform manner.
6. All shop drawings included in the binders and/or folders shall be those previously submitted for review and approval and shall bear Engineer's stamp of approval and comments as originally noted thereon.

D. Electronic Operations and Maintenance Data

1. In addition to the specified printed operations and maintenance materials, furnish all specified operations and maintenance materials in electronic format with the final

draft operations and maintenance manual submittals. prior to Substantial Completion. Electronic equipment manual files shall be submitted in Adobe Acrobat Reader (.PDF) format.

2. Electronic files shall be submitted on one or more compact disks (650 MB CD). Two sets of compact disks shall be provided, one for Owner and one for Engineer. CDs and covers shall be labeled with the project name, supplier, equipment identification, and Specification section. CDs shall be provided in individual hard plastic cases.

1.13. LUBRICATION

- A. Retain the services of a qualified lubrication specialist, acceptable to Owner, to review the lubrication and maintenance instructions and schedules provided by the various equipment manufacturers. The lubrication specialist shall represent a major oil company and shall have an office within a 40-mile radius of the site.
- B. Arrange for the lubrication specialist to prepare revised lubrication schedules for all equipment utilizing lubricants from as few companies as possible (preferably single source).
- C. Include revised lubrication schedule(s) in final Operation and Maintenance Manuals.

1.14. GUARANTEES

- A. Manufacturer Warranties During Correction Period
 1. Where indicated in the individual specification sections, provide a one year manufacturer warranty made out in the name of the Owner, coinciding with the correction period defined in General Conditions Article 13.07.A for the particular piece of equipment.
 2. One copy of each manufacturer warranty shall be provided to both Owner and Engineer within 30 days of successful completion of startup.
 3. All requirements of the of the correction period defined in General Conditions Article 13.07 shall apply to the manufacturer's warranty and the equipment supplier obligations shall be the same as Contractor obligations defined in General Conditions Article 13.07 for the particular piece of equipment covered by the warranty.
- B. Special Guarantees - Provide both Owner and Engineer one copy of special guarantees required in individual specification sections. Special guarantees shall be made out in the Owner's name.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

SCHEDULE OF EQUIPMENT TESTING AND MANUFACTURER'S SERVICES

EQUIPMENT ITEM	SPEC. SECTION	PERFORMANCE AFFIDAVIT	SHOP TESTS	FIELD TESTS	CERT.	SERVICES OF MANUFACTURERS' REPRESENTATIVE ⁽¹⁾			OPERATION & MAINTENANCE MANUAL
						INSTALLATION DAYS	FINAL ACCEPTANCE DAYS	INSTRUCTIONS DAYS	
Submersible Grinder Pump Station	11310	Yes	Yes	Yes	Yes	2	2	1/2	Yes
Dry Pit Submersible Horizontal Centrifugal Pumps	11320	Yes	Yes	Yes	Yes	2	2	1/2	Yes
Channel Grinder	11330	Yes	No	Yes	Yes	1/2	1/2	1/2	Yes
Axial Fans	15865	No	No	Yes	No	1/4	1/4	1/4	Yes
Power Ventilators	15870	No	No	Yes	No	1/2	--	--	Yes
HVAC Controls and Sequence of Operations	15985	No	No	Yes	No	1/2	1/2	1/2	Yes
Transfer Switches	16497	Yes	Yes	Yes	Yes	1/2	1/2	1/2	No
Packaged Engine Generator System - Diesel Outdoors	16235	Yes	Yes	Yes	Yes	1/4	1/4	1/4	Yes

(1) All times are actual on-site times and represent minimum requirements.

END OF SECTION

SECTION 01660

TESTING AND STARTUP

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Definitions
- B. Submittals
- C. Preliminary Field Testing
- D. Functional Testing
- E. System Demonstration Testing
- F. Startup
- G. Meeting

1.02. DEFINITIONS

- A. System - The combination of Subsystems that will collectively undergo sequential System Demonstration Testing, Startup, and delivery to the Owner. Each System includes all components necessary for that System to function as intended, including structural/architectural components, HVAC, plumbing, process equipment, piping, power, automated controls, life safety, etc.
- B. Subsystem - The multiple components of a System. Subsystems are generally defined as unit processes and support systems, including structural/architectural components, HVAC, plumbing, process equipment, piping, power, automated controls, life safety, etc
- C. System Delivery Plan - Contractor's schedule for delivering Systems to the Owner.
- D. Preliminary Field Test - Field test to demonstrate that equipment is properly installed and ready for operation.
- E. Functional Test - Field test to demonstrate successful operation and performance of equipment in all intended modes of operation, including operation from remote devices.
- F. System Demonstration Testing - Continuous successful operation of a System in its entirety utilizing a testing fluid prescribed by the Owner for seven consecutive days prior to Startup of that System.
- G. Startup - Continuous successful online operation of a System in its entirety utilizing actual process fluid and at actual service conditions for seven consecutive days prior to delivery of that System to the Owner.

1.03. SUBMITTALS

A. Functional Testing Plans

- a. Submit at least 30 days prior to proposed Functional Testing date in accordance with procedures identified in Section 01300, Submittals.
- b. Submit individual plans for each piece of equipment requiring a Functional Test.
- c. Coordinate with Owner to determine testing fluid sources and include in Functional Testing Plans.

B. System Demonstration Testing and Startup Plans

1. Submit a minimum of thirty days prior to proposed System Demonstration Test date in accordance with procedures identified in Section 01300, Submittals.
2. Identify all testing media sources and disposal locations including testing fluid, sludge, utility water, chemicals, process air, instrument air, etc. for both System Demonstration Testing, and Startup.
3. Identify all instrumentation and recording devices required to complete testing.
4. Identify days during which the manufacturer's representatives will be on site.

1.04. GENERAL

A. Provide a minimum of fourteen days notice to the Owner and Engineer prior to all testing. The Owner and Engineer reserve the right to witness all testing.

B. Materials, Supplies, and Utilities

1. Owner Furnished - None.
2. Contractor Furnished
 - a. All required tools, materials, and spare parts.
 - b. All required instrumentation and monitoring devices, including temporary devices required for testing (i.e. flowmeters, pressure gauges, level sensors, etc.)
 - c. All required fuel, lubricants, energy, equipment, and instruments.
 - d. All required utilities not furnished by the Owner.
 - e. All required chemicals.
 - f. Provide means to convey designated testing fluid to testing location and to disposal location unless otherwise indicated, including all temporary facilities required (i.e. pumps, piping, etc.).

- C. Connection to Existing Equipment and Facilities - Test all equipment and facilities to ensure that they are in operating condition before the final tie-ins are made which connect new equipment and facilities to existing equipment and facilities.

1.05. PRELIMINARY FIELD TESTING

- A. Demonstrate the following:
 - 1. Equipment is permanently installed in the correct location and orientation.
 - 2. Equipment is properly adjusted, aligned, and lubricated.
 - 3. Equipment is prepared for operation in strict accordance with the Contract Documents and with manufacturer's recommendations.
- B. Make all changes, adjustments and replacements required to comply with the requirements of the Contract Documents.
- C. Preliminary field testing shall be witnessed by the manufacturer's representative where required by individual Specification sections.
- D. Prerequisites:
 - 1. Accepted System Delivery Plan.
 - 2. Permanent power has been connected and unit is ready for operation.

1.06. FUNCTIONAL TESTING

- A. At a minimum, Functional Tests shall include the following:
 - 1. Verification that equipment meets the specified performance requirements in every detail and performs its intended function without any unusual vibration, noise or other signs of possible malfunction. Unless specifically identified otherwise in individual Specification sections, all performance testing shall be conducted during Functional Testing.
 - 2. Motor testing where required.
 - 3. Vibration testing where required.
 - 4. Demonstration of successful operation in all control modes including from remote devices.
 - 5. Demonstration of successful operation in all control modes including all remote devices.
- B. Prerequisites
 - 1. Accepted Functional Testing plan.
 - 2. Preliminary Field Testing.
 - 3. Manufacturer's Installation Certificate.

4. Final Draft Operations and Maintenance Manual.
5. Testing fluid shall be non-potable water or treated plant effluent unless otherwise required by Owner.

1.07. STARTUP

- A. Operate System under Owner's direction demonstrating all modes of operations. This shall include, when practical, simulation of extreme conditions so as to check the response of instrumentation and control devices, bypass functions, pumping cycles, etc. Contractor shall be responsible for the complete operation of the System, including the positioning of valves, gates, switches, proper equipment devices, controls and associated components furnished and/or installed under this Contract. Owner will provide operation of all existing treatment plant components and provide all required sampling and laboratory testing required for operation of System during Startup unless otherwise specified.
- B. During Startup, Owner will operate the System under actual operating conditions and test for successful operation in the various operating modes required by the Contract Documents under the direction and responsibility of the Contractor. Owner will provide all required sampling and laboratory testing required for operation of System during Startup unless otherwise noted.
 1. Provide the following support to Owner:
 - a. Routine maintenance of new equipment and devices.
 - b. Non-routine operations and maintenance, such as cleaning clogged pumps, etc.
 - c. Notify Owner prior to performing actions related to Startup or shutdown of Systems including, but not limited to, valve and gate operation, electrical shutdown, change in process flow configuration, etc.
- C. If any component of the System fails to operate in accordance with the Contract Documents during Startup, provide all necessary all repairs, maintenance, replacement of parts, corrections, adjustments, and other actions necessary to restore proper operation of the System. Required adjustments to equipment shall be made by a qualified manufacturer's representative. After the System is restored to proper operating conditions, restart the test. No credit will be given for operating time prior to System failures when calculating test durations. Examples of System failures include, but are not limited to the following:
 1. Tank overflows.
 2. Equipment failures and/or malfunctions.
 3. Instrumentation failures and/or malfunctions.
 4. Tank or piping failures and/or leakage.
 5. Loss of power to equipment and/or devices.
 6. Controls malfunctions.
- D. Upon successful completion of Startup, the System shall be delivered to the Owner for partial utilization.

E. Prerequisites

1. System Demonstration Testing.
2. Provide Owner with up-to-date record Drawings showing all components as they are installed. The record Drawings shall cover all major components of the System including power feed, control and alarm annunciation, and piping.
3. Seven days written notice prior to proposed actual beginning of Startup date. Startup cannot commence without Owner and Engineer acceptance of proposed actual beginning of Startup date

1.08. SYSTEM DEMONSTRATION TESTING AND STARTUP MEETINGS

A. At least seven days prior to the proposed start date for each System Demonstration Test, conduct a meeting with Owner and Engineer to review testing plans, finalize testing procedures, verify status of associated equipment and prerequisites, and coordinate all aspects of System Demonstration Testing and Startup. Representatives of the Owner, Engineer, and Contractor shall attend the conference.

B. Prerequisites:

1. Accepted System Demonstration Testing and Startup Plan.
2. Completion of all associated Functional Testing.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01700
RECORD DOCUMENTS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Closeout procedures.
- B. Record documents.

1.02. CLOSEOUT PROCEDURES

- A. Contract closeout procedures shall be in accordance with GC-14.07.

1.03. RECORD DOCUMENTS

- A. The following supplements the requirements of GC-6.12:
 - 1. Recording, keep, and monitor up to date record documents of work constructed in the field. Legibly mark in red ink or red pencil to show all changes in, or directly associated with, the work of this contract. Keep entire set or record documents current on a day-to-day basis. Record documents shall be kept on hand in the Contractor's field office and shall be available for periodic examination by Engineer upon request.
 - 2. Examples of annotations that could occur are as follows:
 - a. Change in location or elevation of structures.
 - b. Change in dimensions of structures.
 - c. Elimination of structures.
 - d. Unforeseen modifications to existing structures.
 - e. Relocation of equipment.
 - f. Additions to or expansion of structures.
 - g. Changes in mechanical trades components; (electrical, heating, ventilating, plumbing).
 - h. Measured location of internal utilities or mechanical trade items, which are to be concealed from view, referenced to visible and accessible features of the structure.
 - i. Change in location or elevations of Underground Facilities installed under this Contract.
 - j. Change in materials, such as pipe materials.
 - k. Relocation of existing underground facilities.

- I. Change in topographical contours of finished earth and paved surfaces.
 - m. Change in elevations of finished surfaces along route of installed Underground Facilities.
 - 3. Show measurement of pipeline location from edge of pavement, at a minimum of 100-foot intervals.
- B. At Substantial Completion, affix Contractor's red identification stamp to front cover of each set of record documents and label them as "Record Documents". One set of record documents shall be given to Engineer no later than 14 days after the date of Substantial Completion. Engineer will either approve record documents or return them to Contractor with comments. Contractor shall resubmit record documents until Engineer has no further comments. Affix Contractor's identification stamp, together with the label "Record Documents," as follows:
 - 1. On each Drawing, just above the Engineer's title block.
 - 2. On each Shop Drawing, just above the preparer's title block.
 - 3. On the front cover or front page of all other documents.
- C. Final payment to Contractor will not be considered until acceptable record documents have been turned over to Owner."

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 02030

DEMOLITION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Demolition and removal of site-related construction.
- B. Demolition and removal of architectural construction for minor remodeling of buildings.
- C. Demolition and removal of tanks, related structures, and residual tank contents.
- D. Demolition and removal of process equipment and piping.
- E. Demolition and removal of electrical construction.
- F. Demolition and removal of HVAC construction.
- G. Demolition and removal of plumbing construction.

1.02. RELATED SECTIONS

- A. Section 01010 - SUMMARY OF WORK: Work sequence. Owner's continued occupancy.
- B. Section 01039 - COORDINATION: Alteration project procedures, cutting and patching.
- C. Section 01300 - SUBMITTALS
- D. Section 01500 - TEMPORARY FACILITIES: Temporary enclosures, dust control, barricades, security at Owner-occupied areas, and cleanup during demolition operations.
- E. Section 01700 - RECORD DOCUMENTS
- F. Section 02223 - BACKFILLING: Fill material.
- G. Section 09900 - PAINTING

1.03. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Shop Drawings
 - 1. Submit proposed demolition plan together with any necessary diagrams and/or drawings, taking into account Owner's continuing occupancy and sequence of construction of the project.
 - 2. Demolition plan shall include the following:
 - a. Demolition, removal, and disposition of items identified in this Section.
 - b. Disposal locations of removed items.

- c. Relocation of salvageable items.
- d. Temporary storage of items to be reused.
- e. Time lines and sequences of operations.
- f. Location of temporary barricades, fences, and signs.
- g. Provisions for disposal of sludge, grit, debris, and hazardous materials (if any).

1.04. PROJECT RECORD DRAWINGS AND PHOTOGRAPHS

- A. Submit under provisions of Section 01700, Record Documents.
- B. Accurately record actual locations of capped utilities, and subsurface obstructions.
- C. Furnish services of commercial photographer to take, develop, and produce such 8-inch by 10-inch prints of those items designated by Owner, prior to their scheduled demolition, removal, or relocation.
 - 1. Produce and submit photographs in accordance with requirements of Section 01300, Submittals.
 - 2. Allowance for number of acceptable photographs is included in the allowance stated for construction photographs under Section 01300, Submittals. Unacceptable photographs will not be charged against the allowance total.

1.05. REGULATORY REQUIREMENTS

- A. Conform to applicable codes for demolition of structures, protection of adjacent structures, dust control, runoff control, and disposal of materials.
- B. Obtain required permits from authorities.
- C. Notify affected utility companies before starting demolition operations and comply with their requirements.
- D. Do not close or obstruct roadways, sidewalks, hydrants, and parking areas without required permits.
- E. Conform to applicable regulatory procedures if a hazardous environmental condition is encountered at site or if hazardous material disposal is required.

1.06. HAZARDOUS ENVIRONMENTAL CONDITIONS

- A. If an unknown unforeseeable hazardous environmental condition is encountered at the site, or if Contractor or anyone for whom Contractor is responsible creates a hazardous environmental condition, immediately:
 - 1. Secure or otherwise isolate such condition;
 - 2. Stop all work in connection with such condition and in any area affected thereby; and
 - 3. Notify Owner and Engineer (and promptly thereafter confirm such notice in writing).

- B. Resume work in connection with such condition or in any affected area only after Owner has obtained any required permits related thereto and delivered to Contractor a written notice specifying under what special conditions work may be resumed safely.

1.07. SEQUENCING

- A. Sequence demolition work to conform with provisions of Section 01010, Summary of Work.

PART 2 PRODUCTS

2.01. FILL MATERIALS

- A. Fill Material - Type A as specified in Section 02223.

PART 3 EXECUTION

3.01. PREPARATION

- A. Thirty days prior to performing any demolition, there shall be a coordination meeting between the Contractor, Owner, and Engineer to discuss the Contractor's Demolition Plan and related procedures. Items to be discussed shall be, but not limited to, dust control, sequence of work, removal of material, protection of existing equipment, access and egress of material, etc. Demolition procedures must be coordinated with the Owner's operating personnel and operations, and adjusted accordingly, if necessary.

Following the coordination meeting, begin demolition operations after obtaining written authorization to proceed from the Owner.

- B. Notify Owner and Engineer at least 48 hours in advance of intended start of demolition operations in each affected area.
- C. Provide, erect, and maintain temporary barriers, signs, and security devices.
- D. Erect and maintain temporary partitions and weatherproof closures to prevent spread of dust, odors, and noise in areas of continued Owner occupancy identified in Section 01010, Summary of Work.
- E. Protect existing structures, equipment, appurtenances, architectural features, and materials which are not to be demolished. Prevent movement or settlement of adjacent structures.
- F. Protect existing site-related items such as pavements, walkways, parking areas, curbs, aprons, and landscaping features which are not to be demolished.
- G. Protect existing electrical; heating, ventilating, and air conditioning; and plumbing systems, including related components, which are not to be demolished.
- H. Mark location of underground utilities.

3.02. DEMOLITION REQUIREMENTS

- A. Confine demolition operations to designated areas of the site.

- B. Conduct operations to minimize interference with adjacent and occupied building areas. Maintain protected egress and access at all times.
- C. Cease operations immediately if adjacent structures appear to be in danger. Notify Engineer. Do not resume operations until directed.
- D. All materials, except rubble and non-metallic scrap, shall become the property of the Owner and be disposed of.
- E. Dispose of rubble and non-metallic scrap at an approved off-site location.
- F. Dispose of designated hazardous materials in accordance with the nature of the material, required handling and disposal procedures, regulatory requirements, and applicable permits.

3.03. DEMOLITION

- A. Break up and remove slabs-on-grade, pavements, curbs, aprons, etc., and related items in designated areas.
- B. Break up and remove foundation walls, footings, etc., including any below-grade concrete slabs, to a point 2 feet below grade.
- C. Break up and remove concrete structures and tanks, including walls, piers, base slabs, cover slabs, etc.
- D. Empty and remove buried tanks, meter pits, and associated piping.
- E. Backfill, compact, and rough grade areas excavated, including cavities created by removal of demolished items, in accordance with Section 02223 using fill material specified in Part 2.
- F. Disconnect cap, and identify utilities within demolition areas.
- G. Remove designated buried sewer and storm drain piping systems, capping with concrete plugs those segments to be abandoned, and provide temporary capping of those segments to be reused.
- H. Disconnect and remove designated process piping systems, including valves and fittings; provide temporary capping of those segments of the system to be reused. Plug openings in walls and floors where utilities are removed.
- I. Detach, dismantle, and remove metal components of process equipment from designated tanks, including miscellaneous metal work items associated with access to and operation of such equipment.
- J. Carefully disconnect support, protect, and remove designated equipment to be reused on the project or salvaged for Owner's future use.
- K. All removed materials and equipment designated for reuse on the project or salvaged for Owner's future use shall be stored at locations protected from damage and from deterioration by weather.
- L. Remove and dispose of demolished materials as work progresses. Do not burn materials; do not bury materials unless otherwise specified.

- M. Patch and refinish existing visible surfaces which are to remain in accordance with Section 01039, Coordination, and otherwise restore adjacent surfaces as specified.
- N. Paint designated metal surfaces and reinforcing steel exposed by demolition operations, in accordance with Section 09900, Painting.
- O. Remove temporary barricades, partitions, signs, etc.
- P. Remove and dispose of residual materials such as grit, sludge, debris, trash, and other scrap.
- Q. Upon completion of demolition operations, leave areas in a clean condition.

ED OF SECTION

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Removal of surface debris, rubbish, snow and water without unnecessary excavation of topsoil and subsoil.
- B. Removal of paving, curbs, and walks.
- C. Removal of trees, shrubs, and other plant life.
- D. Removal of stumps and root system of trees and shrubs.
- E. Disposal of excess materials, trash, and debris.
- F. Topsoil excavation and stockpile reusable topsoil for later use.

1.02. RELATED SECTIONS

- A. Section 01500 - TEMPORARY FACILITIES
- B. Section 01564 - EROSION CONTROL
- C. Section 02112 - PAVEMENT CUTTING
- D. Section 02226 ROCK REMOVAL

1.03. REGULATORY AND DISPOSAL REQUIREMENTS

- A. Coordinate clearing work with utility companies.
- B. Conform to applicable local and state codes for environmental requirements, disposal of debris, burning debris on site, and stockpiling.
- C. On-site disposal of surplus materials, if permitted by the Owner, shall be as approved by the Engineer.
- D. Make all arrangements for disposal sites, unless the Owner designates special locations. All expenses for disposal shall be borne by the Contractor. Bidders shall carefully investigate all aspects of surplus material disposing operations.
- E. Prior to depositing surplus material at any off-site location, obtain a written agreement between Contractor and the owner of the property on which the disposal of the material is proposed. The agreement shall state that the owner of the property gives permission for the Contractor to enter and deposit material of a particular classification on the owner's property at no expense to the project Owner, and shall include any other conditions pertinent to the situation as agreed upon by each party. A copy of said agreement shall be furnished to the Owner.
- F. Follow standard horticultural practice for cutting and/or pruning of trees, brush, and shrubs.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Mark limits of clearing by flagging, fencing or other approved methods.
- C. Vehicles used to haul soft or wet material over streets or pavements shall be sufficiently watertight to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles of the Contractor, he shall clean up the same, and keep the crosswalks, street and pavements clean and free from debris.
- D. Identify on-site waste or salvage areas for placing removed materials.

3.02. PROTECTION

- A. Locate, identify, and protect existing utilities that are to remain, including notification of Underground Facilities Protection Organizations having jurisdiction in the geographic area (Dig Safely New York).
- B. Install temporary fences (minimum 3 feet high) to protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect bench marks, survey control points and existing structures from damage or displacement.
- D. Where trees are to be protected or preserved, no excavation and grubbing, except as directly required for construction, shall be performed within the radius of spread of tree branches.
- E. No storage of topsoil materials or construction equipment will be permitted within the radius of spread of such tree branches.

3.03. CLEARING

- A. Clear areas required for access to site and execution of work.
- B. Partially remove paving, curbs, as indicated. Neatly saw cut edges at right angle to surface.
- C. Remove trees and shrubs indicated. Remove stumps and main root ball.
- D. Clear undergrowth and deadwood without disturbing subsoil.
- E. Remove debris, extracted rock, and plant life.
- F. Prune branches and/or roots of trees to be preserved or where they interfere with or obstruct construction operations.
 - 1. If exposed, bend and relocate main lateral roots and tap roots.

2. Engage a state-certified arborist or qualified tree surgeon who shall cut roots and/or branches with sharp pruning instruments without breaking or chopping.
 3. Qualified personnel shall paint all cuts with standard tree paint or equivalent which is waterproof, antiseptic, elastic and free of kerosene, coal, tar, creosote, and other harmful substances.
 4. Where required, extend pruning procedures to restore the natural shape of the entire tree or shrub.
- G. Damaged Trees - Vegetation which has been damaged by site clearing activities and deemed non-functional by the Owner or Engineer, shall be replaced by the Contractor with vegetation of the same genus and species at Contractor's expense.

3.04. DISPOSAL OF MATERIAL

- A. All material shall be treated as surplus material and disposed of off-site in a legal manner per Article 1.03.

3.05. TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated re-landscaped, or re-graded without mixing with foreign materials.
- B. All topsoil, loam, or other natural organic materials covering such areas shall be removed; and when suitable for reuse as topsoil shall be stockpiled. Stockpiles shall be established only at approved locations and shall be maintained to prevent erosion and contamination until reuse. To prevent intermixing, topsoil shall not be stockpiled immediately adjacent to other stockpiled materials. All excavated materials shall be stockpiled at locations which will not create public endangerment or inconvenience. Stockpiles shall be kept clear of Fire Department and police facilities and equipment and, where possible, clear of driveways, sidewalks, and crossings.
- C. Stockpile in area designated on site to depth not exceeding 8 feet. Protect from erosion. Remove excess topsoil not being reused to a location designated by Owner.
- D. No topsoil shall be removed from the site without Owner's permission.

END OF SECTION

SECTION 02112
PAVEMENT CUTTING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Pavement cutting.
- B. Pavement scoring.
- C. Pavement (concrete) breaking.
- D. Pavement grinding.
- E. Pavement removal and disposal.

1.02. REFERENCES

- A. NYSDOT - Manual of Uniform Traffic Control Devices.

1.03. RELATED SECTIONS

- A. Section 01026 - LUMP SUM ITEMS: Requirements applicable to lump sum prices for the work of this section.
- B. Section 01500 - TEMPORARY FACILITIES
- C. Section 02110 - SITE CLEARING
- D. Section 02225 - TRENCHING

1.04. REGULATORY REQUIREMENTS

- A. Coordinate pavement cutting with utility companies.
- B. Conform to applicable local and state codes for legal disposal of pavement materials.
- C. Refer to Section 02110 for requirements of disposal of surplus material.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. PREPARATION

- A. Notify local officials, Fire and Police Departments of streets to be blocked off, detours or restrictions to maintaining of traffic on a daily basis.

- B. Set up barricades, warning signs and traffic direction information prior to start of pavement cutting.
- C. Provide flagmen to direct traffic.

3.02. PAVEMENT CUTTING AND BREAKING

- A. Pavements covering those areas to be excavated shall be broken up, removed, and then disposed of in accordance with Article 1.04 above. All paved areas shall be first cut or scored continuously along a straight line, parallel to and on each side of the centerline of the trench or excavation, at a width sufficient for the trench excavation or structure excavation.
- B. Pavement cuts in concrete pavement or pavement with a concrete base shall be made by scoring or cutting the concrete with a concrete saw. The depth of the saw cut shall be to the full depth of the concrete pavement thickness. Before excavation, the concrete pavement shall then be broken up with hand operated, pneumatic paving breakers, or mechanical drop hammers designed for such purpose, providing they may be used without endangering existing utilities or causing undesirable vibrations. "Headache balls" will not be permitted for breaking up concrete pavement.
- C. Pavements cuts in blacktop pavement shall be made by scoring or cutting the pavement with a concrete saw, wheel cutter, pneumatic paving breaker or drop hammer type pavement cutter. The pavement cut must be continuous, and made for the full depth of the pavement.
- D. Pavement cuts for final pavement replacement shall be made as outlined above. Pavement cuts shall be made parallel to the centerline of the trench, shall be located at a minimum of 12 inches outside the backfilled trench on undisturbed subgrade and shall be in a straight line for minimum length of 100 feet between manholes or between those stations where changes in direction of the installed piping were made. Where a full street width overlay is to be installed the cutbacks may follow the backfilled trench alignment. Loose, torn, cut, marked up or damaged pavement outside the cutback areas shall be removed and replaced at the Contractor's expense and match the proposed permanent paving.
- E. Pavement cuts in driveways shall be made in a straight alignment perpendicular or parallel to the driveway and for its full width.
- F. Pavement cuts in parking areas shall be made in a straight alignment parallel to the centerline of trench.

3.03. PAVEMENT GRINDING

- A. Where shown on the Contract Drawings, the Contractor shall remove a portion of an existing pavement including Portland cement concrete pavement, asphalt Portland cement concrete pavement base course, to the limits and profile specified by grinding, milling, or planing methods. This process shall yield a base upon which a final pavement course will be applied. The Contractor shall employ equipment especially designed and manufactured for the grinding, milling or planing of pavements.
- B. The resulting ground, milled or planed surface shall be thoroughly cleaned and free from dust, loose pavement material or other material. The surface shall be free from gouges, large cracks and unsound, soft or broken-up areas. Gouges from lack of proper control of the grinding, milling or planing machine shall be made level and true by the use of a trueing and leveling course of asphalt concrete if allowed by the Engineer. Cracks greater than 1/4 inch shall be cleaned and filled in accordance with NYSDOT Specification 633.302 referenced above. Unsound, soft or broken-up areas shall be excavated and repaired.

C. Contractor shall dispose of all asphalt concrete removed by grinding.

END OF SECTION

SECTION 02141
REMOVAL OF WATER

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Providing equipment, materials and labor required to successfully complete the work included in this section.
- B. Maintaining and operating pumps and related equipment, including standby equipment, of sufficient capacity to adequately perform dewatering as required by this section.
- C. Lowering the groundwater table elevation.
- D. Intercepting seepage from excavation slopes.
- E. Controlling groundwater flow that may adversely affect excavation or construction activities.
- F. Collecting, removing and disposing of all excess groundwater.
- G. Collecting, removing, and disposing of all wastewater.
- H. Removing and/or disposing of spoil, excess materials, equipment, trash and debris used for or resulting from the work included in this section.

1.02. RELATED SECTIONS

- A. Refer to Article 4 of the Supplementary Conditions for identification of report on subsurface investigation.
- B. Section 01026 - LUMP SUM ITEMS: Requirements applicable to lump sum prices for the works of this section.
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 01564 - EROSION CONTROL
- E. Section 02222 - EXCAVATING
- F. Section 02225 - TRENCHING

1.03. REGULATORY REQUIREMENTS

- A. Conform to applicable local and state codes for legal disposal of water.
- B. Temporary water supplies shall meet requirements of local, state, and federal regulatory agencies.
- C. Conform to applicable OSHA standards.

1.04. WELLPOINT DEWATERING SYSTEM

- A. If wellpoint dewatering methods are proposed by Contractor, he shall prepare a plan of dewatering system and discuss plan with Owner and Engineer. Review or comments by Owner and Engineer concerning the proposed plan shall not relieve Contractor of his responsibilities for dewatering his excavations in conformance with this section of the specifications.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. PREPARATION

- A. Conduct appropriate investigations and become familiar with the groundwater conditions at the site. Allocate sufficient time and use appropriate procedures based on these conditions for dewatering excavations.
- B. Arrange for water sampling and analysis of each water supply source which may be affected by dewatering operations and submit a copy of the results to the Engineer.
- C. Examine adjacent structures and utilities, both existing and under construction, for possible settlement, movement or other adverse effects resulting from dewatering methods or water removal. Take necessary precautionary steps to protect such structures and utilities.
- D. Should the drawdown of groundwater levels by removal or dewatering systems critically reduce or disrupt public or private water supplies, the Contractor shall be prepared to:
 - 1. Provide adequate potable water to the Owners or users of the affected water supplies until groundwater levels have recovered, so as to sufficiently restore those deficient water supplies.
 - 2. Provide to the Engineer documentation to confirm that temporary water supplies meet the requirements of local, state and federal regulatory agencies.

3.02. REMOVAL OF WATER

- A. Assume responsibility for site, surface and subsurface drainage. Maintain such drainage as specified herein during the life of the contract.
- B. Supply all supervision, labor, material, equipment, including standby equipment, necessary to maintain a dry excavation as may be necessary to construct the project.
- C. Maintain groundwater in or below the bearing strata at a safe level at all times by methods which prevent loss of fines, which preserves the undisturbed state of subgrade soils and which sufficiently lowers the groundwater level in permeable strata at or below excavation and fill levels such that blowing or unstable conditions do not develop in the bottom or sides of excavation or fill areas.
- D. Protect all adjacent structures, existing and under construction, from settlement, flotation, damage or other adverse effects resulting from water removal or dewatering methods.

- E. Install all drains, ditching, sluiceways, pumping and bailing equipment, wicking, sumps, wells, well points, cutoff trenches, curtains, sheeting and all other equipment and structures necessary to create and maintain a dry excavation and a groundwater level at a minimum of 2 feet below excavation subgrades.
 - 1. As part of any dewatering system, observation wells or piezometers shall be provided and installed, as required, to effectively and efficiently monitor drawdown to required levels.
- F. Discharge water removed from the site to natural watercourses, storm drains, or channels.
 - 1. Large quantities of water shall not be discharged as overland flow. Overland flow is not permitted onto private property.
 - 2. No unpolluted water shall be discharged to sanitary sewers.
 - 3. Wastewater shall be disposed of in a manner satisfactory to the local Public Health Officer.
- G. Dewatering operations shall cease when all foundations, structures, pipe installations and other excavated areas have been properly backfilled and compacted, and are safe from damage, flotation, settlement and displacement.

3.03. MAINTENANCE

- A. Operate and maintain dewatering and removal operations on a 24-hour basis for the time required to complete that portion of the work which requires dewatering prior to its construction and which requires protection from flotation or displacement of such Work until proper backfilling and compaction is completed.

3.04. REMOVAL

- A. After groundwater levels have returned to elevations appropriate for conditions and time of year, without causing damage to the work, remove all dewatering equipment and related equipment from the site and restore site to original conditions or rehabilitate site to meet requirements of Contract Documents.

END OF SECTION

SECTION 02205

PROTECTION OF EXISTING FACILITIES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Location of facilities.
- B. Notification of owners and authorities.
- C. Coordination and preparation.
- D. Protection of facilities.
- E. Relocation of facilities.
- F. Protection of sewers and storm drains.
- G. Protection of water mains near sewers.
- H. Abandonment of utilities.
- I. Restoration of property markers.

1.02. RELATED SECTIONS

- A. General Conditions: Article 4, Paragraphs 4.02, 4.03 and 4.04; Article 6, Paragraph 6.20.
- B. Section 01039 - COORDINATION: Preconstruction meeting.
- C. Section 01300 - SUBMITTALS: Construction photographs.
- D. Section 02225 – TRENCHING
- E. Section 02161 - SHEETING AND BRACING
- F. Section 02226 - ROCK REMOVAL

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. LOCATION OF FACILITIES

- A. Prior to construction, verify location of existing underground facilities near or adjacent to project.

1. Consult with appropriate Underground Facilities Protection Organization (Dig Safely New York) and owners of facilities and arrange for field stake-out or other markings to show locations.
 2. Perform exploratory excavation at key junctures and other critical points to aid in ascertaining locations.
- B. Report field stake-out findings and results of exploratory excavations to Engineer if possible changes in project location or design are indicated because of suspected interferences with existing facilities. Allow Engineer sufficient time to determine magnitude of changes and to formulate instructions in that regard.
- C. If location of an existing underground facility is uncertain, apply careful excavation and probing techniques during construction to locate and avoid damage to same.

3.02. NOTIFICATIONS OF OWNERS AND AUTHORITIES

- A. Prior to construction, notify owners of existing facilities, including local Police and Fire Departments, of general scope, nature and planned progress schedule of the Work.
- B. Notify owners of nearby underground facilities when excavating is to take place in a particular area, allowing them reasonable time to institute precautionary procedures or preventive measures which they deem necessary for protection of their facilities.
- C. When existing utilities, such as sewer, water, gas, telephone or electric power are damaged or disturbed during construction, immediately notify affected Owner and Project Owner.
- D. Notify Police and Fire Departments, including affected owners, immediately if hazardous conditions are created or have the potential for occurring, as a result of damage to an existing facility or as a result of other activities at project site. Hazardous conditions could be created from: fire, explosion, escape of gas, escape of fuel oil, gasoline or industrial fluids, downed electrical wires, and disrupted underground electrical cables.

3.03. COORDINATION AND PREPARATION

- A. Discuss anticipated work schedule with local authorities and owners of utilities at preconstruction meeting, including procedures to be followed if one or more utilities are damaged or disrupted. Develop contingency plans to address Contractor's role in repair of damaged utilities.
- B. Make preparations beforehand to repair and restore damaged utilities, including arrangements for standby materials and equipment to be promptly assembled at site and utilized immediately.
- C. Adjust work schedules and personnel assignments as necessary to conform with requirements of utility owner whose utility is to be temporarily interrupted during construction. Cooperate with utility owner in this regard to minimize the time of interruption.
- D. Make preparations for and conform to applicable requirements of New York State Industrial Code Rule 53 (as amended April 1, 1975) entitled, "Construction, Excavation and Demolition Operations at or Near Underground Facilities," issued by State Department of Labor.

3.04. PROTECTION OF FACILITIES

- A. Plan and conduct construction operations so that operation of existing facilities near or adjacent to the Work, including electric, telephone, sewer, water, gas or drainage utilities, are sustained insofar as the requirements of the project will permit.
- B. Protect existing facilities from damage or movement through installation of adequate support systems and use of proper equipment, including application of careful excavation and backfilling techniques in sensitive areas.
- C. Existing utilities and other facilities which are damaged by the Contractor's construction operations shall be promptly repaired by Contractor to the satisfaction of the affected owner or, if he so elects, that owner will perform the repairs with his own forces. Under either arrangement, such repair work shall be done at Contractor's expense.
- D. When aboveground visible facilities such as poles, wires, cables, fences, signs or structures constitute an unavoidable interference, notify Engineer and consult with affected owner regarding temporary removal and later restoration of the interfering item. Arrange with that owner to remove and later restore the interfering item to the satisfaction of the owner, subject to approval of the project Owner; or, allow affected owner to perform such work with his own forces. Under either arrangement, such work shall be done at Contractor's expense.
- E. Take all necessary precautions to prevent fires at or adjacent to the work, buildings, and other facilities. No burning of trash or debris is permitted. If permanent fire extinguishers are used, they shall be recharged and in "new" condition when turned over to Owner.

3.05. RELOCATION OF FACILITIES

- A. If the location or position of an existing gas or water pipe, public or private sewer or drain, conduit or structure be such as, in the opinion of Engineer, to require its removal, realignment or change, such alteration shall be without cost to the Contractor for the work of removal, realignment or change only.
- B. Uncovering, supporting and sustaining such facility before its removal or before and after its realignment or change, shall be the Contractor's responsibility as part of the work of his Contract.
- C. Contractor shall be entitled to extension of time for completion of entire Work as the Engineer determines that the entire Work was delayed by the removal, realignment or change of such obstruction.

3.06. PROTECTION OF SEWERS AND STORM DRAINS

- A. Where existing sanitary sewers or storm drain systems are being replaced or interrupted, provide temporary bypass pumping or piping to maintain flow around that segment of the Work such that no back-ups occur in existing systems.
- B. Existing sanitary sewer laterals damaged in the work or temporarily disconnected shall be restored to operation by the end of each work day. Existing sanitary sewer laterals crossing over new pipelines to be restored in accordance with details shown on the Drawings.
- C. Maintain existing manholes, catch basins, and other utility structures in their pre-work condition. Any material or debris entering same due to the Contractor's operation shall be promptly removed.

3.07. PROTECTION OF WATER MAINS NEAR SEWERS

- A. Where a minimum 10-foot horizontal separation or minimum 18 inch vertical separation (bottom of water pipe to top of sewer pipe) cannot be maintained between a water main and sewer line, one or more of the following remedies shall be incorporated in the work:
 - 1. The sewer lines shall be encased in 4,000 psi mix concrete for a length of 10 feet on either side of the water main.
 - 2. Both the water main and sewer line shall be constructed of pressure type joints of ductile iron pipe, and shall be pressure tested to 100 psi to assure watertightness.
 - 3. One full length of water main shall be centered over the sewer line, so that both joints will be as far from the sewer as possible.
 - 4. Relocate water main to obtain 18-inches minimum vertical separation.

3.08. ABANDONMENT OF UTILITIES

- A. Remove existing utilities to be abandoned within limits of trench excavation, or impinging on trench limits.
- B. Open ends of abandoned utilities, or those scheduled for abandonment, shall be bulkheaded by brick masonry or 4,000 psi mix concrete; or by cast iron plugs or caps in small diameter water mains.
- C. Abandoned sewers 36-inch diameter or larger shall be completely filled with sand or gravel or other approved material prior to bulkheading the open end(s).
- D. Abandoned manholes and water valve casings shall be backfilled to grade with approved trench backfill material.
- E. Frames, covers, grates, water valve casing, sections of water piping, hydrants (including standpipe and boot) valves and other items to be abandoned shall, if ordered by Owner, be salvaged for reuse and be delivered to Owner's property yard.

3.09. RESTORATION OF PROPERTY MARKERS

- A. Property corner markers, boundary monuments, etc., disturbed or moved by the Contractor's operation shall be restored, in conformance with the property deed description, by a licensed land surveyor. Restoration of the property corner markers or boundary monuments shall be certified by said surveyor on a map prepared by him which shows the work accomplished. One copy of the map shall be given to the property owner and one copy given to the project Owner.

END OF SECTION

SECTION 02222

EXCAVATING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Excavation for building foundations.
- B. Excavation for slabs-on-grade, paving, and landscaping.
- C. Excavation for site structures.

1.02. RELATED SECTIONS

- A. Section 01400 - QUALITY CONTROL: Inspection of bearing surfaces.
- B. Section 01500 - TEMPORARY FACILITIES: Barriers, water controls, erosion and sediment controls.
- C. Section 02205 - PROTECTION OF EXISTING FACILITIES.
- D. Section 02110 - SITE CLEARING: Topsoil excavation.
- E. Section 02223 - BACKFILLING
- F. Section 02225 - TRENCHING: Excavation and backfilling for underground utilities.
- G. Section 02226 - ROCK REMOVAL

1.03. FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as indicated.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Notify utility company to remove and relocate utilities as required.
- D. Protect above- and below-grade utilities which are to remain.

- E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- F. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- G. Excavations shall be in complete accordance with all details of applicable codes, rules, and regulations including all local, state, and federal regulations including the Occupational Safety and Health Administration (OSHA) Title 29 Code of Federal Regulations Part 1926, Subpart P - Excavations and Trenching Standards. Contractor shall designate a "Competent Person" [29 CFR 1926.32(f)] who shall be responsible for inspections of excavations on a daily basis and document and maintain daily trenching and excavation logs per OSHA 29 CFR 1926.

3.02. CLASSIFICATION OF EXCAVATED MATERIAL

- A. Classifications of excavated materials are as follows:
 - 1. Unclassified Excavation - "Unclassified excavation" shall include all material excavated within the authorized lines and grades prescribed in the Drawings. Unclassified excavation shall include "rock excavation" as well as "common excavation" as defined herein.
 - 2. Common Excavation - "Common excavation" shall include all excavation except "rock excavation." All unconsolidated and non-indurated material, rippable rock, loose rock, soft mineral matter, weathered rock or saprolite, and soft or friable shale which is removable with normal earth excavation equipment shall be considered "common excavation." All boulders and detached pieces of solid rock or concrete or masonry less than 1 cubic yard in volume shall be classified as "common excavation."
 - 3. Rock Excavation - "Rock excavation" shall include all sound solid masses, layers and ledges of consolidated and indurated rock or mineral matter of such hardness, durability and/or texture that it is not rippable or cannot be excavated with normal earth excavation equipment. Should a conflict arise as to the classification of excavation as either "common" or "rock," the following test shall be used in the appropriate determination:
 - a. Where practicable, a late model tractor mounted hydraulic ripper equipped with a one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler-type tractor rated between 210 and 240 net fly-wheel horsepower, operating in low gear, shall be utilized. Should the suspect material not be effectively loosened or broken down by ripping in a single pass with the aforementioned ripper, the material shall be classified as "rock."
 - b. In situations where interbedded strata of "common excavation" material and "rock excavation" material are encountered in the same excavation, the individual classification of those materials shall be made on an average percentage basis of the occurrence of those materials as measured in stratigraphic sections and as approved by the Engineer.
 - c. When rock is encountered in excavations, it shall be removed by blasting methods, jackhammering or any other method suitable and safe considering the proximity of existing utilities or facilities.
 - 4. For this project all excavated material shall be classified as unclassified excavation.

3.03. EXCAVATING

- A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, and site structures.
- C. Machine-slope banks to angle which is safe for specific material in which excavation is made.
- D. Excavation cut not to interfere with normal 45-degree bearing splay of foundation. Undercutting of excavation faces will not be permitted.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Hand trim excavation to required undisturbed subgrade. Remove loose matter.
- G. Remove lumped subsoil, boulders, and rock under 1 cubic yard, measured by volume. Refill voids with Mix "C" concrete or compacted gravel/crushed stone.
- H. Notify Engineer of unexpected subsurface conditions, or of questionable soils encountered at required subgrade elevations, and discontinue work in area until notified to resume operations.
- I. Should the Contractor, through negligence or otherwise carry his excavation below the designated subgrade, Mix "C" concrete or such other materials as may be approved by the Engineer, shall be furnished and placed as backfill in sufficient quantities to reestablish the designated subgrade surface. Granular material used for backfilling shall be spread and compacted in conformance with the requirements of Section 02223, and to the percentage compaction outlined therein. The cost of this refilling operation, including any tests associated therewith, shall be borne by Contractor.
- J. Stockpile excavated material in area designated on-site and remove excess material not being reused, from site.

3.04. DISPOSAL OF MATERIAL

- A. All excavated material except reusable topsoil or reusable fill shall be classified as surplus material and disposed of off-site unless Owner designates an on-site location.
- B. On-site disposal of surplus material will be allowed only at locations designated by Owner and approved by Engineer. Reuse of excavated material as on-site fill shall conform with Section 02223, Backfilling.
- C. Make all arrangements for disposal sites, unless the Owner designates special locations. All expenses for disposal shall be borne by the Contractor. Bidders shall carefully investigate all aspects of surplus material disposing operations.
- D. Prior to depositing surplus material at any off-site location, obtain a written agreement between Contractor and the owner of the property on which the disposal of the material is proposed. The agreement shall state that the owner of the property gives permission for the Contractor to enter and deposit material of a particular classification on the owner's property at no expense to the project Owner, and shall include any other conditions pertinent to the situation as agreed upon by each party. A copy of said agreement shall be furnished to the Owner.

3.05. FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01400, Quality Control.
- B. Provide for visual inspection of bearing surfaces.

3.06. PROTECTION

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.
- C. Exposed subgrade surfaces shall remain undisturbed, drained, and maintained as uniform, plane areas, shaped to receive the foundation components of the building or structure.

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Building perimeter and site structure backfilling to subgrade elevations.
- B. Site filling and backfilling.
- C. Fill under slabs on grade and paving.
- D. Classification of materials.
- E. Consolidation and compaction.

1.02. RELATED SECTIONS

- A. Section 01400 QUALITY CONTROL: Testing fill materials.
- B. Section 01500 - TEMPORARY FACILITIES
- C. Section 02110 - SITE CLEARING
- D. Section 02222 EXCAVATING
- E. Section 02228 - COMPACTION

1.03. REFERENCES

- A. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates
- B. ASTM D1556 - Density of Soil in Place by Sand-Cone Method
- C. ASTM D1557 - Laboratory Compaction of Soil Using Modified Effort
- D. ASTM D2922 - Density of Soil in Place by Nuclear Methods
- E. ASTM D3017 - Water Content of Soil in Place by Nuclear Methods

1.04. SUBMITTALS

- A. Granular Materials
 - 1. Granular materials required for filling, backfilling, subbase and other purposes shall be as shown on the Drawings. Prior to bidding, prospective contractors shall familiarize themselves with the available quantities of approved on-site and off-site materials.
 - 2. For each on-site or off-site material proposed, furnish to Engineer for approval a certified gradation analysis at least 10 days prior to date of anticipated use of such material. Except as specified herein, only off-site approved materials shall be utilized.

3. The Engineer reserves the right to inspect proposed source of off-site granular material and to order such tests of the materials as he deems necessary to ascertain its quality and graduation of particle size. The Contractor shall, at his own expense, engage an approved testing laboratory to perform such test, and submit certified test results to the Engineer. If similar tests of the material from a particular source were performed previously, submit results of these tests to the Engineer for consideration.
4. No granular materials shall be used on this project for fill, backfill, subbase, or other purpose until approval is obtained from the Engineer, and only material from approved sources shall be used.

B. Geotextile Fabrics

1. Submit a 1 square foot sample of each geotextile to be used.
2. Submit manufacturer's specifications of average roll characteristics for standards ASTM geotextile tests for each geotextile to be used.

PART 2 PRODUCTS

2.01. ON-SITE MATERIALS

- A. Type A, Excavated Material - Material under this classification shall be derived solely from excavations necessary to construct the project to the lines and grades specified. If the excavated material on-site is approved for reuse and is suitable, it shall be used for filling or backfilling purposes. If he so elects, the Contractor may, at his own expense, substitute other types of material in place of Type A material, provided such substitution is approved in advance by the Engineer. All replaced or surplus material shall be disposed of as outlined in Section 02110.
1. Unclassified Excavated Material
 - a. Type A-1 - Referred to as "excavated material" and from which all frozen material, boulders, trash, foreign debris, and material greater than 6 inches in any dimension has been removed. Approved Type A-1 material shall be used for all backfilling except under structures.
 - b. Type A-2 - Referred to as "select excavated material" and from which all frozen material, humus, peat, roots, vegetation, ashes, trash, debris, and rocks or stones greater than 2 inches in any dimension have been removed.
 2. Classified Excavated Material - Where the Contract Documents allow the reuse of excavated on-site materials as a substitute for off-site sources of Type "B" gravel or Type "C" sands, the minimum requirements for each of those excavated materials shall be the same as required for the equivalent off-site material. If such materials are used, submit for approval in writing the proposed methods of excavation, location of stockpiles, quantities of required sand and gravels, estimated excavation quantities and proposed excavation limits within the accepted excavation area. Provide a demonstration at least 10 days prior to commencement of excavation that the methods will provide consistent quantity and quality of material as specified for Type "B" gravels and Type "C" sands. The Engineer will require subsurface investigations, sampling, and testing to confirm the extent and quality of the proposed material. Cost of all investigations, sampling, and testing shall be the Contractor's responsibility.

B. Type E - Borrow Material

1. "Borrow material" is defined as approved on-site material required for fill or backfill in excess of the quantity of available approved material designated as Type "A" material.
2. No such borrow material shall be used on this project unless specified in the Contract Documents and except within the limits of borrow areas designated on the Drawings.
3. Approval of all borrow material must be obtained from the Engineer, and only material from approved sources shall be used.
4. Use of designated borrow areas shall be subject to the approval of the Engineer and Owner at all times. Test pits and analyses of borrow material shall be provided as required by the Engineer for each borrow area and at the expense of the Contractor. In addition, the Engineer may require full excavation and restoration plans for each borrow area. All borrow areas shall be stripped of topsoil and organic materials far enough in advance of operations that contamination of borrow material is prevented.

- a. Unclassified Borrow Material - This material consists of a naturally occurring mixture of sand, silts, clay, gravel, deteriorated rock or other inorganic particles.

Type E-1 - Referred to as "common borrow material," from which all frozen material, boulders, trash or debris have been removed.

Type E-2 - Referred to as "select borrow material" and from which all frozen material, humus, peat, roots, vegetation, ashes, trash, debris, and rocks or stones greater than 6 inches in any dimension have been removed.

- b. Classified Borrow Material - Where the Contract Documents allow the use of on-site borrow areas as a substitute for off-site sources of Type "B" gravels and Type "C" sands, the requirements for each of those on-site materials shall be the same as off-site sources.

In addition, all of the requirements for "classified excavated material" (Type "E" material) must be met at least 10 days prior to the acceptance of approved borrow areas for use as a source of Type "B" gravel or Type "C" sand.

2.02. OFF-SITE MATERIALS

Within the following specifications where grain size distribution requires a maximum of 10 percent or less material capable of passing the #200 mesh sieve, the percentage of material finer (than the #200 sieve) by weight shall be determined by wet screening in accordance with ASTM Standard D-1140. It is the intent of the specifications to allow the use of granular materials from local suppliers. Material Specifications shall conform to the requirements of the New York State Department of Transportation, (NYSDOT) and shall conform to the latest NYSDOT Standard Specification.

No gravel, sand, crushed stone or run-of-crusher material shall be used for this project until acceptance is obtained from the Engineer, and only material from approved sources shall be used. A certified sieve analysis from the supplier shall be submitted for the Engineer's acceptance prior to the use of any materials specified in Article 2.02, Off-Site Materials.

A. Type B - Gravel

1. Shall be a mixture of hard, durable gravel and sand.
2. Shall be free from organic matter, trash, shale, debris, snow ice and other frozen or mechanically deleterious material.
3. Each type of gravel fill material shall also meet the gradation requirements of Table 1.
4. Gravel Fill Materials
 - a. Type B-1 - Run-of-Bank or R.O.B. gravel.
 - b. Type B-2 - Select granular fill.
 - c. Type B-3 - Screened gravel.
 - d. Type B-4 - Screened gravel subbase.

TABLE 1

GRADATION REQUIREMENTS: TYPE B - GRAVEL

SIEVE SIZE	PERCENT PASSING BY WEIGHT			
	GRAVEL TYPE			
	B-1	B-2	B-3	B-4
6"	100			
2"		100	100	100
1"				75-90
3/4"		75-90		55-85
1/4"				30-65
No. 4	25-70	20-65	30-95	
No. 8				
No. 10				
No. 20		10-45		
No. 40			5-50	5-40
No. 100				0-20
No. 200	0-12	0-10	0-8	0-8

B. Type C - Sand

1. Shall be a mixture of natural fine gravel and sand.
2. Shall be free from organic matter, trash, debris, snow, ice and other frozen or mechanically deleterious material.
3. Each type of sand fill material shall also meet the gradation requirements of Table 2.

4. Sand Fill Materials
 - a. Type C-1 - Run-of-bank sand.
 - b. Type C-2 - Select filter sand.

TABLE 2

GRADATION REQUIREMENTS: TYPE C - SAND

SIEVE SIZE	PERCENT PASSING BY WEIGHT	
	SAND TYPE	
	C-1	C-2
3/4"	100	
3/8"		100
No. 4	0-95	95-100
No. 8		80-100
No. 16		50-85
No. 30		25-60
No. 50		10-30
No. 200	2-10	2-10

- C. Type D - Crushed Stone
 1. Shall be clean, hard, durable, angular crushed stone.
 2. Shall be free from organic matter, trash, debris, snow, ice and other frozen or mechanically deleterious material.
 3. Unless otherwise specified, crushed stone shall be composed of limestone pieces, chips and fines.
 4. All crushed stone shall also meet the gradation requirements of Table 3.
 5. The material shall be obtained from sources which are approved by the NYSDOT, Material Designation 703 0201.

TABLE 3

GRADATION REQUIREMENTS: TYPE D - CRUSHED STONE

TYPE	CORRESPONDING NYSDOT (TABLE 703-4) SIZE
D-1B	1B
D-A	1A
D-1ST	1ST
D-1	1
D-2	2
D-3A	3A
D-3	3
D-4A	4A

TYPE	CORRESPONDING NYSDOT (TABLE 703-4) SIZE
D-4	4
D-5	5

D. Type D-R - Run-of-Crusher

1. Referred to as “run-of-crusher” (R.O.C.), the material shall be angular crusher run stone as delivered unsorted from the crusher. Limestone material shall be used, and shall be well graded, durable and composed of rock pieces, chips and fines. The amount of fine material shall be sufficient to fill all voids between large stones when the material is compacted.

a. Type D-R-1 - Top Size: Maximum 1-1/4"; Minimum 3/4"

Shall be used where Type “D-R” is specified for pipe bedding or side fill and may be used for remainder of trench backfill where “D-R” is specified. When used for pipe bedding, side fill and trench fill, a minimum of 3 percent and maximum of 15 percent by weight shall pass the #200 size sieve, except not more than a maximum of 8 percent in the final 1 foot of fill beneath pavement.

When used as subbase beneath paving or structures on rock, a maximum of 8 percent by weight shall pass the #200 size sieve.

b. Type D-R-2 - Top Size: Maximum 2"; Minimum 1"

May be substituted for trench backfill with the minus #200 sieve fraction having a minimum of 4 percent to maximum of 15 percent by weight. When used for subbase under paving, a maximum of 8 percent by weight shall pass #200 size sieve.

c. Type D-R-3 - Top Size: Maximum 3"; Minimum 2"

All Type “D-R” crusher run shall undergo a minimum of handling from the source to installation in order to minimize segregation of particles by size. Stockpiles which have undergone excessive particle segregation shall be remixed and approved by the Engineer prior to using.

E. Type F - Gravel-Cement Mixtures

1. Shall be a mixture of 15 parts gravel to 1 part cement by weight.

2. Gravel shall be Type B-3.

3. Gravel shall be Type I Portland cement.

4. Mixing of material shall be performed in an approved mixer.

5. The mixture shall be placed and compacted in accordance with Section 02228.

F. Required Materials

1. Trench Backfill
 - a. In Pavement, to Subbase - Type D-R-1 crushed stone.
 - b. Other Areas - Type A-1 or Type B-1 bank-run gravel.
2. Trench Special Bedding - Type D-2 crushed stone or Type D-3 crushed stone.
3. Pipe Bedding - Type D-R-1 run-of-crusher.
4. Road Construction
 - a. Base - Type B-4 gravel.
 - b. Subbase - Type B-1 bank-run gravel or Type A-1.
5. Backfill Below Structures - Type B-2 gravel.
6. Backfill Adjacent to Structures - Type B-2 gravel.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify fill materials to be used are acceptable.
- B. Verify that all subsurface installations for the project have been inspected and are ready for backfilling.
- C. Verify that foundation walls are properly shored and braced to withstand lateral soil pressures created when backfilled material is placed against such walls.

3.02. PREPARATION

- A. Generally, compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Type B fill and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Inspect spaces to be backfilled and remove all unsuitable materials including sheeting, bracing, forms and debris prior to commencing backfilling operations.

3.03. BACKFILLING

- A. Backfill areas to required contours, grades and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Backfill material shall be inspected prior to placement and all roots, vegetation, organic matter, or other foreign debris shall be removed. Stones larger than 12 inches in any

dimension shall be removed or broken. Stones shall not be allowed to form clusters with voids.

- D. Backfill material shall not be placed when moisture content is more than two percent above optimum or is otherwise too high to allow proper compaction. When material is too dry for adequate compaction, water shall be added to the extent necessary.
- E. Hydraulic compaction by ponding or jetting will not be permitted except in very unusual conditions and then only upon written request and demonstration of its effectiveness by the Contractor and the written acceptance by the Engineer.
- F. Place and compact fill materials in continuous layers to meet appropriate requirements of Table 1 of Section 02228.
- G. Employ a placement and compaction method consistent with Section 02228 that does not disturb or damage adjacent walls, drainage systems, damp-proofing, waterproofing, protective coverings, utilities in trenches, underground conduits or tanks.
- H. Maintain optimum moisture content of backfill materials to attain required compaction density.
- I. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.
- J. Backfill simultaneously on each side of unsupported foundation walls.
- K. Slope grade away from building minimum 2 inches in 10 feet unless noted otherwise.
- L. Rough grade all backfilled and filled areas to meet subsequent topsoiling or paving requirements. Make grade changes gradual. Blend slopes into level areas.
- M. Remove surplus backfill materials from site.
- N. Leave fill material stockpile areas completely free of excess fill materials.

3.04. TOLERANCES

- A. Top Surface of Backfilling Under Pavement Subgrade - ± 1 inch from required elevations.
- B. Top Surface of Backfilling Under Paved Areas - ± 1 inch from required elevations.
- C. Top Surface of General Backfilling - ± 1 inch from required elevations.

3.05. FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400, Quality Control.
- B. Tests and analysis of fill material will be performed in accordance with ASTM D698 and with Section 02228.
- C. Compaction testing will be performed in accordance with ASTM D1556, ASTM D2922, and with Section 01400.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

E. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.06. PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01500, Construction Facilities.

B. Regrade and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02225

TRENCHING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Excavating trenches for utilities.
- B. Pipe foundations and bedding.
- C. Backfilling and compacting.
- D. Materials.

1.02. RELATED SECTIONS

- A. Section 01019 - CONTRACT CONSIDERATIONS
- B. Section 01400 - QUALITY CONTROL
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 02110 - SITE CLEARING
- E. Section 02112 - PAVEMENT CUTTING
- F. Section 02141 - REMOVAL OF WATER
- G. Section 02205 - PROTECTION OF EXISTING FACILITIES
- H. Section 02226 - ROCK REMOVAL
- I. Section 02228 - COMPACTION: Testing backfill compaction.
- J. Section 02661 - WATER DISTRIBUTION PIPING
- K. Section 02698 - UNDERGROUND PROCESS PIPING
- L. Section 02733 - SANITARY SEWER PIPING
- M. Section 02740 - SEWAGE FORCE MAIN
- N. Section 03001 - CONCRETE

1.03. REFERENCES

- A. Standard Material Specifications for gravel, sand, crushed stone and gravel-cement mixtures published by the Department of Transportation (DOT) of the State in which project is located
- B. ASTM C136 - Sieve Analysis of Fine and Course Aggregates
- C. ASTM D1556 - Density of Soil in Place by Sand-Cone Method

- D. ASTM D1557 - Laboratory Compaction of Soil Using Modified Effort
- E. ASTM D2922 - Density of Soil in Place by Nuclear Methods
- F. ASTM D3017 - Water Content of Soil in Place by Nuclear Methods
- G. OSHA - Occupational Safety and Health Administration

1.04. SUBMITTALS

A. Granular Materials

1. Granular materials required for filling, backfilling, bedding, subbase and other purposes shall be as shown on the Drawings. Prior to bidding, prospective contractors shall familiarize themselves with the available quantities of approved on-site and off-site materials.
2. For each on-site or off-site material proposed, furnish to Engineer for approval a certified gradation analysis at least 10 days prior to date of anticipated use of such material. Except as specified herein, only off-site approved materials shall be utilized.
3. The Engineer reserves the right to inspect proposed sources of off-site granular material and to order such tests of the materials as he deems necessary to ascertain its quality and gradation of particle size. The Contractor shall, at his own expense, engage an approved testing laboratory to perform such test, and submit certified test results to the Engineer. If similar tests of the material from a particular source were performed previously, submit results of these tests to the Engineer for consideration.
4. No granular materials shall be used on this project for fill, backfill, bedding, subbase, or other purpose until approval is obtained from the Engineer, and only material from approved sources shall be used.

B. Geotextile Fabric

1. Submit a 1 square foot sample of each geotextile to be used.
2. Submit manufacturer's specifications of average roll characteristics for standards ASTM geotextile tests for each geotextile to be used.

1.05. FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings, or as provided by the Engineer.

1.06. QUANTITY FACTORS FOR VOLUME MEASUREMENT

- A. The tables on the Drawings shall be used as the basis for computing volumes of excavation below subgrade, trench lining material, special pipe foundation materials, and special backfill materials when such volumes constitute the basis for payment, as established elsewhere in the Contract Documents. No deviations from the factors shown shall be allowed because of variations between the several pipe materials and classes.
- B. No special computations of quantities shall be made for structures such as manholes, valve pits, catch basins, etc., which may occur in the various pipelines, but the quantities for payment noted above, where applicable to such structures, shall be computed by assuming

that the appurtenant pipeline continues uninterrupted through such structure; such as for center-to-center of manholes.

1. Excavation Below Subgrade, Trench Lining Material and Special Pipe Foundations - The quantity for which payment shall be made will be computed by using the Quantity Factors based on nominal inside pipe diameter multiplied by the measured depth and by the measured length without regard to actual width or actual quantity.
2. Special Backfill Material - The maximum quantity of special backfill material for which payment shall be made will be computed by using the Quantity Factors based on nominal inside pipe diameter multiplied by the measured length and the measured height of special backfill, except that where soil or rock conditions allow steeper side slopes and narrow trench conditions (minimum width pipe O.D. plus 2 feet 0 inches), the quantity of special backfill shall be based on actual width, height, and length.

PART 2 PRODUCTS

2.01. ON-SITE MATERIALS

- A. Type A, Excavated Material - Material under this classification shall be derived solely from excavations necessary to construct the project to the lines and grades specified. If the excavated material on-site is approved for reuse and is suitable, it shall be used for filling or backfilling purposes. If he so elects, the Contractor may, at his own expense, substitute other types of material in place of Type "A" material, provided such substitution is approved in advance by the Engineer. All replaced or surplus material shall be disposed of as outlined in Section 02110.
 1. Unclassified Excavated Material

Type A-1 - Referred to as "excavated material" and from which all frozen material, boulders, trash and foreign debris greater than 6 inches in any dimension has been removed. Approved Type A-1 material shall be used for all backfilling except under structures.

Type A-2 - Referred to as "select excavated material" and from which all frozen material, humus, peat, roots, vegetation, ashes, trash, debris, and rocks or stones greater than 2 inches in any dimension have been removed.
 2. Classified Excavated Material - Where the Contract Documents allow the reuse of excavated on-site materials as a substitute for off-site sources of Type "B" gravel or Type "C" sands, the minimum requirements for each of those excavated materials shall be the same as required for the equivalent off-site material. If such materials are used, submit for approval in writing the proposed methods of excavation, location of stockpiles, quantities of required sand and gravels, estimated excavation quantities and proposed excavation limits within the accepted excavation area. Provide a demonstration at least 10 days prior to commencement of excavation that the methods will provide consistent quantity and quality of material as specified for Type "B" gravels and Type "C" sands. The Engineer will require subsurface investigations, sampling, and testing to confirm the extent and quality of the proposed material. Cost of all investigations, sampling, and testing shall be the Contractor's responsibility.

B. Type E - Borrow Material

1. "Borrow material" is defined as approved on-site material required for fill or backfill in excess of the quantity of available approved material designated as Type "A" material.
2. No such borrow material shall be used on this project unless specified in the Contract Documents and except within the limits of borrow areas designated on the Drawings.
3. Approval of all borrow material must be obtained from the Engineer, and only material from approved sources shall be used.
4. Use of designated borrow areas shall be subject to the approval of the Engineer and Owner at all times. Test pits and analyses of borrow material shall be provided as required by the Engineer for each borrow area and at the expense of the Contractor. In addition, the Engineer may require full excavation and restoration plans for each borrow area. All borrow areas shall be stripped of topsoil and organic materials far enough in advance of operations that contamination of borrow material is prevented.

a. Unclassified Borrow Material

This material consists of a naturally occurring mixture of sand, silts, clay, gravel, deteriorated rock or other inorganic particles.

Type E-1 - Referred to as "common borrow material", from which all frozen material, boulders, trash or debris have been removed.

Type E-2 - Referred to as "select borrow material" and from which all frozen material, humus, peat, roots, vegetation, ashes, trash, debris, and rocks or stones greater than 6 inches in any dimension have been removed.

- b. Classified Borrow Material - Where the Contract Documents allow the use of on-site borrow areas as a substitute for off-site sources of Type "B" gravels and Type "C" sands, the requirements for each of those on-site materials shall be the same as off-site sources.

In addition, all of the requirements for "classified excavated material" (Type "E" material) must be met at least 10 days prior to the acceptance of approved borrow areas for use as a source of Type "B" gravel or Type "C" sand.

2.02. OFF-SITE MATERIAL

Within the following specifications where grain size distribution requires a maximum of 10 percent or less material capable of passing the #200 mesh sieve, the percentage of material finer (than the #200 sieve) by weight shall be determined by wet screening in accordance with ASTM D1140. It is the intent of the specifications to allow the use of granular materials from local suppliers. Material Specifications shall conform to the requirements of the New York State Department of Transportation, (NYSDOT) and shall conform to the latest NYSDOT Standard Specification.

No gravel, sand, crushed stone or run-of-crusher material shall be used for this project until acceptance is obtained from the Engineer, and only material from approved sources shall be used. A certified sieve analysis from the supplier shall be submitted for the Engineer's acceptance prior to the use of any materials specified in Article 2.02, Off-Site Materials.

A. Type B - Gravel

1. Shall be a mixture of hard, durable gravel and sand.
2. Shall be free from organic matter, trash, shale, debris, snow ice and other frozen or mechanically deleterious material.
3. Each type of gravel fill material shall also meet the gradation requirements of Table 1.
4. Gravel Fill Materials
 - a. Type B-1 - Run-of-Bank or R.O.B. gravel.
 - b. Type B-2 - Select granular fill.
 - c. Type B-3 - Screened gravel.
 - d. Type B-4 - Screened gravel subbase.

TABLE 1

GRADATION REQUIREMENTS: TYPE B - GRAVEL

SIEVE SIZE	PERCENT PASSING BY WEIGHT			
	GRAVEL TYPE			
	B-1	B-2	B-3	B-4
6"	100			
2"		100	100	100
1"				75-90
3/4"		75-90		55-85
1/4"				30-65
No. 4	25-70	20-65	30-95	
No. 8				
No. 10				
No. 20		10-45		
No. 40			5-50	5-40
No. 100				0-20
No. 200	0-12	0-10	0-8	0-8

B. Type C - Sand

1. Shall be a mixture of natural fine gravel and sand.
2. Shall be free from organic matter, trash, debris, snow, ice and other frozen or mechanically deleterious material.
3. Each type of sand fill material shall also meet the gradation requirements of Table 2.

4. Sand Fill Materials
 - a. Type C-1 - Run-of-bank sand.
 - b. Type C-2 - Select filter sand.

TABLE 2

GRADATION REQUIREMENTS: TYPE C - SAND

SIEVE SIZE	PERCENT PASSING BY WEIGHT	
	SAND TYPE	
	C-1	C-2
3/4"	100	
3/8"		100
No. 4	0-95	95-100
No. 8		80-100
No. 16		50-85
No. 30		25-60
No. 50		10-30
No. 200	2-10	2-10

- C. Type D - Crushed Stone
 1. Shall be clean, hard, durable, angular crushed stone.
 2. Shall be free from organic matter, trash, debris, snow, ice and other frozen or mechanically deleterious material.
 3. Unless otherwise specified, crushed stone shall be composed of limestone pieces, chips and fines.
 4. All crushed stone shall also meet the gradation requirements of Table 3.
 5. The material shall be obtained from sources which are approved by the NYSDOT, Material Designation 703 0201.

TYPE	CORRESPONDING NYSDOT (TABLE 703-4) SIZE
D-1B	1B
D-A	1A
D-1ST	1ST
D-1	1
D-2	2
D-3A	3A
D-3	3
D-4A	4A
D-4	4
D-5	5

D. Type D-R - Run-of-Crusher

1. Referred to as "run-of-crusher" (R.O.C.), the material shall be angular crusher run stone as delivered unsorted from the crusher. Limestone material shall be used and shall be well graded, durable and composed of rock pieces, chips and fines. The amount of fine material shall be sufficient to fill all voids between large stones when the material is compacted.

- a. Type D-R-1 - Top Size: Maximum 1-1/4"; Minimum 3/4"

Shall be used where Type "D-R" is specified for pipe bedding or side fill and may be used for remainder of trench backfill where "D-R" is specified. When used for pipe bedding, side fill and trench fill, a minimum of 4 percent and maximum of 15 percent by weight shall pass the #200 size sieve, except not more than a maximum of 8 percent in the final 1 foot of fill beneath pavement.

When used as subbase beneath paving or structures on rock, a maximum of 8 percent by weight shall pass the #200 size sieve.

- b. Type D-R-2 - Top Size: Maximum 2"; Minimum 1"

May be substituted for trench backfill with the minus #200 sieve fraction having a minimum of 4 percent to maximum of 15 percent by weight. When used for subbase under paving, a maximum of 8 percent by weight shall pass #200 size sieve.

- c. Type D-R-3 - Top Size: Maximum 3"; Minimum 2"

All Type "D-R" crusher run shall undergo a minimum of handling from the source to installation in order to minimize segregation of particles by size. Stockpiles which have undergone excessive particle segregation shall be remixed and approved by the Engineer prior to using.

E. Type F - Gravel-Cement Mixtures

1. Shall be a mixture of 15 parts gravel to one part cement by weight.
2. Gravel shall be Type B-3.
3. Cement shall be Type I Portland cement.
4. Mixing of material shall be performed in an approved mixer.
5. The mixture shall be placed and compacted in accordance with Section 02228.

F. Required Materials

1. Trench Backfill
 - a. In pavement, to Subbase - Type D-R-1 crushed stone.
 - b. Other areas - Type A-1 or Type B-1 bank run gravel.
2. Trench Special Bedding - Type D-2 crushed stone or Type D-3 crushed stone.

3. Pipe Bedding - Type D-R-1 run of crusher.
4. Road Construction
 - a. Base - Type B-4 gravel.
 - b. Subbase - Type B-1 bank run gravel or Type A-1.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Submit for approval fill materials to be reused.

3.02. PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Prior to start of construction, notify the appropriate organization identified in Section 02205 (under Article 3.01), and have staked or marked all underground utilities. Utilities include water, gas, electrical, telephone, cable, storm sewer, sanitary sewers, laterals, and services. In the event such locations indicate a possible interference, or when needed to locate points of connection to existing facilities, perform exploratory excavations to determine the utilities' location and elevation. Provide the Engineer with the results of the exploratory excavations for his review. Allow the Engineer sufficient time to determine any changes required as a result of such exploratory excavations prior to start of construction.
- C. When the project consists of reconstructing sanitary sewers and reconnection of existing sanitary laterals, only reconnect live laterals, unless otherwise shown on the Drawings. Verify whether the lateral is alive or abandoned and the source of the lateral using such methods as necessary including dyeing, flushing with water, roding, pipe locators, and exploratory excavations.
- D. Abandoned pipes and laterals shall be plugged in with 12 inches of concrete or grout or for large pipes with solid brick masonry.
- E. Conduct the operations such that no interruptions to the existing utility system shall occur. Where existing sanitary sewers or storm drain systems are being replaced or interrupted, provide temporary bypass pumping or temporary piping to maintain flow around the work site such that no backups occur in these sewer systems.
- F. Existing sanitary sewer laterals damaged in the work or temporarily disconnected shall be restored to operation by the end of each work day. Existing sanitary sewer laterals where crossing over new pipelines to be restored in accordance with details shown on the drawings.
- G. Maintain existing manholes, catch basins, and other utility structures above and below grade which are to remain in their pre-work condition. Any material or debris entering same due to the operation shall be promptly removed.
- H. Protect plant life, lawns, rock outcropping, and other features remaining as a portion of final landscaping.
- I. Protect control points, bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic. Preserve the control points provided by the

Engineer throughout the life of the project, and accurately replace any such point, which is damaged or moved, at Contractor's expense.

- J. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type III pipe foundation and compact to density equal to or greater than requirements for subsequent backfill material.
- K. Brace walls and slabs of structures to support surcharge loads and construction loads imposed by backfilling operations.
- L. Maintain a stable, dry backfill area in accordance with Section 02141.
- M. Remove all water, snow, ice and debris from surfaces to accept fill materials and from the backfill material. No calcium chloride or other chemicals shall be used to prevent freezing.
- N. Areas to receive compacted fill shall be graded to prevent surface runoff and ponding in accordance with Section 02110.
- O. No fill or backfill material may be used without approval of the Engineer.
- P. No geotextile fabric may be used without approval of the Engineer.
- Q. Backfill operations shall be started at the lowest elevation in the area to be backfilled, and continue, in horizontal layers, upward to the limits specified.
- R. Backfill material shall be within 2 percent of the optimum moisture content for that material.
- S. Any crushed gravel stockpiles which have undergone excessive particle segregation shall be reviewed and approved by the Engineer prior to placement.

3.03. TRENCH EXCAVATION

- A. Trenches for underground piping, ductwork, drains, and similar utilities shall be excavated and maintained as shown on the Drawings and specified in this Section. Trench widths shall be held within the minimum and maximum limits shown on the Drawings. If a prefabricated, mobile shield is utilized in lieu of conventional sheeting and bracing in pipe trenches, the bottom of the shield shall be maintained as high as possible, but no higher than 2 feet above the bottom of the excavation, so as to prevent disturbance of the pipe foundation material and to avoid forces which would tend to pull pipe joints apart when the shield is dragged forward. Gouged openings or troughs left by the shield shall be filled with additional pipe foundation material and thoroughly compacted. Installation of sheeting and bracing and use of mobile shields shall be in complete accordance with all details of applicable safety codes, rules and regulations including all applicable local, state, federal, and OSHA regulations.
- B. Excavation shall be such that a flat bottom trench of allowable width is established at the required subgrade elevation for subsequent installation of pipe foundation material.
- C. If indicated on the Drawings or when required as a result of unsuitable soil conditions, trench excavation shall be carried below the required subgrade and a special pipe foundation installed in conformance with the Contract Documents. In any event, operations shall result in stable trench walls and a stable base free from standing water, consistent with trench width requirements.
- D. Bedrock, boulders and cobbles greater than 6 inches shall be trimmed back or removed on each side of the trench so that no rock protrudes within 6 inches of the installed pipe. Rock

shall also be trimmed back across the bottom of the trench so that no rock, boulder or cobble protrudes within 4 inches of the installed pipe.

- E. In general, trenches shall not be opened for more than 50 feet in advance of installed pipe. Excavation of the trench shall be fully completed at least 5 feet in advance of pipe laying operations. No more than 40 feet of trench shall be left open overnight.

3.04. EXCAVATION CLASSIFICATION

- A. All material excavated will be measured and classified as provided herein.
 - 1. Unclassified Excavation - "Unclassified excavation" shall include all materials excavated within the authorized lines and grades prescribed in the Drawings. Unclassified excavation shall include "rock excavation" as well as "common excavation" as defined herein. Unless specifically designated otherwise in the appropriate bid items of the Bid Proposal, all excavation shall be considered to be "unclassified excavation."
 - 2. Common Excavation - "Common excavation" shall include all excavation except "rock excavation." All unconsolidated and non-indurated material, rippable rock, loose rock, soft mineral matter, weathered rock or saprolite, and soft or friable shale which is removable with normal earth excavation equipment shall be considered "common excavation." All boulders and detached pieces of solid rock or concrete or masonry less than 1 cubic yard in volume shall be classified as "common excavation."
 - 3. Rock Excavation - "Rock excavation" shall include all sound solid masses, layers and ledges of consolidated and indurated rock or mineral matter of such hardness, durability and/or texture that it is not rippable or cannot be excavated with normal earth excavation equipment. Should a conflict arise as to the classification of excavation as either "common" or "rock," the following tests shall be used in the appropriate determination:
 - a. Where practicable, a late model tractor mounted hydraulic ripper equipped with a one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler-type tractor rated between 210 and 240 net fly-wheel horsepower, operating in low gear, shall be utilized. Should the suspect material not be effectively loosened or broken down by ripping in a single pass with the aforementioned ripper, the material shall be classified as "rock."
 - b. In situations where inter-bedded strata of "common excavation" material and "rock excavation" material are encountered in the same excavation, the individual classification of those materials shall be made on an average percentage basis of the occurrence of those materials as measured in stratigraphic sections and as approved by the Engineer.
 - c. When rock is encountered in excavations, it shall be removed by blasting methods, jackhammering, or any other method suitable and safe considering the proximity of existing utilities or facilities.

3.05. UNAUTHORIZED EXCAVATION

- A. The Contractor shall not be entitled to additional compensation for unauthorized excavations carried beyond or below the lines and subgrades prescribed in the Contract Documents. The

Contractor shall refill such unauthorized excavations at his own expense, and in conformance with the following provisions of this Article.

- B. Should the Contractor, through negligence or for reasons of his own, carry his excavation below the designated subgrade, fill concrete or such other material as may be approved by the Engineer, as specified in Part 2, shall be furnished and placed as backfill in sufficient quantities to reestablish the designated subgrade surface. Granular material used for backfilling shall be spread and compacted in conformance with the requirements of later Articles of the section, and to the percentage compaction outline therein. The cost of any tests associated with this refilling operation shall be borne by the Contractor.
- C. If the maximum widths of pipe trenches are exceeded, the installed pipes shall be fully cradled in a minimum of 6 inches of fill concrete, as specified elsewhere, and at the Contractor's expense. Excavation below subgrade which is ordered by the Engineer because the normal subgrade has been disturbed by the Contractor's operations shall be considered as unauthorized excavation.

3.06. MAINTENANCE OF EXCAVATIONS

- A. All excavations shall be properly and legally maintained while they are open and exposed. Sufficient and suitable barricades, warning lights, flood lights, signs, etc., to protect life and property shall be installed and maintained at all times until the excavation has been backfilled and graded to a safe and satisfactory condition. All signs, markers, barricades shall conform to the requirements of the manual of Uniform Traffic Control Devices. All barricades, signs and markers shall be reflectorized.
- B. To maintain traffic and safety temporary plating over trenches consisting of steel plates shall be used to temporarily bridge trench excavations. Plates shall be of size and positioned to provide adequate bearing at plate edges, shall be securely anchored, and shall be fitted in place in a manner to minimize noise when crossed by traffic. Plates shall be of sufficient thickness to safely carry heavy traffic without detrimental deflection; however, unless otherwise specified, the minimum thickness of plates shall be 1-inch.
- C. Plate edges exposed to traffic shall be feathered with asphalt mix as part of trench excavation work. Work includes surveillance and adjustment of plating over trenches which shall be provided by the Contractor during non-working hours, weekends, and holidays.

3.07. PIPE FOUNDATIONS

- A. All pipes, fittings or specials which are to be installed in the open trench excavation shall be properly bedded in, and uniformly supported on pipe foundations of the various types specified herein and shown on the Drawings. Flat-bottom trenches of required width shall be excavated to the necessary depth as required in the Table of Quantity Factors shown on the Drawings and maintained in accordance with this section prior to installing the foundation. Trenches shall be dewatered and all work performed in a dry trench.
- B. Bedding material shall be spread in maximum of 8-inch layers to the midpoint of the pipe and each layer shall be compacted until the required total depth of the bedding has been built up. Compaction methods include hand tamping with T-bars, flat heads, shovel slicing, as well as mechanical compactors. The Contractor shall perform his bedding operations with care to maintain line and grade.
- C. The pipe foundation above the midpoint of the pipe shall be spread and compacted in 12-inch layers to 12 inches above the top of the pipe. When PVC, plastic or polyethylene pipe is

used, do not compact directly over pipe until the depth of backfill has reached 2 feet above the top of the pipe.

- D. Type I - Normal Soil Conditions - Unless shown otherwise in the Drawings, all pipe shall be supported on Type I foundation. The trench shall be excavated from 4 to 8 inches deeper than the bottom of the pipe, depending on the diameter of the pipe (see Table of Quantity Factors shown on the Drawings). Run-of-crusher stone standard bedding, Type "D-R-1" material as described above shall be furnished, placed and compacted in the trench for its full width such that, after the pipe has been uniformly bedded in this material, the required minimum depth of Type "D-R-1" material remains between pipe and undisturbed trench bottom, as noted in the "Table of Quantity Factors." Suitable holes shall be provided in the trench bottom to permit adequate bedding of bells, couplings, or similar projections. The run-of-crusher stone shall extend upward to a point 12 inches over the top of the pipe. Minimum width of pipe foundation shall be outside diameter of pipe plus 2 feet 0 inches.
- E. Type II - Moderately Unstable Soil Conditions - When specifically called for on the Drawings, or when ordered by the Engineer, the pipe shall be supported on Type II foundation. The foundation shall be installed where a suitable supporting soil or rock stratum occurs within 2 feet, more or less of the bottom of the pipe. The trench shall be excavated to the depth necessary to reach the suitable supporting stratum. Type "D-R-1" material or Type "D-2" crushed stone, as ordered by the Engineer as described above, shall then be furnished and placed in the trench for its full width. The material shall be spread in 12-inch layers, and each layer shall be compacted. The pipe foundation material to be supported on Type VII foundation, geotextile fabric foundation. The crushed stone or gravel depth shall extend from the supporting stratum up to an elevation 4, 6 or 8 inches below the bottom of the pipe depending upon the pipe diameter. The bedding material shall then be installed in accordance with Type I pipe foundation requirements.
- F. Type III - Unstable Soil Conditions - When specifically called for on the Drawings, or when ordered by the Engineer, the pipe shall be supported on Type III foundation. The foundation shall be installed where no suitable supporting soil or rock stratum exists within 2 feet of the bottom of the pipe. The trench shall be excavated two feet deeper than the bottom of the pipe. Each side of the trench shall be supported and maintained by a permanent system of tight, continuous sheeting (and bracing) which shall be driven below the trench bottom as shown and which shall extend to an elevation of at least 12 inches above the top of the pipe. Minimum plank size to be 2-inch x 12-inch tongue and groove.

Type "D-R-2" material shall then be furnished and placed in the trench for its full width, and to a depth of 8 inches. The pipe foundation material to be supported on a Type VII Foundation, Geotextile Fabric Foundation. Crushed stone, "Type D 3" material shall then be furnished and placed in the trench for its full width. All material shall be spread in layers and each layer shall be compacted until their respective total depths have been built up as required. The "Type D-3" material depth shall extend a distance of 12 inches from the top of the compacted trench lining up to an elevation 4, 6 or 8 inches below the bottom of the pipe, depending upon the pipe diameter. Bedding material shall then be installed in accordance with Type I Pipe Foundation requirements. All installed sheeting below an elevation established at 12 inches above the top of the pipe shall be left in place and undisturbed. Only the cross struts and walers shall be gradually removed as construction proceeds.

- G. Type IV - Reinforced Concrete Encasement - When specifically called for on the Drawings, or when ordered by the Engineer, the pipe shall be supported on Type IV foundation. The trench shall be excavated to a depth below the bottom of the pipe equal to one-quarter of the inside diameter of the pipe or 6 inches, whichever is greater. The excavated space shall then be completely filled with, and the entire pipe encased in, concrete such that the minimum concrete encasement at any point around the outside barrel of the pipe measured 6 inches thick. The total minimum width of the concrete encasement shall equal the outside diameter

of the pipe plus 12 inches and such minimum width shall be constant for the entire length of the encasement. Concrete mix, formwork, reinforcing, curing, etc., shall be in accordance with the requirements of Section 03001. Freshly placed concrete shall be maintained free from groundwater and no backfilling of the trench shall begin until initial set has taken place, but not less than 3 hours has elapsed after the encasement has been cast. Backfill a depth of 12 inches over top of concrete before beginning compaction with mechanical equipment.

- H. In the event an underground pipe is shown under a base slab, the pipe shall be encased in concrete for its entire length under the slab in accordance with details shown on the Drawings. Where no detail is shown, encasement shall be formed to provide a minimum of 8 inches of concrete cover reinforced with #5 reinforcing bars spaced 12 inches each way. When the top of the pipe is within 12 inches of the bottom of the slab, the encasement shall be tied to the base slab with reinforcing. The General Contractor shall be responsible for encasement of all pipes under slabs including piping by other contracts.
- I. Type V - Concrete Cradle - When specifically called for on the Drawings or when ordered by the Engineer, the pipe shall be supported on Type V foundation. The foundation shall be furnished and installed equal to the Type IV foundation, "Concrete Encasement," except that only that portion of the encasement at and below the horizontal diameter of the pipe shall be encased, forming a true cradle under the bottom half of the pipe. Maintain cradle free from groundwater for a period of three hours or until initial set has taken place. Complete pipe foundation in 12-inch lifts as for Type I pipe foundation.
- J. Type VI - Plain Concrete Encasement - When specifically called for on the Drawings, or when ordered by the Engineer, the pipe shall be supported on Type VI foundation. The foundation shall be furnished and installed equal to the Type IV foundation, "Reinforced Concrete Encasement," except that no steel reinforcing is required. Maintain encasement free of groundwater for a period of three hours or until initial set has taken place.
- K. Type VII - Geotextile Fabric Foundation - When specifically called for on the Drawings, or when ordered by the Engineer, the pipe foundation shall be supported on a geotextile fabric foundation. The fabric to be placed on the bottom of the excavated foundation and extended upwards to the top of the Type I pipe foundation where it can then be placed flat with a minimum overlap of 6 inches. Longitudinal overlaps to be a minimum of 2 feet. Fabrics to be installed and stretched tight, have no wrinkles so that the fabric will be in tension when placing the pipe foundation material. Geotextile material to be Trevia Type S 1127 by Hoechat Corporation; Mirafi Type 500X by Celanese Corporation; or equal.
- L. Type VIII - Pressure Pipe Foundation
 - 1. Pipe and fittings shall be laid on stable foundations, free from standing water, and trimmed to shape. Type A 2 material as described above in Part 2 shall be used for pipe foundation unless otherwise shown on the Drawings. In particular, stones 2 inches or larger shall be removed from the bearing surface of the pipe foundation. At the joints, enough depth and width shall be provided to permit the pipe layer to reach entirely around the pipe so that the joints may be made in a proper manner. Pipes shall have full bearing throughout their entire length, which shall be accomplished by shaping the bottom of the ditch or adequately tamping the backfill under the pipe in accordance with Minimum Compaction Requirements, of Section 02228. When laid in tunnels, pipes shall be blocked in such a manner as to take the weight off the bells. Pipe laid in normal trench excavation shall not be laid on wood blocking. Mechanical-type joints shall be tightened within the AWWA recommended torque range.
 - 2. The following sources shall be reviewed by the Contractor for installation guidelines and requirements:

Pipe Material	Sources
Ductile iron	AWWA Standard C600; Project Specification, Section 15060; Project Drawings; manufacturer's recommendations.
Gray cast iron	AWWA Standard C600; Project Specification, Section 15060; Project Drawings; manufacturer's recommendations.
PVC pipe	ASTM Standard D2321; Project Specification, Section 15060; Project Drawings; manufacturer's recommendations.
PE pipe	AWWA Standard C901, including Appendix A; ASTM D2774; Project Specification, Section 15060; Project Drawings; manufacturer's recommendations.
PB pipe	AWWA Standard C902, including Appendix A; ASTM D2774; Project Specification, Section 15060; Project Drawings; manufacturer's recommendations.
Prestressed concrete pipe	Project Specification, Section 15060; Project Drawings; manufacturer's recommendations.
Copper	Project Specification, Section 15060; Project Drawings; manufacturer's recommendations.

3. Unless otherwise shown on the Drawings, as a minimum, all pipe shall be backfilled to the springline, including hand tamping with T-bars, shovel slicing, and flatheads, and mechanically compacted and the remaining backfill placed in 12-inch lifts to 1 foot above the crown of the pipe in accordance with the minimum compaction requirements of Section 02228. Backfill material within 12 inches of the pipe shall be free of stones greater than 2 inches in any dimension. Unless otherwise shown on the Drawings, the minimum total finished cover over the top of the pipe barrel of all pressure pipe shall be 5 feet.

3.08. GENERAL BACKFILLING REQUIREMENTS

- A. Backfilling shall be started as soon as practicable and after structures or pipe installations have been completed and inspected, concrete has acquired a suitable degree of strength, and subgrade waterproofing materials have been in place for at least 48 hours. Backfilling shall be carried on expeditiously thereafter. Backfill shall be started at the lowest section of the area to be backfilled. Natural drainage shall not be obstructed at any time.
- B. Backfill spaces shall be inspected prior to backfilling operations and all unsuitable materials, including sheeting, bracing forms and debris, shall be removed. No backfill shall be placed against foundation walls on structural members unless they are properly shored and braced or of sufficient strengths to withstand lateral soil pressures.
- C. Backfill material shall be inspected prior to placement and all roots, vegetation, organic matter, or other foreign debris shall be removed. Stones larger than 12 inches in any dimension shall be removed or broken. Stones shall not be allowed to form clusters with voids.
- D. Backfill material shall not be placed when moisture content is more than 2 percent above optimum or is otherwise too high to allow proper compaction. When material is too dry for adequate compaction, water shall be added to the extent necessary.
- E. No backfill material shall be placed on frozen ground nor shall the material itself be frozen or contain frozen soil fragments when placed. No calcium chloride or other chemicals shall be added to prevent freezing. Material incorporated in the backfilling operation which is not in satisfactory condition shall be subject to rejection and removal at the Contractor's expense.

- F. If the Contractor fails to stockpile and protect on-site excavated material acceptable for backfill, then the Contractor shall provide an equal quantity of acceptable off-site material at no expense to the Owner.
- G. Remove surplus backfill material from site.

3.09. PIPE TRENCH BACKFILL

- A. Pipe foundations, to a depth of 1 foot above the pipe, shall be placed in 12-inch layers and thoroughly compacted by approved mechanical methods to ensure firm bedding and side support. Refer to Section 02228 for density requirements. For plastic or polyethylene pipe materials, do not compact directly over pipe until the 2 feet of cover has been installed. Pipe foundations are specified in the appropriate sections covering underground piping. The remainder of the trench shall be backfilled and consolidated in accordance with Section 02228 and by one of the following methods, depending on the nature of backfill material and location of trench.
- B. Procedure I - For cross-country pipelines under uncultivated areas where subsequent settlement can be tolerated:
 - 1. Backfill material shall be placed in the trench and consolidated by packing with the backhoe bucket or other means to prevent voids. Refer to Section 02228 for density requirements. The top layer shall be thoroughly compacted mechanically and slightly mounded to allow for subsequent settlement. Maintain trench surface until completion of contract and regrade as necessary within guarantee period.
- C. Procedure II - For lawns, cultivated fields, gardens and non-paved areas where minimum subsequent settlement is required: Same as for Procedure I, refer to Section 02228 for density requirements. Top of back fill shall be compacted by mechanical means and surface maintained prior to topsoil installation, fine grading, and seeding.
- D. Procedure III - For streets, driveways, parking areas, highways, shoulder areas, miscellaneous type pavements, walks, curbs, gutters and other specified areas:
 - 1. Backfill material shall be placed in layers not exceeding 18 inches thick and each layer thoroughly compacted by a backhoe mounted hydraulic or vibratory tamper, up to 4 feet under pavement (below top of subgrade). The upper 4 feet shall be compacted using hand-guided or small self-propelled vibratory or static rollers or pads in layers not exceeding 12 inches in thickness. Refer to Section 02228 for density requirements.
 - 2. For pipelines in or across state highways, backfill material and compaction shall conform with the Standard Specifications or specific requirements of the state in which the project is located.
 - 3. Where a gravel-cement mixture (Type F) backfill is specified, the dry gravel and cement mixture shall be placed in the trench, in 6-inch layers and thoroughly tamped using mechanical or vibratory tampers. Water shall not be introduced to the gravel-cement mixture during placing and compacting thereof.

3.10. BACKFILL FOR STRUCTURES

- A. Backfill shall be placed in layers not exceeding 8 inches thick and thoroughly compacted by mechanical means.

- B. Where pipelines or conduits are to be placed on structural backfill, all backfill under the pipes shall be Size D-2 crushed stone placed in 8-inch layers and mechanically tamped, unless an alternate method of supporting such pipes is specified.
- C. Hydraulic compaction by ponding or jetting will not be permitted except in very unusual conditions and then only upon written request and demonstration of its effectiveness by the Contractor and the written acceptance by the Engineer.

3.11. PERIODIC CLEAN-UP; BASIC RESTORATION

- A. When work involves installation of sewers, drains, water mains, manholes, underground structures, or other disturbances of existing features in or across streets, rights-of-way, easements or private property, the Contractor shall (as the work progresses) promptly backfill, compact, grade and otherwise restore the disturbed area to a basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or function consistent with the original use of the land. The requirements for temporary paving of streets, walks, and driveways are specified elsewhere. Unsightly mounds of earth, large stones, boulders and debris shall be removed so that the site presents a neat appearance.
- B. The Contractor shall perform the clean-up work on a regular basis and as frequently as required. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.
- C. Upon failure of the Contractor to perform periodic clean-up and basic restoration of the site to the Engineer's satisfaction, the Owner may, upon five days prior written notice to the Contractor, without prejudice to any other rights to remedies of the Owner, cause such work for which the Contractor is responsible to be accomplished to the extent deemed necessary by the Engineer, and all costs resulting therefrom shall be charged to the Contractor and deducted from the amounts of money that may be due him.

3.12. TOLERANCES

- A. Top Surface of Backfilling - Under Paved Areas - ± 1 inch from required elevations.
- B. Top Surface of General Backfilling - ± 1 inch from required elevations.

3.13. FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. The Contractor shall designate an experienced person who shall be responsible for inspection of excavations on a daily basis, document, and maintain daily trenching and excavation logs per OSHA 29 CFR 1926.
- C. Tests and analysis of fill material will be performed in accordance with ASTM D698 and with Section 02228.
- D. Compaction testing will be performed in accordance with ASTM D1556, ASTM D2922, and with Section 02228.
- E. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.14. PROTECTION OF FINISHED WORK

- A. Protect finished work under provisions of Section 01500, Construction Facilities.
- B. Regrade and recompact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02226

ROCK REMOVAL

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Removal of subsurface rock encountered during excavation, utilizing mechanical methods.

1.02. RELATED SECTIONS

- A. Information Available to Bidders - Subsurface Report; bore hole locations and findings of subsurface materials.
- B. Section 02205 - PROTECTION OF EXISTING FACILITIES
- C. Section 02222 - EXCAVATING: Excavations for buildings and structures.
- D. Section 02223 - BACKFILLING
- E. Section 02225 - TRENCHING: Trenching for underground utilities.
- F. Section 03001 - CONCRETE

1.03. UNIT PRICES

- A. Rock Quantity - Determined by quantity of rock indicated in the Contract Documents.
- B. Determination of Unit Measurements - Identified by site measurements made by the Engineer and calculated in accordance with payment limits established in the appropriate Bid Item Description.

1.04. REFERENCES

- A. NFPA 495 - Code for Manufacture, Transportation, Storage, and Use of Explosive Materials.
- B. Code of Federal Regulations (CFR) - U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Construction Standards and Interpretation, 29 CFR Part 1926.
- C. Bureau of Alcohol, Tobacco and Firearms (BATF) - Title XI, Regulation of Explosives (18 U.S.C. Chapter 40; 84 Statute 952) of the Organized Crime Control Act of 1970 (84 Statute 922) and 27 CFR 55.
- D. Department of Transportation (DOT) - Title 49 (49 CFR), Parts 106, 107, 171-179, 383, and 390-399.
- E. United States Department of the Interior, Bureau of Mines Report of Investigations 8507, "Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting."

1.05. DEFINITIONS

- A. "Rock" is defined to include all sound solid masses, layers and ledges of consolidated and indurated rock or mineral matter of such hardness, durability and/or texture that it is not rippable or cannot be excavated with normal earth excavation equipment.
- B. All boulders and detached pieces of solid rock or concrete or masonry 1 cubic yard in volume or greater, shall be classified as "rock."
- C. Should a conflict arise as to the classification of the material to be removed, the following tests shall be used to aid in the determination:
 - 1. Where practicable, a late model tractor-mounted hydraulic ripper equipped with a one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler-type tractor rated between 210 and 240 net fly-wheel horsepower, operating in low gear, shall be utilized.

Should the suspect material not be effectively loosened or broken down by ripping in a single pass with the aforementioned ripper, the material shall be classified as "rock."
 - 2. In situations where interbedded strata of "common excavation" material and "rock excavation" material are encountered in the same excavation, the individual classification of those materials shall be made on an average percentage basis of the occurrence of those materials as measured in stratigraphic sections as approved by the Engineer.

1.06. SCHEDULING

- A. Schedule work to avoid disruption to occupied buildings nearby.
- B. Schedule work to minimize disruption of vehicular traffic in nearby public thoroughfares.
- C. Coordinate schedule with local police and fire departments, including owners of nearby existing facilities.
- D. Schedule work to coordinate with concrete placement. Reference Section 03001.

1.07. SUBMITTALS

- A. Submit plan of action for rock removal. As a minimum, include a site plan showing starting date, preconstruction inspection requirements, location, direction of progress, finish point, and completion schedule.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify site conditions and location of nearby buildings, structures and other facilities, recording irregularities which exist prior to work of this section.
- B. Verify locations of nearby underground utilities and structures. Reference Section 02205.

3.02. PREPARATION

- A. Identify required lines, levels, contours, and datum; establish quantity of rock to be removed to meet project requirements.

3.03. ROCK REMOVAL - GENERAL

- A. Allow time for Engineer to take site measurements of rock quantities to be removed.
- B. Cut away rock at bottom of excavation to form level bearing surface for foundations of buildings and structures.
- C. Remove shaled layers to provide sound and unshattered base for footings, foundations and pipe bedding.
- D. In utility trenches, trim rock to 4 inches below bottom of installed pipe and 12 inches wider than outside diameter of installed pipe.
- E. Remove excavated materials from site.
- F. Correct unauthorized rock removal in accordance with backfilling and compaction requirements of Section 02223, 02225, concrete fill, Section 03001, under direction of Engineer.

3.04. ROCK REMOVAL - MECHANICAL METHOD

- A. Excavate and remove rock by mechanical methods at locations required by the Contract Documents and when trimming bottom or sides of excavation is necessary to meet project requirements.
- B. Drill holes and utilize expansive tools, wedges, and/or mechanical disintegration compound, as appropriate, to fracture rock.

END OF SECTION

SECTION 02228

COMPACTION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Compaction requirements and test methods.
- B. Compact all subgrades, foundations, embankments, trench backfills, filled and backfilled material as specified.

1.02. RELATED SECTIONS

- A. Section 01026 - LUMP SUM ITEMS: Requirements applicable to lump sum prices for the work of this section.
- B. Section 01400 - QUALITY CONTROL: Inspection and testing by laboratory services.
- C. Section 02223 - BACKFILLING
- D. Section 02225 - TRENCHING

1.03. REFERENCES

- A. ASTM D698 - Laboratory Compaction of Soil Using Standard Effort
- B. ASTM D1556 - Density of Soil in Place by the Sand-Cone Method
- C. ASTM D1557 - Laboratory Compaction of Soil Using Modified Effort
- D. ASTM D2922 - Density of Soil in Place by Nuclear Methods
- E. ASTM D3017 - Water Content of Soil in Place by Nuclear Methods

1.04. SUBMITTAL

- A. Submit in writing a description of the equipment and methods proposed to be used for compaction.

1.05. QUALITY ASSURANCE

- A. The Contractor shall adopt compaction methods which will produce the degree of compaction specified herein, prevent subsequent settlement, and provide adequate support for the surface treatment, pavement, structure and piping to be placed thereon, or therein, without damage to the new or existing facilities.
- B. The natural subgrade for all footing, mats, slabs-on-grade for structures or pipes shall consist of firm undisturbed natural soil, at the grades shown on the Drawings.
- C. After excavation to subgrade is completed, the subgrade shall be compacted if it consists of loose granular soil or if its surface is disturbed by the teeth of excavating equipment.

1. This compaction shall be limited to that required to compact loose surface material and shall be terminated in the event that it causes disturbance to underlying fine-grained soils, as revealed by weaving or deflection of the subgrade under the compaction equipment.
2. If the subgrade soils consist of saturated fine or silty sands, silts, or clay or varved clays, no compaction shall be applied.

PART 2 PRODUCTS

2.01. MATERIALS

- A. Materials to be compacted shall be as specified in Sections 02223 and 02225.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Examine spaces to be filled beforehand and remove all unsuitable materials and debris including sheeting, forms, trash, stumps, plant life, etc.
- B. Inspect backfill and fill materials beforehand and remove all roots, vegetation, organic matter, or other foreign debris. Stones larger than 12 inches in any dimension shall also be removed or broken into smaller pieces.
- C. No backfill or fill material shall be placed on frozen ground nor shall the material itself be frozen or contain frozen soil fragments.
- D. Spaces to be filled shall be free from standing water so that placement and compaction of the fill materials can be accomplished in "dry" conditions.

3.02. PREPARATION

- A. Brace walls and slabs of structures to support surcharge loads and construction loads imposed by compaction operations.
- B. Proof-roll all subgrade surfaces to accept fill material.
- C. Each layer of fill shall be compacted to the specified density the same day it is placed.
 1. The moisture content of backfill or fill material shall be adjusted, if necessary to achieve the required degree of compaction.
- D. Compact each lift in accordance with Table 1.
- E. Match compaction equipment and methods to the material and location being compacted in order to obtain specified compaction, with consideration of the following guidelines:
 1. Rubber-tired rollers are preferred for most areas to prevent bridging of softer materials.
 2. Double smooth drum rollers may be used provided that careful inspection can prevent bridging.

3. Compaction roller should be lighter in weight than proof-rolling equipment, with a minimum compaction force of 350 pounds per linear inch (PLI).
4. Vibratory compaction is preferred for dry, granular materials.
5. Hand compaction equipment such as impact rammers, plate or small drum vibrators, or pneumatic buttonhead compactors should be used in confined areas.
6. Hydraulic compaction by ponding or jetting will not be permitted except in unusual conditions, and then only upon written approval by the Engineer and after a demonstration of effectiveness.
7. Backhoe-mounted hydraulic or vibratory tampers are preferred for compaction of backfill in trenches under pavements over 4 feet in depth. The upper 4 feet shall be compacted as detailed above or with hand-guided or self propelled vibratory compactors or static roller.
8. For plastic pipelines (PVC, PE or PB) do not compact directly over center of pipe until backfill has reached 2 feet above top of pipe.

TABLE 1

COMPACTION REQUIREMENTS

CONSTRUCTION ELEMENT	MAXIMUM COMPACTION LAYER THICKNESS (INCHES)	ASTM	MINIMUM COMPACTION
I. STRUCTURES*			
a. Fill beneath foundation elements and under slabs-on-grade - hand-guided compaction	6	D1557	95%
Fill beneath foundation elements and under slabs-on-grade - self-propelled or tractor-drawn compaction	8	D1557	95%
b. Fill around structures and above footings	8	D1557	95%
II. TRENCHES**			
a. Fill under pipelines and pipe bedding	8	D1557	95%
b. Pipe sidefills and top 4 feet of pipe backfill under pavements	12	D1557	93%
c. Backfill below 4 feet under pavement	18	D1557	90%
d. Backfill under lawns, gardens and cultivated fields	24	D1557	90%
e. All other trenches***	36	D698	85%
III. EMBANKMENTS AND FILLS			
a. Fill under streets, parking lots, and other paved areas	12	D1557	92%
b. Embankments not supporting pavement or structures	18	D1557	90%
c. Rough site grading	24	D698	85%

* Where structural loads are carried by piles, caissons or other deep foundations, minimum compaction may be reduced to 92 percent.

** The first 1 foot above pipelines shall have a compacted thickness of 12 inches.

*** For cross-country pipelines, lifts may be compacted with a backhoe bucket or other means, and slightly mounded at the surface provided that regrading is performed within the guarantee period.

3.03. FIELD QUALITY CONTROL

A. Material Testing

1. The Engineer reserves the right to order testing of materials at any time during the work.
2. Testing will be done by a qualified, independent testing laboratory in accordance with this section and Section 01400, Quality Control.
3. The Contractor shall aid the Engineer in obtaining representative material samples to be used in testing.
4. For each material which does not meet specifications, the Contractor shall reimburse the Owner for the cost of the test and shall supply an equal quantity of acceptable material, at no additional compensation.
5. The Contractor shall anticipate these tests and incorporate the time and effort into procedure.

B. Compaction Testing

1. The Engineer reserves the right to order the qualified independent testing laboratory to conduct in-place density tests of compacted lifts.
2. Testing shall be conducted for every 200 cubic yards of fill or backfill, or every 100 linear feet of trench backfill placed.
3. The Contractor shall dig test holes and provide access to all backfill areas at no additional compensation when requested by the Engineer.
4. For each test which does not meet specifications, the Contractor shall reimburse the owner for the cost of the test and shall replace all material included in that lift or section, replace with acceptable material, and compact to specifications, at no additional compensation.
5. The Contractor shall anticipate these tests and incorporate the time and effort into procedures.

C. Unacceptable Stockpiled Material - Stockpiled material may be tested according to Material Testing Materials.

D. Alternate Methods of Compaction - The Contractor may employ alternate methods of compaction if the desired degree of compaction can be successfully demonstrated to the Engineer's satisfaction.

E. Select Material - On-Site

1. Any on-site material may be used for select fill material provided it meets all the requirements of the equivalent off-site material.
2. No on-site material shall be used without prior approval of the Engineer.

F. Systematic Compaction - Compaction shall be done systematically, and no consideration shall be given to incidental coverage due to construction vehicle traffic.

3.04. PROTECTION

- A. Prior to terminating work for the day, the final layer of compacted fill, after compaction, shall be rolled with a smooth-wheel roller if necessary to eliminate ridges of soil left by tractors or equipment used for compaction or installing the material.
- B. As backfill progresses, the surface shall be graded so as to drain off during incidence of rain such that no ponding of water shall occur on the surface of the fill.
- C. The Contractor shall not place a layer of fill on snow, ice or soil that was permitted to freeze prior to compaction.
 - 1. These unsatisfactory materials shall be removed prior to fill placement.

END OF SECTION

SECTION 02661

WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Water main piping including fittings, accessories and materials.
- B. Connection of water mains to existing piping, hydrants, valves, and meters.
- C. Water services to serve domestic or fire protection.
- D. Installation.

1.02. RELATED SECTIONS

- A. Section 01039 - COORDINATION
- B. Section 01300 - SUBMITTALS
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 01700 - RECORD DOCUMENTS
- E. Section 02205 - PROTECTION OF EXISTING FACILITIES
- F. Section 02225 - TRENCHING
- G. Section 02228 - COMPACTION
- H. Section 02662 - WATER VALVES AND HYDRANTS
- I. Section 03001 - CONCRETE
- J. Section 15060 - INSIDE PROCESS PIPING

1.03. REFERENCES

- American National Standard Institute (ANSI)
- American Water Works Association (AWWA)
- American Society for Testing Materials (ASTM)
- A. Ductile Iron and Gray Iron Pipe
 - 1. ANSI A21.4/AWWA C104 - Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water
 - 2. ANSI A21.4/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids

3. ANSI A21.10/AWWA C110 - Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
 4. ANSI A21.11/AWWA C111 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
 5. ANSI A21.50/AWWA C150 - Thickness Design of Ductile Iron Pipes
 6. ANSI A21.51/AWWA C151 - Ductile Iron Pipe Centrifugally Cast in Metal Molds and Sand Lined Molds for Water and Other Liquids
 7. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances
 8. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- B. Copper Pipe and Tubing
1. ASTM B88 - Copper Pipe Type K
 2. AWWA C800 - Underground Service Line Valves and Fittings (with Type K Copper Pipe and Tubing)

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Product Data - Provide data describing conformance to ANSI/AWWA/ASTM codes, materials, sizes, class, dimensions, joint type, fittings, and pipe accessories.
- C. Manufacturer's Installation Instructions - Indicate special procedures required to install products specified.
- D. Results of shop tests, if required.
- E. Manufacturer's Certificate - Certify that products meet or exceed specified requirements.

1.05. PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700, Record Documents.
- B. Submit marked-up record plans, including record location if different from plan, variations in specified depth of more than ± 6 inches, record a minimum of two ties on all hydrants, bends, valves, and service connections.
- C. Identify and locate on record drawings the exposed unmapped utilities or services.

1.06. REGULATORY REQUIREMENTS

- A. Conform to requirements of regulatory agencies having jurisdiction over the work.
- B. Conform to permit requirements obtained by Owner.

1.07. FIELD MEASUREMENTS

- A. Prior to start of construction, verify by field measurements that existing conditions and structures are as shown on Drawings, notify Engineer of specific discrepancies or potential interferences.
- B. Prior to start of construction where ordered, verify by exploratory excavations that existing underground utility locations and elevations are as shown on the Drawings or to confirm marked location and elevation of underground utilities by the organization identified in Section 02205.
- C. Where connections are to be made to existing pipes, confirm the type of material and the outside dimensions of pipes.

1.08. COORDINATION AND SHUTDOWNS

- A. Coordinate field work under provisions of Sections 01039 and 01500, including field engineering, maintenance of traffic, access to private driveways, and emergency vehicle access.
- B. Coordinate work with local utility companies (private and municipal), including the organization identified in Section 02205 for location of existing utilities and protection thereof.
- C. Coordinate shutdowns of existing systems with local authorities. Notify affected property owners and industries at least 24 hours prior to shutdown including duration of shutdown.

PART 2 PRODUCTS

2.01. DUCTILE IRON PIPE

- A. Pipe material, sizes, classes, etc. shall be furnished and installed as listed herein.
- B. For potable water applications, all linings and sealers shall conform to all applicable local, state and federal health codes.
- C. Pipe shall be ANSI A21.51/AWWA C151 - Ductile Iron Pipe Material, thickness design conforming to ANSI A21.50/AWWA C150, Pressure Class 350, rubber gasket push-on joint and fittings with mechanical or push-on joint conforming to ANSI 21.11/AWWA C111 and ANSI A21.10/AWWA C110.
- D. Ductile iron pipe shall have cement mortar linings for potable water which shall conform to ANSI A21.4/AWWA C104 as follows:
 - 1. Double Thickness - Linings shall consist of cement mortar, centrifugally applied and shall not be less than 1/8 inch for 3 to 12 inches inclusive, 3/16 inch for 14 to 24 inches inclusive, and 1/4 inch for 30 to 54 inches inclusive. The inside shall be given a seal coat of asphalt material as described in ANSI A21.4/AWWA C104.
- E. Protective coatings for ductile iron pipe potable water pipes shall be an asphaltic coating approximately 1 mil thick and conform to requirements of ANSI 21.51/AWWA C151.
- F. All mechanical joint pipe and fittings shall be furnished with ductile iron retainer glands.
- G. Push-on joints shall provide the following maximum deflections:

PIPE SIZE	MAXIMUM DEFLECTION
4" through 12"	5°
16" through 18"	3°
24" through 36"	1.5°

H. Manufacturers shall be:

1. American Pipe Product.
2. U.S. Pipe Product.
3. Griffin Pipe Product.
4. McWane Group (Clow or Atlantic States).
5. Or equal.

I. Where shown on the Drawings or described herein, provide ductile iron pipe with polyethylene sleeve encasement conforming to ANSI 21.5/AWWA C105.

1. The encasement shall be a continuous 8-mil thick polyethylene sleeve.
2. The joints in the sleeve shall be overlapped a minimum of 12 inches and taped with a 2-inch wide polyethylene adhesive tape wrapped a minimum of three times around the pipe to secure the tube of polyethylene to the pipe.

2.02. COPPER SERVICE PIPE

- A. Copper Pipe - ASTM B-88, Type K material for underground service, nominal inside diameter 1 inches.
- B. Fitting shall be flare-type fittings in conformance with AWWA C800.
- C. Joints - Copper joints shall be thoroughly cleaned and the end of pipe uniformly flared by a suitable tool to the bevel of the fitting used. Wrenches shall be applied to the bodies of the fittings where the joint is being made and, in no case to a joint previously made.

2.03. PIPE ACCESSORIES

- A. Fittings - Same materials, class, coatings and linings as pipe unless under Article 2.01 it was specifically described otherwise. Fittings molded or formed to suit pipe size and end design and in required tee, bends, elbow, couplings, adapters, and other configurations.

2.04. IDENTIFICATION

- A. Each pipe length and fitting shall be clearly marked with:
 1. Manufacturer's name and trademark.
 2. Nominal pipe size and class.
 3. Material designation.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Contractor shall verify all existing conditions.
- B. The drawings and specifications may contain information relating to conditions below the ground surface at the site of proposed work, but such information is furnished without guarantee as to it being complete or correct. The Contractor shall assume all risk and responsibilities and shall complete the work in whatever manner and under whatever conditions he may encounter or create without extra cost to the Owner. Location of existing underground facilities at or contiguous to the site is based upon information and data furnished to the Engineer by owners of such underground facilities or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof. The Contractor shall perform exploratory excavations in advance of this work to verify the location, depth, size, and material of existing utilities which may interfere with the work to be performed under this contract. All damage to existing utilities shall be the Contractor's cost to repair or replace.
- C. Verify that trench cut, excavated base and pipe bedding are ready to receive pipe and that excavations and pipe bedding dimensions and elevations are as shown on Drawings.
- D. All pipe or fittings which have been damaged in transit or which are obviously deformed or refinished in any way shall be rejected, marked, and removed from the site of the work. Any pipe or fitting which the Engineer suspects is improper for the job shall be temporarily rejected, marked, and set aside for subsequent investigation to determine its conformity with the specifications.
- E. All pipe fittings and specials shall be carefully inspected in the field before lowering into the trench. Cracked, broken, warped, out-of-round, damaged pipe joints including damaged pipe lining or coatings or specials, as determined by the Engineer, shall be culled out and not installed. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the Contractor at his own expense.

3.02. PREPARATION

- A. The Contractor shall have on the job site with each pipe laying crew, all the proper tools, gauges, pipe cutters, lubricants, etc. to handle, cut and join the pipe.
- B. Flat-bottom trenches of required width shall be excavated to the necessary depth as required and maintained in accordance with Section 02225.
- C. Prior to installing the pipe foundation material, trenches shall have all water removed and all work performed in a dry trench.
- D. All pipes, fittings and specials which are to be installed in the open trench excavation shall be properly bedded in a uniformly supported on pipe foundations of the type specified in Section 02225 and shown on the Drawings. In particular, stones 2 inches and larger shall be removed from the bearing surface of the pipe foundation.
- E. Pipe foundation bedding material shall be spread in maximum 8-inch layers and each layer shall be compacted up to the spring line of the pipe.

- F. Compaction methods include hand tamping with T-bars, flat heads, and shovel slicing as well as mechanical compactors.
- G. The Contractor shall perform his bedding operations with care to maintain line and grades.
- H. Suitable holes or depressions shall be provided in the pipe bedding to permit adequate bedding of bells, couplings, or similar pipe projections.

3.03. LINES AND GRADES

- A. The Contractor shall furnish all labor, materials, surveying instruments, and tools to establish and maintain all lines and grades. The Contractor shall have personnel on duty or on standby call, at all times, who are qualified to check line and grade of water mains as they are installed.
- B. Property, staked centerline, and other control lines necessary for locating the work are shown on the Drawings.
- C. During construction, the Contractor shall provide the Engineer, at his request, all reasonable and necessary materials, opportunities, and assistance for setting stakes and making measurements, including the furnishing of one or two rodmen or chainmen as needed at intermittent times.
- D. The Contractor shall carefully preserve bench marks, reference points and stakes established by the Engineer or Owner, and in case of willful or careless destruction by his own operations he will be charged with the resulting expense to reestablish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the unnecessary loss or disturbance of such control data.
- E. The Contractor may use laser equipment to assist in setting the pipe provided he can demonstrate satisfactory skill in its use.
- F. The use of string levels, hand levels, carpenter's levels or other relatively crude devices for transferring grade or setting pipe are not to be permitted.

3.04. TOLERANCES

- A. Pipes shall be laid to the lines and grades shown on the Drawings.
- B. Minimum depth of cover shall be maintained as shown on the Drawings or as described herein.

3.05. INSTALLATION

- A. Installation of ductile iron pipe or plastic pipe to be in conformance with AWWA C600 or ASTM D2774, respectively, except as modified in this section or referenced sections or as shown on the Drawings.
- B. The Contractor shall furnish slings, straps and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from storage areas to the trench shall be restricted to operations which can cause no damaged to the pipe or lining or castings.
- C. The pipe shall not be dropped from trucks onto the ground or into the trench.

- D. Each pipe section shall be placed into position in the trench on the pipe bedding in such manner and by such means required to cause no injury to the pipe, persons or to any property.
- E. The method of laying and jointing the pipe shall be in accordance with the recommendations of the manufacturer and as approved by the Engineer. Each pipe shall be aligned with that already in place, forced home completely with horizontal axial movement and held securely in position. The bell of each pipe length to be laid in the same direction the installation is proceeding.
- F. At the joints, enough depth and width shall be provided to permit the pipe layer to reach entirely around the pipe so that the joints may be made in accordance with the manufacturer's recommendations. Mechanical-type joints shall be tightened within the AWWA recommended torque range.
- G. Pipes, fittings, and specials shall be firmly bedded in the pipe foundation and shall have full bearing throughout their entire length, which shall be accomplished by combination of shaping the bedding and adequately compacting the pipe bedding and backfill under and around the pipe to the spring line of the pipe. The remaining backfill placed in 12-inch lifts to 1 foot above the crown of the pipe in accordance with Table 1, Minimum Compaction Requirements, Section 02228. The remaining backfill installed in accordance with Sections 02225 and 02228.
- H. When laid in tunnels, pipes shall be blocked in such a manner as to take the weight off the bells. Pipe laid in normal trench excavation shall not be laid on wood blocking.
- I. Backfill material within 12 inches of the pipe shall be free of stones greater than 2 inches in any dimension.
- J. Unless otherwise shown on the Drawings, the minimum total finished cover over the top of the pipe barrel of all pressure pipe shall be 4 feet.
- K. Refer to Section 02225 for other installation guidelines and requirements.
- L. To deflect a pipe joint, first join the pipe in the proper manner and then deflect the pipe within the allowable deflection recommended by the manufacturer.
- M. Installation of polyethylene sleeves to be performed in accordance with the manufacturer's instructions and ANSI A21.4/AWWA C105.
- N. Install magnetic locating tape, trace wire, minimum 2 inches wide with the words "Water Line Below" along the centerline of the installed water main for the entire length at a maximum depth of 2 feet 0 inches below finished grade.
- O. For each pipe entering or leaving a manhole or underground structure, at least one pipe joint shall be located within 4 feet of the outside face of the wall, and preferably at the 2-foot point.
- P. For ductile iron pipe installations, install three bronze wedges in each joint of pipe, fittings and specials.

3.06. CONNECTIONS TO EXISTING PIPES

- A. Connections to existing water mains shall be by dry connection by inserting a tee with coupling and where shown on the Drawings.

- B. Contractor to verify outside dimension of existing water main.
- C. Couplings to be ductile iron fittings, Smith Blair Model 441, or equal with stainless steel bolts and nuts. The couplings shall receive two coats of coal tar epoxy paint on all exterior surfaces prior to installation.

3.07. BRACING AND BLOCKING

- A. All bends, tees, crosses, plugs, etc., shall be braced and blocked with wood and then anchored with concrete thrust blocks so that there will be no movement of the pipe in the joints due to the internal or external pressures.
- B. The concrete shall be placed around the fittings and completely fill the space between the fittings and walls of the trench, from 6 inches below the fittings of pipe to 12 inches above the fittings and in accordance with the dimensions and details shown on the Drawings.
- C. The anchor concrete shall be so placed that the bell and spigot joints or other joints may be tightened, if necessary.
- D. Steel ties to be used only where shown on the Drawings.
- E. Prior to installation of the concrete anchor, the Contractor shall wrap all fittings with a minimum of 8-mil thick polyethylene.
- F. Refer to details shown on the Drawings.
- G. Cast-in-place concrete used in constructing concrete thrust blocks shall conform to requirements specified in Section 03001.
- H. Measuring, mixing, transporting and placing of concrete shall conform to American Concrete Institute (ACI) Publication 304.
- I. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- J. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.08. TEMPORARY PLUGGING

- A. At all times when pipe laying is not actually in progress, the open ends of the pipes shall be closed temporarily with pipe plugs or by other means such that there is no possibility of any water or foreign material entering the line. If water is in the trench when work is resumed, the plugs shall not be removed until the water has been removed and work can proceed in a dry stable trench.

3.09. CLEANING PIPELINE

- A. At the conclusion of the work, the Contractor shall thoroughly clean all new pipes by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered during the construction period.
 - 1. Pipes shall be flushed at a minimum rate of 2.5 feet per second for a suitable duration.

2. If, after this cleaning, any obstructions remain, they shall be corrected to the satisfaction of the Engineer.
- B. Where required, the Contractor shall use mechanical methods to clean pipes when flushing does not remove all obstructions or material.
- 3.10. PRESSURE TESTING AND FLUSHING
- A. Pressure testing and flushing of the water mains shall be performed in accordance with Section ____.
 - B. Any section of pipe that fails the pressure test shall be dug up and replaced or permanently repaired as approved by the Engineer. All repairs and/or replacements shall be the Contractor's cost. The replaced or repaired section shall then be retested.
- 3.11. DISINFECTION
- A. Disinfection of water mains shall be performed in accordance with Section ____.
- 3.12. ENCASEMENT
- A. Where shown on the Drawings, pipes shall be encased in concrete; details and requirements for encasement of pipes are described in Section 02225 and shown on the Drawings.
 - B. Requirements for encasement of pipes 10 inches and smaller, shown under a base slab, are described in Section 02225.
 - C. Where shown on the Drawings, pipes shall be encased in a polyethylene sleeve.
 1. Damage to wrapping during pipe laying or backfilling operations shall be repaired with additional sleeve material and adhesive tape.
- 3.13. VALVES AND HYDRANTS
- A. Valves and hydrants to be installed on this project are specified in Section 02662.
 - B. Valve and hydrant details for connection to the water main are shown on the Drawings.

END OF SECTION

SECTION 02662

WATER VALVES AND HYDRANTS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Furnishing the several types of valves, stops, and backflow preventers.
- B. Hydrants.
- C. Valve operators.
- D. Valve boxes.
- E. Installation.

1.02. RELATED SECTIONS

- A. Section 01039 - COORDINATION
- B. Section 01300 - SUBMITTALS
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 01700 - RECORD DOCUMENTS
- E. Section 02225 - TRENCHING
- F. Section 02661 - WATER DISTRIBUTION PIPING

1.03. REFERENCES

- A. ANSI/AWWA C500 - Gate Valves for Water and Sewerage Systems
- B. ANSI/AWWA C502 - Dry Barrel Fire Hydrants
- C. ANSI/AWWA C504 - Rubber Seated Butterfly
- D. ANSI/AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types
- E. ANSI/AWWA C507 - Ball Valves 6 inches through 48 inches
- F. ANSI/AWWA C508 - Swing Check Valves for Waterworks Service 2 inches through 24 inches NPS
- G. ANSI/AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems
- H. ANSI/AWWA C540 - Power-Activating Device for Valves and Sluice Gates
- I. ANSI/AWWA C550 - Protective Interior Coatings for Valves and Hydrants

- J. ASTM A126 - Gray Iron Castings
- K. ASTM A48 - Gray Iron Castings for Valves, Flanges and Pipe Fittings

1.04. DESIGN REQUIREMENTS

- A. The design working pressure shall be 200 psig for valves 12 inches NPS in diameter and smaller.
- B. Valves shall be designed for normal cold water use.
- C. Gate valves shall be designed to be leak-tight with full pressure on either face with no pressure on the opposite face.
- D. Resilient seated gate valves shall be designed to be leak-tight with full pressure on either face with no pressure on the opposite face.
- E. Hydrants shall be designed for a 300 psig test pressure and 150 psig working pressure.

1.05. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Submit shop drawings of types of valves, hydrants and appurtenances proposed for the project including conformance to ANSI/AWWA codes and related details for field assembly, operations and maintenance.
- C. Manufacturer's Installation Instructions - Indicate special procedures required to install Products specified.
- D. Results of shop tests, if required.
- E. Manufacturer's Certificate - Certify that products meet or exceed specified requirements.

1.06. PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700. Record Documents.
- B. Record location of valves and hydrants with a minimum of two ties to permanent objects.

1.07. REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the work of this section.
- B. All sheeting and bracing including the use of mobile shields shall conform to Public Law 91-596 (Williams Steiger Act). Occupational Safety and Health Administration Act (OSHA) of 1970 and its amendments and regulations or to the New York State Industrial Code Rule 23, entitled, "Protection in Construction, Demolition and Excavation Operations" as issued by New York State Department of Labor, Board of Standards and Appeals, whichever is the most stringent.
- C. Conform to New York State Industrial Code Rule 53, entitled "Construction, Excavation and Demolition Operations at or Near Underground Facilities" as issued by the State of New York Department of Labor, Board of Standards and Appeals.

- D. Conform to requirements of permits obtained by Owner.

1.08. FIELD MEASUREMENTS

- A. Verify by field measurements and exploratory excavations that existing pipe outside diameter (for tapping sleeve and valve installations) and facilities locations and elevations are as indicated and/or as shown on drawings. Notify Engineer of specific differences.

1.09. COORDINATION

- A. Coordinate work under provisions of Sections 01039 and 01500.

PART 2 PRODUCTS

2.01. MATERIALS

- A. Valve size, type of valve, joint type, class, lining, coatings shall be installed as listed herein.
- B. Valves shall be of standard manufacturer and of highest quality, both as to material and workmanship, conforming to the latest edition of AWWA standards specified.
- C. All valves and hydrants shall have the manufacturer's name monogrammed or initialed by the manufacturer thereon and shall be identified by catalog numbers.
- D. All valves shall be provided with hub, spigot, mechanical joint, flange or screwed ends as described herein
- E. Valves, 2 inches in nominal diameter and smaller shall be all brass or bronze.
- F. Valves over 2 inches in nominal diameter shall be iron bodied, fully brass or bronze mounted.
- G. All surface forming joints or bearing surfaces shall be machined to a perfect fit.
- H. All disc and seat rings shall be carefully and thoroughly secured in place with the iron castings machined where the rings are bare and the backs of the rings machined all over.
- I. After the rings have been fastened securely in place, the front shall be machined all over to a perfectly true and smooth bearing surface.
- J. All valves with non-rising stems shall have valve position indicators.
- K. Valves shall open counterclockwise (left) unless otherwise specified.

2.02. GATE VALVES

- A. Gate valves 2 inches and smaller shall be bronze gate valves with rising stem, double wedge disc, screwed bonnet, screwed ends, 125-lb. rating, and shall be repackable under pressure in full open position.
- B. All gate valves 2 inches and smaller shall be Stockham Figure 107; Lunkenheimer Figure 2127; or equal.

- C. All other interior gate valves shall conform to AWWA Standard C500 and shall be of iron body, bronze mounted, double-disc type with outside screws and yokes and have 125 pound ANSI flanged ends.
 - 1. Valves shall be constructed with bolted bonnets, provided with cast iron stuffing boxes having bolted followers.
 - 2. The stuffing boxes shall be so arranged as to be readily accessible and shall be packed ready for use with synthetic fiber, graphite impregnated stuffing.
- D. Stems shall be fabricated of brass or bronze with the lath-cut, half-V pattern threads. Double-disc type gate valves shall be Kennedy Valve Manufacturing, Mueller, or equal.
- E. All interior gate valves shall be equipped with handwheel operators unless otherwise specified. Handwheel or chain and wheel operators shall be replaceable with 2-inch operating nuts without replacing the valve stem or removing the bevel gears.
- F. All underground gate valves shall be non-rising stems, 2-inch operating nuts, O-ring seal and shall open counterclockwise (left).
 - 1. Underground gate valves shall be of the iron body, bronze mounted type conforming to AWWA Standard C500.
 - 2. Mechanical joint type designed for underground use at 150 psi.
 - 3. Underground gate valves shall be Mueller, Kennedy Valve Manufacturing Company, or equal.

2.03. CHECK VALVES

- A. All check valves, except those installed on sump pump discharge lines, shall be of the horizontal single disc swing type designed to operate with a minimum loss of pressure.
- B. Check valves shall be so designed that when there is no flow through the line, the disc shall hang lightly against the seat and shall afford ample waterway with but a small angle of opening.
- C. All check valves shall be provided with screwed or bolted covers for access to the disc.
- D. Unless shown otherwise, all check valves shall be located in horizontal piping runs and shall be provided with extended hinge pin and outside lever and weight fully installed to assist the valve in closing.
- E. All check valves with outside lever and weights shall be provided with guards which protect operating personnel from the swinging action of the outside lever and weights.
- F. Guards shall be of a cage-type design using heavy duty wire mesh, easily removable, constructed as shown on the Standard Details in the Contract Drawings.
- G. All check valves, except for those installed on the discharge piping of raw wastewater pumps, primary scum pumps, and sump pumps, shall be manufactured by Kennedy Valve Manufacturing Company, Inc.; Clow Corporation; or equal.
- H. Check valves for sump pumps shall be Series 100 rubber flapper as manufactured by Apco; Darling; or equal.

2.04. PLUG VALVES

- A. Plug valves shall be non-lubricated, eccentric type and shall close drop-tight at the rates pressure of 150 psig.
- B. Port areas shall be at least 80 percent of the full pipe area to provide clog-free operation.
- C. The valve body shall be cast iron or semi-steel with a welded-in-place nickel seat. The body shall have a bolted bonnet for permitting removal of the plug while body remains in line.
- D. Flanges shall be 125-lb., faced, and drilled.
- E. The plug shall be cast iron with synthetic rubber facing, suitable for frequent open-close operation and for flow throttling.
- F. Journal bearings shall be provided at each end of the plug and shall be of the wetted type to prevent binding. Bearings shall be fabricated from oil-impregnated 316 stainless steel so that the plug will operate freely after long periods of inactivity.
- G. Packing shall be adjustable U-rings, and shall be capable of being replaced under pressure without removal of the bonnet or plug.
- H. Valves shall be provided with adjustable stops.
- I. Valves for interior installation and smaller than 8 inches in diameter shall be equipped with standard 2-inch nuts for wrench operation.
- J. Valves 8 inches in diameter and larger shall be equipped with worm gear and handwheels.
- K. Chain operators shall be furnished in accordance with chain wheel operators as stated hereinafter.
- L. Unless otherwise specified, valves shall be installed so that when closed, the plug is at the upstream end of the valve.
- M. In horizontal piping with the plug shaft installed horizontally, the plug shall be in the upper part of the valve body when open.
- N. Plug valves on digester gas piping shall be NBR Hydrocarbonated for corrosion protection.
- O. Plug valves shall be as manufactured by DeZurik, Sartell, MN; or equal.

2.05. PRESSURE REDUCING AND REGULATING VALVES

- A. Pressure reducing and regulating valves shall be installed where shown on the Contract Drawings.
- B. Each valve shall be provided with "Y" strainer as specified hereinafter.
- C. Pressure reducing and regulating valves shall have cast iron bodies and covers, with bronze trim, with valve opening to be at least as large as the size of valve.
- D. All valves provided shall be designed such that repairs can be made without the valve being removed from the line.

- E. Each valve shall automatically reduce a constant or variable higher inlet pressure to a constant lower downstream pressure by means of pilot operated regulator, with the downstream pressure being adjustable by means of a single screw. The pilot system shall be bronzed-bodied and be protected by a sedimentation chamber and bronze bodied strainer.
- F. The General Contractor shall coordinate with equipment suppliers for required pressure settings where these valves are to be used for seal water.
- G. Pressure reducing and regulating valves shall have a maximum pressure rating of at least 175 psi.
- H. These valves shall be manufactured by G.A. Industries, Inc., Mars, PA; Cla-Val Company, Newport Beach, CA; the Ross Valve Manufacturing Company, Troy, NY; or equal.

2.06. SOLENOID VALVES

- A. Solenoid valves shall be properly sized and rated for their intended use and shall be installed where indicated on the Contract Drawings and as required to facilitate proper process equipment operations.
- B. Each valve shall be of heavy-duty type capable of operating on continuous duty.
- C. Solenoid valves in hazardous areas shall be rated explosionproof, and all others shall be waterproof.
- D. Solenoid valves shall be normally closed and open on energization.
- E. Valves shall be suitable for operation on 120 volt, a-c, single phase, 60 Hertz.
- F. Solenoid valves shall be Model WP 8210 (water-proof) and Model 8211 (explosion-proof) as manufactured by Automatic Switch Company; Skinner; or equal, and shall be preceded with a bronze-bodied Monel metal element strainer equal to the Automatic Switch Company Bulletin 8600.

2.07. BACKFLOW PREVENTER

- A. Reduced pressure zone backflow preventers shall be supplied where shown on the Contract Drawings.
- B. The backflow preventers shall consist of two spring-loaded check valves and a spring-loaded diaphragm-actuated, differential pressure relief valve located in the zone between the check valves.
- C. The unit shall include properly located test cocks and operation shall be completely automatic. The total headloss shall not exceed 10 psi at AWWA rated flow.
- D. All parts shall be manufactured from corrosion-resistant materials.
- E. A continuous discharge from the relief valve opening shall provide a visual inspection of need of repair.
- F. Manufacturers - Reduced pressure zone backflow preventers shall be listed on approved list of New York State Department of Health Technical Reference PWS-14 latest edition.

2.08. GLOBE VALVES

- A. All globe valves shall be of suitable design to provide the full pipe opening and to operate with full pressure on either side of the seat.
- B. Valves shall be of the inside screw-type seat with yoke to insure square seating of the disc.
- C. Globe valves shall be provided with the normal composition disc of a material suitable for according to the use of which the valves are put.
- D. They shall be equipped with cast iron handwheels and shall be packed ready for use.
- E. Globe valves for the waterseal piping system shall be bronze bodied as manufactured by Powell; Lunkenheimer; or equal.
- F. Refer to the Contract Documents for size and location.

2.09. CORPORATION STOPS

- A. Corporation stops shall be of brass or bronze construction and shall be installed by the wet method, connecting service line to water mains, with water main at or near operating pressure when corporation stops are installed.
- B. Corporation stops shall be installed by experienced tradesmen using the proper tools especially designed for a wet-tap connection.
- C. Corporation stops shall be installed in complete accordance with the pipe manufacturer's recommendations for tapping and installing corporation stops.
- D. Saddles shall be used where recommended by the pipe manufacturer or as ordered by the Engineer, and such saddles shall be approved for use with the pipe by the pipe manufacturer. Threads of service saddle shall be compatible with the corporation stop specified. Saddles shall be of double strap design. Contractor shall verify diameter and pipe material ahead of time. Saddles shall be made of either brass or bronze and shall be as manufactured by Mueller Company, Ford Meter Box Company, or equal. All saddles shall be field wrapped with a polyethylene sheet.
- E. Where saddles are used, or for other reasons the main cannot be tapped wet, the Engineer may approve visual inspection of such connections after they have been pressurized.
- F. Buried corporation stops shall be Model H-15000 as manufactured by Mueller Company, or Model F-600 as manufactured by Ford Meter Box Company, or equal. Corporation stops located within pits or vaults shall be Model H-10045 or H-9992 with I.P. outlet as manufactured by Mueller Company, or Model F800 or F1600 with I.P. outlet as manufactured by Ford Meter Box Company, or equal.

2.10. CURB STOPS

- A. Curb stops shall be of brass or bronze construction and two rubberized O-ring seals to provide pressure-tight seal. Curb stops shall be Figure H-15204 as manufactured by Mueller-Oriseal, B22 as manufactured by Ford Meter Box Company, Hayes, Nuseal, or equal.
- B. Curb boxes shall be 2-1/2-inch shaft size two-piece screw type. They shall be adjustable from 48-inch to 72-inch. Curb boxes shall be constructed of cast iron and thoroughly coated with two coats of asphaltum varnish.

- C. Curb box top section shall include a water cover which shall be of the “old style” with the word “water” cast into it and shall include a brass pentagon screw.
- D. Curb box rods shall be supplied with a hole in the “U” portion for the insertion of a brass pin. Pins shall be supplied and shall be made of brass.
- E. Curb boxes shall be as manufactured by Ford Meter Box Company, Mueller Company, or equal.

2.11. HANDWHEEL OPERATOR

- A. Valves specified with handwheel operator shall have the proper size handwheel to provide an effortless operation.
- B. Handwheels shall be made of bronze or cast iron materials, and shall be properly secured to the valve stem to prevent displacement during use.

2.12. WRENCH OPERATOR

- A. Wrench for wrench-operated valves located above ground shall be of bronze or cast iron, and shall be of suitable size and length to facilitate an effortless operation. One such wrench shall be provided for each valve on the project requiring wrench operation.
- B. Wrenches for wrench-operated valves located underground shall be of tee handle type and shall be of suitable length to enable operation of all such valves on the project. Two wrenches compatible with each type of operating nut on all valves used throughout the project shall be provided.

2.13. CHAIN AND WHEEL OPERATIONS

- A. All valves located with center of shaft 6-1/2 feet or higher from the operating floor shall be equipped with chain-and-wheel operators.
- B. The chain-and-wheel operators shall have a straight or a beveled gear reducer type operator depending on the type recommended by the manufacturer.
- C. The length of the operating chain shall extend to 6 feet 0 inches above the operating floor.

2.14. EXTENDED OPERATORS

- A. All submerged valves, valves located below walkways and as otherwise shown on the Contract Drawings shall be provided with extended operators.
- B. Extended operators shall be cold rolled steel supported by bronze bushed guide brackets at intervals not to exceed 10 feet.
- C. Extended operators shall be provided with position indicators and shall be of sufficient length to allow operation of valve from approximately 36 inches above the surface of the walkway.
- D. Anchor bolts for guide brackets shall be stainless steel.
- E. Right angle extended operators of the same material shall be furnished where shown on the Contract Drawings. Each right angle extended operator shall be provided with a minimum of two bearing blocks.

2.15. VALVE BOXES

- A. Valve boxes shall be provided for all buried valves unless they are housed in valve chambers.
- B. Valve boxes shall be made of good quality cast iron and shall be of the sectional adjustable type. The long section shall be a minimum of 5 inches in inside diameter and fit around the stuffing box of the valve; or over the valve operator, if a two-section box is used; or to fit a circular or oval-base section if a three-section box is used.
- C. The upper section shall be arranged to screw on over the adjoining long section and shall also be full diameter. Screw-type valve boxes shall be used unless otherwise specified. Valve boxes shall be provided with cast iron lids or covers.
- D. Lids or covers shall be marked for the service for which the valve is used by casting words such as "WATER" for potable water system, "GAS", etc. An arrow shall be provided on the cover to indicate the direction in which the valve is turned to open; this arrow shall be labeled with the word "OPEN".
- E. The overall length of each valve box shall be sufficient to permit the top of the box to be set flush with the established finished grade. In asphalt concrete pavements, the top of the box to be set 1/2-inch below finished grade. Asphalt concrete to be compacted 12 inches wide around the upper section for a depth of 12 inches below finished grade.
- F. Valve boxes shall be set truly vertical and fully supported until sufficient backfill has been placed and compacted to ensure vertical alignment of the box.

2.16. VALVE TAGS AND DIRECTORY

- A. Provide valve tags for all valves not buried.
- B. Tags shall be made from a plastic laminate of heavy plastic with a brass eyelet in the corner and shall indicate the valve number and fluid in the pipe.
- C. Tags shall be fastened to each valve with a brass chain.
- D. Tags to be made by Seton Name Plate Company, New Haven, CT; W.H. Brady Company; or equal.
- E. A valve directory shall be provided listing all valve numbers, the valve function, and location. The directory shall be typewritten and framed with a glass cover and delivered to the Owner after approval by the Engineer.
 - 1. Buried valves shall be included in valve directory with a description of their functions and locations.

2.17. YARD HYDRANTS

- A. Yard hydrants shall be minimum 1-1/2-inch or as shown on the Drawings, non-freeze, exposed head, post-type hydrants with 1-1/2-inch hose connections.
- B. Hydrants shall have bronze casing and handwheel operators.

- C. Each 1-1/2-inch hose connection on the yard hydrants shall be provided with a 1-1/2 to 1-inch reducer. The reducer shall be provided with the appropriate threads to make a leak-proof seal when attached to the 1-1/2-inch hose connections on the hydrants.
- D. The reduced end shall be provided with a 1-inch quick disconnect male hose adapter. Hose adapter shall be Ever-Tite; OPW Kamlock; or equal.
- E. Hydrants shall be Zurn Model Z-1390, Jay R. Smith Mfg. Co. Figure 5913, or equal.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that trench cut, excavated base and valve bedding is ready to receive work and valve bedding dimensions and elevations are as indicated on drawings.
- B. All valves, hydrants, stops and appurtenances shall be carefully inspected in the field before lowering into the trench. Cracked, broken, warped, out-of-round, damaged joints, including damaged linings or coatings, or otherwise defective valves, hydrants and stops, as determined by the Engineer, shall be culled out and not installed. Such rejected material shall be clearly tagged in such manner as not to deface or damage it, and the material shall then be removed from the job site by the Contractor at his own expense.
- C. For tapping sleeve and valve connections, the Contractor, prior to making any connections, shall verify the material and outside diameter of the existing water main.
- D. The Contractor shall have on the job site all the proper tools, gauges, pipe cutters, lubricants, etc., to properly install valves, hydrants, etc.

3.02. PREPARATION

- A. Prior to installing the foundation, trenches shall have all water moved and all work performed in a dry stable trench.
- B. All valves, hydrants, etc. which are to be installed in the open trench excavation shall be properly bedded in, and uniformly supported on pipe foundations of the various types specified in Section 02225 and shown on the Contract Drawings.
- C. Flat-bottom trenches of required width shall be excavated to the necessary depth as required and maintained in accordance with Section 02225.
- D. Bedding material shall be spread in maximum of 8-inch layers for the pipe foundation and each layer shall be compacted until the required total depth of bedding has been built up.
- E. Suitable holes or depressions shall be provided in the bedding to permit adequate bedding of bells, couplings or similar joint projections.
- F. Compaction methods include hand tamping with T-bars, flat heads, shovel slicing, as well as mechanical compactors.
- G. The Contractor shall perform his bedding operations with care to maintain line grade and proper depth of valve and hydrants.

3.03. LINES AND GRADES

- A. Property line and other control lines necessary for locating the work are shown on the Drawings.

3.04. TOLERANCES

- A. Valves and hydrants shall be laid to the lines and grades shown on the Drawings.

3.05. INSTALLATION

- A. The Contractor shall furnish slings, straps, and/or approved devices to provide satisfactory support of the valves or hydrants when lifted. Transportation from storage areas to the trench shall be restricted to operations which can cause no damaged to the coating or lining or castings.
- B. The valves or hydrants shall not be dropped from trucks onto the ground or into the trench.
- C. All valves shall be installed in accordance with the specifications for the pipe to which they are to be connected and as previously described for individual types of valves.
- D. Joints of valves shall be made up in accordance with the Contract Drawings and/or as described under the appropriate pipe joint descriptions found in other sections of these specifications.
- E. The valves shall be so located that they are accessible for operating purposes and shall bear no stresses due to loads from the adjacent pipe.
- F. All valves shall be inspected before installation, and they shall be cleaned and well lubricated before being installed in the line.
- G. Hydrants shall be set at locations specified on the Contract Drawings and shall be of such length that, with the frost ring at the ground surface grade, there shall be 4 feet of cover over the connecting pipe.
- H. Hydrants shall be set so that the barrel is truly vertical, and shall be properly backfilled so that the barrel will remain truly vertical.
- I. They shall be placed with 3 cubic feet of crushed stone pocket to provide drainage for the hydrant.

END OF SECTION

SECTION 02698
UNDERGROUND PROCESS PIPING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Underground process pressure piping, fittings and specials located outside structures.
- B. Miscellaneous appurtenances.
- C. Shop tests.
- D. Installation.
- E. Testing.

1.02. RELATED SECTIONS

- A. Section 01039 - COORDINATION
- B. Section 01300 - SUBMITTALS
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 01700 - RECORD DOCUMENTS
- E. Section 02205 - PROTECTION OF EXISTING FACILITIES
- F. Section 02225 - TRENCHING
- G. Section 02228 - COMPACTION
- H. Section 02662 - WATER VALVES AND HYDRANTS
- I. Section 02741 - PRESSURE TESTS OF FORCE MAINS
- J. Section 03001 - CONCRETE

1.03. REFERENCES

- American National Standards Institute (ANSI).
- American Water Works Association (AWWA).
- American Society for Testing Materials (ASTM).
- A. Ductile Iron and Gray Iron Pipe
 - 1. ANSI A21.4/AWWA C104 - Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water

2. ANSI A21.4/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
 3. ANSI A21.10/AWWA C110 - Ductile Iron and Gray Iron Fittings, 3 inch through 48-inch, for Water and Other Liquids
 4. ANSI A21.11/AWWA C111 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
 5. ANSI A21.50/AWWA C150 - Thickness Design of Ductile Iron Pipes
 6. ANSI A21.51/AWWA C151 - Ductile Iron Pipe Centrifugally Cast in Metal Molds and Sand Lined Molds for Water and Other Liquids
 7. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances
 8. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- B. Copper Pipe and Tubing
1. ASTM B88 - Copper Pipe Type K
 2. AWWA C800 - Underground Service Line Valves and Fittings (with Type K Copper Pipe and Tubing)

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Product Data - Provide data, indicating conformance to ASTM/AWWA codes, pipe material, sizes, class, dimension, joint type and accessories.
- C. Manufacturer's Installation Instructions - Indicate special procedures required to install products specified.
- D. Results of shop tests, if required.
- E. Manufacturer's Certification - Certify that products meet or exceed specified requirements.

1.05. PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700, Record Documents.
- B. Submit marked up record plans including record location of pipe connections, valves, cleanouts, bends, tees, manholes, rim and invert elevations. Invert elevations to be of the pipe invert at a point where the pipe enters or exits a structure.
- C. Identify and locate on record drawings during construction the discovery of exposed uncharted existing utilities and services.

1.06. REGULATORY REQUIREMENTS

- A. Conform to requirements of permits obtained by Owner
- B. Conform to the requirements of regulatory agencies having jurisdiction over the work.

1.07. FIELD MEASUREMENTS

- A. Prior to start of construction, verify the field measurements and elevations that existing conditions are as shown on Drawings. Notify Engineer of specific differences.
- B. Prior to start of construction, where ordered, verify by exploratory excavations that existing underground utility locations and elevations are as shown on drawings prior to installation of crossing pipes or to confirm location and elevation of uncharted utilities. Notify Engineer of location and elevation and allow Engineer sufficient time to determine any changes required as a result of such exploratory excavation, prior to start of construction.

1.08. COORDINATION

- A. Coordinate work under provisions of Sections 01039 and 01500, including field engineering, maintenance of traffic, access to private driveways and emergency vehicle access.
- B. Coordinate work with local utility companies (private and municipal), including the organization identified in Section 02205 for location of existing utilities and protection thereof.
- C. Coordinate the work with local owners where effecting operation of existing structures.

PART 2 PRODUCTS

2.01. GENERAL

- A. All products included in this section shall conform to the requirements of the standard specifications referenced herein.
- B. Pipe material, pipe class and pipe sizes shall be furnished and installed as listed herein.
- C. All pipes and fittings shall be restrained push-on joint ductile iron except as follows:
 - 1. Gas pipe shall be steel.
 - 2. Potable and non-potable water pipe 3 inches or less in diameter shall be copper.
- D. The underground process piping system shall be installed as shown on the Drawings.

2.02. MATERIALS

- A. Ductile Iron Pipe - AWWA C151/ANSI A21.51 - Ductile iron pipe material Class 52, inside nominal diameter as shown on the Drawings, restrained push-on bell and spigot type insert with rubber gasket.
- B. Ductile iron pipe and fittings for all potable and non-potable water lines shall be double cement lined and seal coated inside and out in accordance with ANSI/21.4/AWWA C104.
- C. All ductile pipe and fittings used as process pipe shall be lined and coated with asphaltic material, minimum 1 mil thickness, in accordance with ANSI/AWWA A21.4/C104 .
- D. For underground burial provide polyethylene encasement sleeve 8-mil thick conforming to ANSI A21.5/AWWA C105.
- E. Fittings shall conform to ANSI A21.10/AWWA C110.

F. Joints - Fittings shall be furnished with either push-on or pipe furnished with push-on joints. The type of joint shall meet the following applicable requirements:

1. Restrained Push-On Joint - The rubber gasket joint shall be as generally described in ANSI 21.11/AWWA C111. Restrained push-on joints shall provide the following maximum deflection:

PIPE SIZE	MAXIMUM DEFLECTION (DEGREES)
4" through 12"	5.0
16" through 18"	3.0
24" through 36"	1.5

Restrained joint pipe shall be TR FLEX as manufactured by U.S. Pipe and Foundry or equal.

2. Restrained Mechanical Joint - The gasketed and bolted joint of the stuffing box type as described in ANSI A21.11/AWWA Standard C111.

2.03. PIPE ACCESSORIES

- A. Fittings - Same materials, class, coatings and linings as pipe unless under Article 2.02 it was specifically described otherwise. Fittings molded or formed to suit pipe size and end design and in required tee, bends, elbow, couplings, adapters, and other configurations.
- B. Where piping is to be installed above ground or within structures, provide adequate supports and bracing by means of hangers, brackets or concrete supports as may be required by the location.
- C. Hangers and supports shall be as manufactured by Anvil International, Providence, RI, Basic Engineering (BE), Pittsburgh, PA or equal. They shall have stainless steel support rods, stainless steel mounting hardware, fasteners and beam clamps.
- D. Pipe openings in walls shall be precast or core drilled and completely sealed against water seepage with a mechanical type seal consisting of interlocking synthetic rubber links and nuts with pressure plates wider at ends, the seal shall be a link seal manufactured by Thunderline Corporation, Wayne, MI; or equal.

2.04. IDENTIFICATION

- A. Each pipe length and fitting shall be clearly marked with:
 1. Manufacturer's name and trademark.
 2. Nominal pipe size and class.
 3. Material designation.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that trench cut, excavated base and pipe bedding are ready to receive pipe and that excavations and pipe bedding dimensions and elevations are as shown on Drawings.

- B. All pipe or fittings which have been damaged in transit or which are obviously deformed or refinished in any way shall be rejected, marked, and removed from the site of the work.
 - 1. Any pipe or fitting which the Engineer suspects is improper for the job shall be temporarily rejected, marked, and set aside for subsequent investigation to determine its conformity with the specifications.
 - 2. All pipe fittings and specials shall be carefully inspected in the field before lowering into the trench. Cracked, broken, warped, out-of-round, damaged pipe joints including damaged pipe lining or coatings or specials, as determined by the Engineer, shall be culled out and not installed.
 - a. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the Contractor at his own expense.

3.02. PREPARATION

- A. The Contractor shall have on the job site with each pipe laying crew, all the proper tools, gauges, pipe cutters, lubricants, etc. to handle, cut and join the pipe.
- B. Flat-bottom trenches of required width shall be excavated to the necessary depth as required and maintained in accordance with Section 02225.
- C. Prior to installing the pipe foundation material, trenches shall have all water removed and all work performed in a dry trench.
- D. All pipes, fittings and specials which are to be installed in the open trench excavation shall be properly bedded in and uniformly supported on pipe foundations of the type specified in Section 02225 and shown on the Drawings. In particular, stones 2 inches and larger shall be removed from the bearing surface of the pipe foundations.
- E. Pipe foundation bedding material shall be spread in maximum 8-inch layers and each layer shall be compacted up to the spring line of the pipe.
- F. Compaction methods include hand tamping with T-bars, flat heads, shovel slicing as well as mechanical compactors.
- G. The Contractor shall perform his bedding operations with care to maintain line and grades.
- H. Suitable holes or depressions shall be provided in the pipe bedding to permit adequate bedding of bells, couplings, or similar pipe projections.

3.03. LINES AND GRADES

- A. The Contractor shall furnish all labor, materials, surveying instruments, and tools to establish and maintain all lines and grades. The Contractor shall have personnel on duty or on standby call, at all times, who are qualified to check line and grade of pipe lines as they are installed.
- B. Property and other control lines necessary for locating the work are shown on the Drawings.
- C. During construction, the Contractor shall provide the Engineer, at this request, all reasonable and necessary materials, opportunities, and assistance for setting stakes and making

measurements, including the furnishing of one or two rodmen or chainmen as needed at intermittent times.

- D. The Contractor shall carefully preserve bench marks, reference points and stakes established by the Engineer or Owner, and in case of willful or careless destruction by his own operations he will be charged with the resulting expense to reestablish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the unnecessary loss or disturbance of such control data.
- E. The Contractor may use laser equipment to assist in setting the pipe provided he can demonstrate satisfactory skill in its use.
- F. The use of string levels, hand levels, carpenter's levels or other relatively crude devices for transferring grade or setting pipe are not to be permitted.

3.04. TOLERANCES

- A. Pipes shall be laid to the lines and grades shown on the Drawings.
- B. Minimum depth of cover shall be maintained as shown on the Drawings or as described herein.

3.05. INSTALLATION

- A. Installation of ductile iron pipe or plastic pipe to be in conformance with AWWA C600 or ASTM D2774, respectively, except as modified in this Section or referenced Sections or as shown on the Drawings.
- B. The Contractor shall furnish slings, straps and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from storage areas to the trench shall be restricted to operations which can cause no damage to the pipe or lining or castings.
- C. The pipe shall not be dropped from trucks onto the ground or into the trench.
- D. Each pipe section shall be placed into position in the trench on the pipe bedding in such manner and by such means required to cause no injury to the pipe, persons or to any property.
- E. The method of laying and jointing the pipe shall be in accordance with the recommendations of the manufacturer. Each pipe shall be aligned with that already in place, forced home completely with horizontal axial movement and held securely in position. The bell of each pipe length to be laid in the same direction the installation is proceeding.
- F. At the joints, enough depth and width shall be provided to permit the pipe layer to reach entirely around the pipe so that the joints may be made in accordance with the manufacturer's recommendations. Mechanical-type joints shall be tightened within the AWWA recommended torque range.
- G. Pipes, fittings, and specials shall be firmly bedded in the pipe foundation and shall have full bearing throughout their entire length, which shall be accomplished by combination of shaping the bedding and adequately compacting the pipe bedding and backfill under and around the pipe to the spring line of the pipe. The remaining backfill placed in 12-inch lifts to 1-foot above the crown of the pipe in accordance with Table 1, Minimum Compaction Requirements, Section 02228. The remaining backfill installed in accordance with Sections 02225 and 02228.

- H. When laid in tunnels, pipes shall be blocked in such a manner as to take the weight off the bells. Pipe laid in normal trench excavation shall not be laid on wood blocking.
- I. Backfill material within 12 inches of the pipe shall be free of stones greater than 2 inches in any dimension.
- J. Unless otherwise shown on the Drawings, the minimum total finished cover over the top of the pipe barrel of all pressure pipe shall be 4 feet.
- K. Refer to Section 02225 for other installation guidelines and requirements.
- L. To deflect a pipe joint, first join the pipe in the proper manner and deflect the pipe within the allowable deflection recommended by the manufacturer.
- M. Install magnetic locating tape, trace wire, minimum 2 inches wide with the words "Pipeline Below" along the centerline of the installed pipeline for the entire length at a maximum depth of 2 feet 0 inches below finished grade.
- N. For ductile iron pipe installations, install two bronze wedges in each joint of pipe, fittings and specials.
- O. For each pipe entering or leaving a manhole or underground structure, at least one pipe joint shall be located within 4 feet of the outside face of the wall, and preferably at the 2 foot point.
- P. Installation of polyethylene sleeves shall be performed in accordance with the manufacturer's instructions and ANSI A21.4/AWWA C105.

3.06. COUPLINGS

- A. Couplings to be ductile iron fittings, Smith Blair Model 441, or equal with stainless steel bolts and nuts. The couplings shall receive two coats of coal tar epoxy paint on all exterior surfaces prior to installation.

3.07. BRACING AND BLOCKING

- A. All bends, tees, crosses, plugs, etc., shall be braced and block with wood and then anchored with concrete thrust blocks so that there will be no movement of the pipe in the joints due to the internal or external pressures.
- B. The concrete shall be placed around the fittings and completely fill the space between the fittings and walls of the trench, from 6 inches below the fittings of pipe to 12 inches above the fittings and in accordance with the dimensions and details shown on the Drawings.
- C. The anchor concrete shall be so placed that the bell and spigot joints or other joints may be tightened, if necessary.
- D. Steel ties to be used only where shown on the Drawings.
- E. Prior to installation of the concrete anchor, the Contractor shall wrap all fittings with a minimum of 8-mil thick polyethylene.
- F. Refer to details shown on the Drawings.
- G. Cast-in-place concrete used in constructing concrete thrust blocks shall conform to requirements specified in Section 03001.

- H. Measuring, mixing, transporting and placing of concrete shall conform to American Concrete Institute (ACI) publication 304.
- I. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- J. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.08. TEMPORARY PLUGGING

- A. At all times when pipe laying is not actually in progress, the open ends of the pipes shall be closed temporarily with pipe plugs or by other means such that there is no possibility of any water or foreign material entering the line. If water is in the trench when work is resumed, the plugs shall not be removed until the water has been removed and work can proceed in a dry stable trench.

3.09. CLEANING PIPELINE

- A. At the conclusion of the work, the Contractor shall thoroughly clean all new pipes by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered during the construction period.
 - 1. If, after this cleaning, any obstructions remain, they shall be corrected to the satisfaction of the Engineer. Pipes shall be flushed at a minimum rate of 2.5 feet per second for a suitable duration.
- B. Where required the Contractor shall use mechanical methods to clean pipes when flushing does not remove all obstructions or material.

3.10. TESTING

- A. Testing of the process piping or pressure pipelines shall be performed in accordance with Section 02741.
- B. Any section of pipe that fails the pressure or leakage test shall be dug up and replaced or permanently repaired as approved by the Engineer. The replaced or repaired section shall be retested.

3.11. ENCASEMENT

- A. Where shown on the Drawings, pipes shall be encased in Class 2500 concrete. Details and requirements for encasement of pipes are described in Section 02225.
- B. Where shown on the Drawings, pipes shall be encased in a polyethylene sleeve.
 - 1. Damage to wrapping during pipe laying or backfilling operations shall be repaired with additional sleeve material and adhesive tape.

3.12. VALVES AND HYDRANTS

- A. Valves and hydrants to be installed on this project are specified in Section 02662.
- B. Valve and hydrant details for connection to the water main are shown on the Drawings.

- C. Refer to Drawings for locations of valves and hydrants to be installed on this project.

3.13. PIPE CONNECTIONS TO SLUICE GATES

- A. Coordinate with the manufacturer on compatibility of sluice gate's wall thimble with the specified pipe joint connections at each location so that required joint restraint will be achieved.
- B. Verify accurate position and accessibility of installed wall thimble at each location to facilitate proper and secure connection of the pipe joint.
- C. Pipe joint connection for ductile iron pipe shall be made using conventional mechanical joint with a compatible wall thimble, joint restraint being achieved by installation of reinforced concrete thrust blocks, as shown on the Drawings and specified in the Article 3.07.

(continued)

FLUSHING, TESTING, AND DISINFECTION OF WATER LINES TABULATION SHEET

Job No. _____ Location _____
Contract No. _____ Contractor _____
Project _____
Contractor's Representative _____ Observed by _____

FLUSHING

Date _____ Weather _____ Temperature _____
Section Flushed _____ ft. of _____-inch diameter pipe
Line Flushed _____ hrs. _____ min. @ _____ gal/min.
Line Flushed Through _____ Manhole # _____
Method of Measuring Flow _____

PRESSURE AND LEAKAGE TESTING

Date _____ Weather _____ Temperature _____
Section Flushed _____ ft. of _____-inch diameter pipe in _____-ft. laying lengths
Time Started _____ Time Finished _____ Elapsed Time _____
Test Pressure: Start _____ psi Finish _____ psi
Water to Make up Initial Pressure _____ gallons
Allowable leakage, as calculated _____ gallons (allowable leakage from AWWA C600)

Pass _____ Fail _____

$$L = \frac{S \cdot D \cdot \sqrt{P}}{133,200^*}$$

where:

- L = allowable leakage (makeup water), in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the test, in pounds per square inch (gauge)

*Refer to C600 for additional allowance leakage against closed metal-seated valves.

DISINFECTION

Date _____ Weather _____ Temperature _____

Section Flushed _____ ft. of _____-inch diameter pipe

Discharge Rate _____ gal/min; application of _____% hypochlorite solution @ gal/min

_____ mg/L initial total chlorine residual @ end of line at _____ (time)

_____ mg/L initial total chlorine residual @ end of 24 hours at _____ (time)

Method of Measuring Chlorine Residual _____

Line Flushed at _____ gal/min for _____ hours _____ min. on _____ (date)

Bacteria Sample Collected at _____ (location) at _____ (time/date)

Bacteria Sample Results _____ meet _____ do not meet NYSDOH drinking water standards for total coliform.

Line Ready for Service on _____ (date) _____ (time)

Line Put Into Service on _____ (date) _____ (time)

Owner's Representative Notified

_____ (name)

_____ (date)

_____ (time)

FLUSHING AND TESTING OF FORCE MAINS TABULATION SHEET

Job No. _____ Location _____

Contract No. _____ Contractor _____

Project _____

Contractor's Representative _____ Observed by _____

FLUSHING

Date _____ Weather _____ Temperature _____

Section Flushed _____ ft. of _____-inch diameter pipe

Line Flushed _____ hrs. _____ min. @ _____ gal/min.

Line Flushed Through _____ Manhole # _____

PRESSURE AND LEAKAGE TESTING

Date _____ Weather _____ Temperature _____

Section Flushed _____ ft. of _____-inch diameter pipe in _____-ft. laying lengths

Time Started _____ Time Finished _____ Elapsed Time _____

Test Pressure: Start _____ psi Finish _____ psi

Water to Make up Initial Pressure _____ gallons

Allowable leakage, as calculated _____ gallons (allowable leakage from AWWA C600)

Pass _____ Fail _____

$$L = \frac{S \cdot D \cdot \sqrt{P}}{133,200^*}$$

where:

L = allowable leakage (makeup water), in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the test, in pounds per square inch (gauge)

*Refer to C600 for additional allowance leakage against closed metal-seated valves.

FLUSHING AND TESTING OF FORCE LINES TABULATION SHEET

Job No. _____ Location _____
Contract No. _____ Contractor _____
Project _____
Contractor's Representative _____ Observed by _____

FLUSHING

Date _____ Weather _____ Temperature _____
Section Flushed _____ ft. of _____-inch diameter pipe
Line Flushed _____ hrs. _____ min. @ _____ gal/min.
Line Flushed Through _____ Manhole # _____

PRESSURE AND LEAKAGE TESTING

Date _____ Weather _____ Temperature _____
Section Flushed _____ ft. of _____-inch diameter pipe in _____-ft. laying lengths
Time Started _____ Time Finished _____ Elapsed Time _____
Test Pressure: Start _____ psi Finish _____ psi
Water to Make up Initial Pressure _____ gallons
Allowable leakage, as calculated _____ gallons (allowable leakage from AWWA C600)

Pass _____ Fail _____

$$L = \frac{S \cdot D \cdot \sqrt{P}}{148,000}$$

where:

- L = allowable leakage (makeup water), in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the test, in pounds per square inch (gauge)

*Refer to C600 for additional allowance leakage against closed metal-seated valves.

END OF SECTION

SECTION 02733

SANITARY SEWER PIPING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Gravity flow sanitary sewers, fittings, and accessories, materials, and installation.
- B. Connection of sanitary sewers to manholes, pump stations, and existing sewers.
- C. Tests and inspections.

1.02. DEFINITIONS

- A. Building Drain - That part of the lowest piping of a drainage system that receives the discharge from soil, waste, and other drainage pipes inside and that extends 30 inches beyond the walls of the building and conveys the drainage to the building sewer.
- B. Building Sewer - That part of the drainage system that extends from the end of the building drain and conveys the discharge to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.
- C. Service Connection - The point of connection where a service lateral connects to a sewer main and is typically constructed of a wye, tee fitting, or saddle.
- D. Service Lateral - That part of a drainage system that extends from the service connection or structure located on a sewer main to a right-of-way or easement line.

1.03. RELATED SECTIONS

- A. Section 01039 - COORDINATION
- B. Section 01300 - SUBMITTALS
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 01700 - RECORD DOCUMENTS
- E. Section 02205 - PROTECTION OF EXISTING FACILITIES
- F. Section 02225 - TRENCHING
- G. Section 02228 - COMPACTION
- H. Section 02734 - SANITARY SEWER MANHOLES

1.04. REFERENCES

- A. Ductile Iron Gravity Sewer Pipe
 - 1. ASTM A746 - Ductile Iron Gravity Sewer Pipe

2. ANSI/AWWA A21.11/C111 - Push-On Joints and Mechanical Joints
- B. Ductile Iron Pressure Pipe
1. ANSI/AWWA A21.51/C151 - Ductile Iron Pipe
 2. ANSI/AWWA A21.4/C104 - Cement-Mortar Linings and Asphaltic Lining and Coating
 3. AWWA C203 - Coal Tar Enamel Lining and Coating
 4. ANSI/AWWA A21.11/C111 - Push-On Joints and Mechanical Joints
 5. ANSI/AWWA A21.4/C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
 6. ANSI/AWWA A21.10/C110 - Ductile Iron and Gray Iron Fittings, 3-Inch Through 48-Inch, for Water and Other Liquids
- 1.05. SUBMITTALS
- A. Submit under provisions of Section 01300, Submittals.
 - B. Product Data - Provide data indicating conformance to ASTM/AWWA codes, pipe material, sizes, class, dimensions, joint type and accessories.
 - C. Manufacturer's Installation Instructions - Indicate special procedures required to install products specified.
 - D. Results of shop tests, if required.
 - E. Manufacturer's Certificate - Certify that products meet or exceed specified requirements
- 1.06. PROJECT RECORD DOCUMENTS
- A. Submit documents under provisions of Section 01700, Record Documents.
 - B. Submit marked-up record contract drawings, including location and length of sewer sections, service connection stationing from downstream manhole, service lateral length and depth at property line, cleanouts, manholes, and rim and invert elevations where the pipe enters or exits a structure. Mark up detail drawings to indicate as-built conditions.
 - C. Identify and locate (horizontally and vertically) on record drawings during the discovery of exposed uncharted existing utilities and services.
- 1.07. REGULATORY REQUIREMENTS
- A. Conform to applicable code for materials and installation of the work of this section.
 - B. Conform to requirements of permits obtained by Owner.
- 1.08. FIELD MEASUREMENTS
- A. Prior to start of construction, verify the field measurements and elevations that existing conditions are as shown on Drawings. Notify Engineer of specific differences.

- B. Prior to start of construction, verify by exploratory excavations that existing underground utility locations and elevations are as shown on drawings or to confirm marked location and elevation of underground utilities by the organization identified in Section 02205. Notify Engineer of potential interference and allow Engineer sufficient time to determine any changes required as a result of such interferences.

1.09. COORDINATION

- A. Coordinate work under provisions of Sections 01039 and 01500, including field engineering, maintenance of traffic, access to private driveways, and emergency vehicle access.
- B. Coordinate work with local utility companies (private and municipal).
- C. Coordinate the work with local owners where connecting to existing sewers, manholes, structures, pumping stations.

PART 2 PRODUCTS

2.01. SANITARY SEWER PIPE MATERIALS

- A. Ductile Iron Pipe - ASTM A746, Class 52 bell and spigot [plain] end.
 - 1. Ductile Iron Pipe Joint Device - ANSI A21.11 Rubber Gasket Joint Device.
 - 2. Cleanouts to be push-on joint wye fittings with 45 degrees or less bends and brass screwed end plug with recessed nut.

2.02. PIPE ACCESSORIES

- A. Fittings - Same size, material and class as pipe, molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, couplings, adapters and other configurations required.
- B. Pipe Connection Table - When connecting dissimilar pipe materials or when connecting new pipe to existing pipe, the following connections shall be used:

Type to Type	Solvent Cement Socket Coupling	SDR 35 to Schedule 40 (GSX/SXS)	PVC Gasketed Repair Sleeve	Cast Coupling	Rubber Adapter with Shear Ring	Repair Clamp
Sch 40 to Sch 40	✓					✓
Sch 40 to SDR 35		✓				
Sch 80 to Sch. 80	✓					✓
Sch 40, 80, or SDR 35 to DIP/CIP				✓		✓
Sch 40, 80, or SDR 35 to clay					✓	
Sch 40, 80, or SDR 35 to asbestos cement				✓		
DIP/CIP to clay					2. ✓	
Asbestos cement to clay					3. ✓	

Type to Type	Solvent Cement Socket Coupling	SDR 35 to Schedule 40 (GSX/SXS)	PVC Gasketed Repair Sleeve	Cast Coupling	Rubber Adapter with Shear Ring	Repair Clamp
SDR 35 to SDR 35			4. ✓		5.	
DIP/CIP to DIP/CIP			6.	✓	7.	✓
Clay to clay			8.		9. ✓	
Asbestos cement to CIP/DIP			10.	✓	11.	

1. Rubber Adapter With Stainless Steel Shear Rings (4 to 15 Inches) - Fernco Flexible Couplings by the General Engineering Company, Box 609, Frederick, MD 21701; or equal.
2. Repair Clamp - Dresser Model 360 "All-Around" pipe repair clamps in stainless steel; or equal.
3. Cast Coupling (2 to 16 Inches) - Dresser Model 253 "Modular Long Sleeve" cast coupling, Smith-Blair Model 442 "Long Sleeve," or equal.

C. Identification - Each pipe length and fitting shall be clearly marked with:

1. Manufacturer's name and trademark.
2. Nominal pipe size and class.
3. Material designation.

D. Connections to Manholes - Provide rubber boot-type connectors with all stainless steel hardware as manufactured by NPC, Inc., Model Kor N' Seal; Press Seal Gasket Corporation, Model PSX; or equal as shown on the Contract Drawings.

2.03. SHOP TESTS

A. General

1. All shop tests of pipe and pipe materials required by this section and/or the applicable ASTM/AWWA specifications shall be performed at the Contractor's expense.
2. The manufacturer shall submit a performance affidavit certifying his product meets or exceed these specifications and the applicable ANSI/ASTM and AWWA requirements. If required by the Engineer, certified test reports of prior tests shall be submitted with the performance affidavit.
3. Tests shall be conducted at the pipe manufacturer's plant or when approved test facilities do not exist at the point of manufacture, the tests shall be conducted in certified private testing laboratories approved by the Engineer.
4. All testing machines, gages, laboratory apparatus and other devices used for the required shop tests shall be in first class condition and accurately calibrated. Shop tests shall be conducted by qualified personnel.

5. The Contractor shall submit to the Engineer the name or names of the proposed manufacturers of pipe for this project, including shop drawings of the proposed pipe and appurtenances. Each pipe manufacturer shall notify the Engineer and the Contractor when shop tests on the lot or lots of pipe for this project are to take place, allowing sufficient time for the Engineer to send a representative to witness the tests.
6. Tests shall be conducted in accordance with the applicable ANSI/ASTM or AWWA specifications except as modified by these specifications.
7. Wherever in the appropriate ANSI/ASTM or AWWA specification tests are required to be performed for all pipe furnished for this project, certified copies of all test (and retest) results shall be submitted jointly to the Engineer and the Contractor.
8. Specific modifications and/or amendments to the applicable ASTM specifications are as follows:
 - a. Crushing Strength - Crushing strength tests shall be conducted using the three-edge bearing method except that the lower bearing strips utilized in these tests may be of hardwood or hard rubber material complying with the applicable ASTM Specification, unless such option is precluded under the companion ASTM Specification which covers the pipe itself.
9. Upon completion of shipment of the pipe furnished for this project, the pipe manufacturer shall provide the Engineer with a certificate, signed by an officer of the corporation or firm and witnessed by a notary public, attesting that the pipe and appurtenances furnished were manufactured and successfully tested in full accordance with these specifications and the applicable ASTM specifications.
10. Any section or lot of pipe, fittings or specials which does not meet the requirements of these specifications and the applicable ASTM/ANSI or AWWA specifications under which the product is required to be manufactured, will be rejected.

PART 3 EXECUTION

3.01. EXAMINATION

- A. The drawings and specifications may contain information relating to conditions below the ground surface at the site of proposed work, but such information is furnished without guarantee as to it being complete or correct. The Contractor shall assume all risk and responsibilities and shall complete the work in whatever manner and under whatever conditions he may encounter or create without extra cost to the Owner. Location of existing underground facilities at or contiguous to the site is based upon information and data furnished to the Engineer by owners of such underground facilities or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof.
- B. The Contractor shall perform exploratory excavations in advance of this work to verify the location, depth, size, and material of existing utilities which may interfere with the work to be performed under this contract. All damage to existing utilities shall be the Contractor's cost to repair or replace.
- C. Verify that trench cut, excavated base and pipe bedding is ready to receive work and pipe bedding dimensions and elevations are as indicated on drawings.

- D. All pipe, fittings, and specials shall be carefully inspected in the field before lowering into the trench. Cracked, broken, warped, out-of-round, damaged joints, including damaged pipe linings or coatings or otherwise defective pipe, fittings or specials, as determined by the Engineer, shall be removed and not installed. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the Contractor at his own expense.
- E. Any pipe showing a distinct crack with no evidence of incipient fracture beyond the limits of the visible crack, if approved, may have the cracked portion cut off by, and the expense of, the Contractor before the pipe is laid so that the pipe used is perfectly sound and will form an approved joint. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.
- F. If authorized, cutting of the pipe shall be done in a neat and workmanlike manner without damage to the pipe lining. All pipe cutting shall be done by means of an approved type of power cutter and in accordance with manufacturer's instructions. The use of hammer and chisel, or any other method which results in rough edges, chipped or damaged pipe, is prohibited.

3.02. PREPARATION

- A. The Contractor shall have on the job site with each pipe laying crew, all the proper tools, gauges, pipe cutters, lubricants, etc., to handle, cut, pipe laying and join the pipe.
- B. Prior to installing the foundation, trenches shall have all water removed and all work performed in a dry trench. Pipe installation in frozen trench bottoms is not permitted.
- C. All pipes, fittings or specials which are to be installed in the open trench excavation shall be properly bedded in, and uniformly supported on pipe foundations of the various types specified in Section 02225 and shown on the Contract Drawings.
- D. Flat-bottom trenches of required width shall be excavated to the necessary depth as required and maintained in accordance with Section 02225.
- E. Bedding material shall be spread in a maximum of 8-inch layers for the pipe foundation and each layer shall be compacted until the required total depth of bedding has been established.
- F. Suitable holes or depressions shall be provided in the pipe bedding to permit adequate bedding of the bell, coupling or similar pipe projections.
- G. Use of hydrohammer for compaction will not be permitted within 4 feet of the top of pipe.
- H. The Contractor shall perform bedding operations with care to maintain straight alignment and consistent grade.

3.03. LINES AND GRADES

- A. The Contractor shall furnish all labor, materials, surveying instruments, and tools to establish and maintain all lines and grades. The Contractor shall have personnel on duty or on standby call, at all times, who are qualified to set and verify sewer slope and manhole elevations as they are installed.
- B. Property lines, staked center of manholes, and other control lines necessary for locating the work as well as elevations used in the design of the work are shown on the Drawings. Bench marks are shown on the Drawings or the Contractor will be provided a list of bench marks.

- C. The Contractor shall use this information to set line and use laser equipment to set line and grade. The Contractor shall check the grade of pipe by use of level instrument and rod at not more than 50-foot intervals.
- D. The use of string levels, hand levels, carpenter's levels or other crude devices for transferring grade or setting pipe are not permitted.
- E. During construction, the Contractor shall provide the Engineer, when requested, all reasonable and necessary materials, opportunities, and assistance for setting stakes and making measurements, including the furnishing of rodmen or chainmen as needed at intermittent times.
- F. The Contractor shall carefully preserve bench marks, reference points and stake established by the Engineer or Owner, and in case of willful or careless destruction by his own operations he will be charged with the resulting expense to re-establish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the unnecessary loss or disturbance of such control data.

3.04. TOLERANCES

- A. Pipes shall be installed at the lines and grades shown on the Drawings.
- B. Pipes shall be straight between manholes or between points of connection to structures.
- C. The grade of the sewer between manholes and from pipe length to pipe length shall not vary from the design grade shown on the Contract Drawings by more than 0.15 times the design grade, unless a change in grade has been ordered by the Engineer, in which case the same tolerance shall apply.
- D. Invert elevations at any location shall not vary from the design elevations by more than 0.05 feet, unless a change in invert elevation has been ordered by the Engineer, in which case the same tolerance shall apply.
- E. Any sewer grade or invert elevation which exceeds these tolerances shall be corrected by the Contractor at his own expense in a manner prescribed, and to the extent requested, by the Engineer.

3.05. INSTALLATION

- A. The Contractor shall furnish slings, strap and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from storage areas to the trench shall be restricted to operations which can cause no damage to the pipe or lining or coatings.
- B. The pipe shall not be dropped from trucks onto the ground or into the trench.
- C. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow.
- D. Each pipe section shall be placed into position in the trench on the pipe bedding in such manner and by such means required to cause no injury to the pipe, persons, or to any property.
- E. Pipe size up to and including 12 inch I.D. shall be installed so that a pipe joint occurs not more than 2 feet from the outside face of the wall of manholes or structures.

- F. The pipe fittings and specials shall be firmly bedded in the pipe foundations so that the pipe barrel is uniformly supported and cradled throughout its length.
- G. Blocking will not be permitted under the pipe, except where the pipe is to be installed on concrete encasement or concrete cradle.
- H. Holes and depressions in the pipe foundation shall be provided to receive bells, couplings, or similar projections to assure proper bedding of the pipe barrel.
- I. When the pipe is in proper position it shall be joined or coupled to the mating end of the previously laid pipe, using the required joint and following the manufacturer's recommended assembly procedure.
- J. After the pipe has been joined, the pipe bedding material to be placed and spread in maximum 8-inch layers to the midpoint of the pipe.
- K. Each layer shall be compacted using mechanical compactors and hand tamping with T-bars or shovel slicing so the pipe barrel is firmly embedded in the pipe bedding material.
- L. If pipe inspection indicates that the pipe has been properly installed as determined by the Engineer, the Contractor may then continue to spread the pipe foundation material to 12 inches over the top of pipe.
- M. The pipe foundation above the midpoint of the pipe shall be spread and compacted in 12-inch layers to 12 inches above the top of the pipe.
- N. After completing the pipe foundation to 12 inches above the top of pipe, the Contractor may then backfill the remainder of the trench in accordance with Sections 02225 and 02228 and the typical trench details shown on the Drawings.
- O. At the end of each day's work or at intervals of length at the option of the Engineer, the Engineer, with the Contractor, will check the grade and inspect the pipe for alignment. Defective work shall be dug up and reinstalled to the satisfaction of the Engineer.
- P. The completed assembly of pipe sections shall form a sewer with uniform slope.
- Q. Manufactured pipe plugs or temporary bulkheads shall be placed in the open ends of sewer pipes whenever pipe installation is stopped overnight, over weekends, or whenever dirt or debris could enter the pipe during construction. Newly installed pipe shall not be used to remove groundwater from trench.
- R. Except where direct replacement of existing sewers is required, no connections to existing live sewers or laterals shall be made until the leakage test and all other requirements are met and connections approved by the Owner.
- S. Install magnetic marking tape, 2 inches wide with the words - "Sanitary Sewer Below - Not More Than 2 Feet Below Finished Grade."
- T. Any section of sewer or drain, or portions thereof, which do not comply with the inspection criteria defined above, shall be promptly corrected or repaired by the Contractor at his own expense.
- U. Pipe which is cracked or collapsed shall be replaced with new pipe. Pipe which is either out of line or grade shall be dug up and reinstalled to the correct line and grade.

- V. Where deposits of dirt and debris exist, the sewer main shall be flushed with water to the downstream manhole and removed.
- W. At points of leakage, the pipe shall be replaced or repaired with pipe connections made in accordance with the pipe connection table so as to permanently stop the leak in a manner which shall receive the prior approval of the Engineer.

3.06. CONNECTION TO EXISTING STRUCTURES

- A. Where sewer mains or service laterals are to be connected to existing manholes or other structures, and where no stub or opening has been provided for the connection, the Contractor shall cut an opening of minimum diameter through the side wall of the structure for inserting the pipe, at the required location and elevation.
- B. In making connections to existing manholes or structures, care shall be taken to avoid damage to the manhole or structure or allowing debris to enter the pipelines. Any damage resulting from the Contractor's operations shall be repaired and made good by the Contractor at his own expense.
- C. Before inserting pipe, Contractor shall install rubber gasket compression ring with stainless steel straps. Use of oakum, grout, or manhole rubber adapter rings (also known as rubber donut waterstop rings) is prohibited.
- D. The pipe shall be positioned so that the finished or trimmed end of the pipe is flush with the inside wall surface of the structure. The mortar filler shall be struck off neatly to form a smooth, dense surface flush with the inside wall surface of the structure.
- E. Benchwalls in existing structures shall be altered to form a new trough so that the new connection will enter the existing flow channel at 45-degree angle in the direction of flow.
- F. Benchwalls to be extended upwards to the top of pipes as shown on the Drawings.
- G. Existing flow to be maintained through manhole or by bypass pumping or piping.

3.07. CLEANOUTS

- A. Building sewers shall be provided with cleanouts located not more than 100 feet apart, measured from the upstream entrance of the cleanout. For building sewers 8 inches and larger, manholes shall be provided and located at each change in direction and at intervals of not more than 400 feet. Manholes and manhole covers shall be of an approved type.
- B. Cleanouts shall be installed at each change of direction of the building drain or horizontal waste or soil pipes greater than 45 degrees. Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40 feet of developed length of the drainage piping.
- C. Building drain shall not be tied into the sanitary sewer system.
- D. Use wye fittings and 45-degree bend to extend to finished grade with brass screwed end plug with recessed nut.
- E. Extend pipe foundation for a minimum of 12 inches around cleanout to finish grade.

3.08. TESTING REQUIREMENTS

- A. Leakage Testing - All installed sanitary sewer pipe, laterals and manholes shall be subject to a leakage test.

3.09. LAMPING INSPECTION

- A. Each section of installed sewer between manholes, or structures will be inspected by the Engineer no earlier than 30 days after final grade has been established, but before final acceptance. Such inspection will be visual by traversing the inside of the pipe, or by sighting through the pipe from manhole to manhole with the aid of artificial light when the pipe is too small to be entered. To assure proper alignment, a full circle ("full moon") of light should exist; if not, the sewer alignment shall be corrected by Contractor until a full circle of light appears.

END OF SECTION

SECTION 02734
SANITARY SEWER MANHOLES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Factory design and manufacture of manhole sections and accessories.
- B. Quality assurance and control.
- C. Field installation of manholes.
- D. Connection of sewer pipe.
- E. Construction of bench walls and flow channels.
- F. Installation of frames and covers.

1.02. RELATED SECTIONS

- A. Section 02225 - TRENCHING
- B. Section 02733 - SANITARY SEWER PIPING
- C. Section 03001 - CONCRETE

1.03. REFERENCES

- A. ASTM A48 Gray Iron Castings
- B. ASTM A536- Ductile Iron Castings
- C. ASTM C62 - Building Brick
- D. ASTM C90 - Hollow Load Bearing Concrete Masonry Units
- E. ASTM C144 - Aggregate for Masonry Mortary
- F. ASTM C150 - Portland Cement
- G. ASTM C207 - Hydrated Lime for Masonry Purposes
- H. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets
- I. ASTM C478 - Precast Reinforced Concrete Manhole Sections
- J. ASTM D3753 - Glass Fiber Reinforced Polyester Manholes

1.04. SUBMITTALS

- A. Submit shop drawings of typical manufactured wall sections and bases proposed for this project, including joint design and related details for field assembly. Include certification of conformance with Contract Documents and the appropriate ASTM Specification.
- B. Submit shop drawings of typical cast iron frames and covers proposed for this project.
- C. Anti-Flotation Design - Structure shall be designed by a registered professional engineer.
 - 1. Design shall include anti-flotation collar to withstand flotation under full hydrostatic head with a 1.25 factor of safety for all manholes.
 - a. 4-Foot Inner Diameter - Flotation collar shall be minimum of 4-inch.
 - b. 5-Foot Inner Diameter - Flotation collar shall be minimum of 6-inch.
- D. Make submittals prior to start of construction. Make submittals to Engineer.

1.05. QUALITY ASSURANCE

- A. Precast reinforced concrete wall sections and bases for manholes shall be manufactured in a plant approved by Engineer and the New York State Department of Transportation (DOT) for manufacture of concrete pipe.
- B. Aggregate used in producing concrete shall be from New York State DOT-approved sources.

1.06. QUALITY CONTROL INSPECTION

- A. The quality of all materials, the process of manufacture and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, and/or at the work site after delivery. Manhole sections shall be subject to rejection if they fail to meet the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be tagged and removed from the job site immediately. All sections which have been damaged after delivery will be rejected, or if already installed, shall be removed and replaced at the Contractor's expense.
- B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close-textured and free of blisters, cracks, roughness, exposure of reinforcement, damaged joints, and dimensional distortions or other irregularities.
- C. Frames and covers shall be manufactured true to pattern and shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Covers shall seat uniformly in any position in the frame without rocking.

PART 2 PRODUCTS

2.01. PRECAST CONCRETE BASES

- A. Design and manufacture of precast concrete bases for manholes shall conform to the requirements of this Section and ASTM C478. Bases shall conform to the dimensions indicated on the Drawings, and the horizontal joint at the top of the base shall be compatible with that of the precast wall section.

- B. Precast bases shall be manufactured to contain openings in the wall, of minimum size, to receive the ends of the installed sewer pipe. Openings shall be accurately positioned to conform with line and grade of the connecting sewer.
- C. The top of the manhole base shall extend at least 10 inches above any pipe openings in the base.

2.02. MONOLITHIC CAST-IN-PLACE CONCRETE BASES

- A. Cast-in-place concrete bases are not permitted, except when constructing a new manhole on existing concrete sewers.

2.03. PRECAST CONCRETE WALLS AND MANHOLES TOPS

- A. Design and manufacture of precast concrete walls shall conform to the requirements of this section and ASTM C478.
- B. Precast concrete walls shall be made with straight, circular pipe sections and eccentric cone sections if manhole steps are required and concentric cone sections where no steps are required. The total height of precast wall required for each manhole shall be determined in the field, and shall be such that the vertical distance between the top of the assembled precast units and the bottom of the installed cast iron manhole frame is a minimum of 4 inches and a maximum of 12 inches, to allow for grade adjustment rings.
- C. If required, manhole steps shall be cast integrally with or grouted solid into the precast wall units as specified in a later article. Lifting holes that extend completely through the manhole are not permitted in the precast units.
- D. All joints in the precast wall, including the joint at the top of the base, shall be made up using either one of the following:
 - 1. "Snap-On" type O-ring gasket, and shall conform to ASTM C443; except that joint taper shall not exceed 3-1/2 degrees. The precast sections shall be provided with a special groove (cast into the male end) to receive and hold the gasket in position during joint assembly.
 - 2. Two beads of butyl-type rope joint sealant material. Install to manufacturer's specifications. Barrel mating surfaces shall be clean, dry, and free from grease, oil, dirt, or organic matter to assure a proper watertight seal between seating and butyl rope material.

When using O-ring gaskets, the gap between sections shall be packed on the inside and outside with grout after joint assembly. The grout shall be A-H Aexpandcrete by Anti-Hydro, Masterflow 713 Plus by Degussa, or Five Star® Grout by Five Star Products, Inc., or equal, and shall be troweled smooth so that no projections remain on the inside. There shall be concrete to concrete bearing between the various sections, and the gasket shall not support the weight of the section.

- E. If required, precast reinforced concrete slab tops for manholes shall be manufactured in accordance with ASTM C478, except that thickness and reinforcing shall be as shown on the Drawings. Openings shall be of the proper diameter to receive the frame specified.
- F. Manhole tops shall be cast with four threaded inserts to accommodate frame hold-down bolts.

2.04. FRAMES AND COVERS

- A. Frames and covers shall be of the make, style, opening, height, weight, and other designation specified herein or shown on the Drawings.
- B. Material shall be gray cast iron conforming to ASTM A48, Class 30; or shall be ductile cast iron conforming to ASTM A536, Grade 60 40 18.
- C. Unless otherwise scheduled, frames and covers shall be heavy duty, non-penetrating pickhole type of non-rocking design, and shall have machined bearing surfaces to prevent rocking and rattling under traffic loads. Covers shall have cast in, 1-1/2-inch wide, raised letters, the words "SANITARY SEWER."
- D. Unless otherwise noted, all manhole covers shall be self sealing and shall be furnished with O-ring rubber gaskets.
- E. Surface finish shall be smooth and well-cleaned by shot-blasting or by some other approved method.
- F. Frames and covers shall have clear opening of 30-inch diameter.
- G. Rubber gasketed lids shall be installed on all manholes into which pressure sewer discharges and all meter pit manholes.
- H. Acceptable manufacturers and pattern numbers for self-sealing frames and covers are:
 - 1. Neenah Foundry Company; Pattern R-1642 or equal.
- I. Acceptable manufacturers and pattern numbers for watertight frame and cover are:
 - 1. Neenah Foundry Company; Pattern R-1916-F.
 - 2. Neenah Foundry Company; Pattern R-1755-E
 - 3. Neenah Foundry Company; Pattern R-1755-F2.
 - 4. East Jordan Iron Works, Inc.; Pattern 1893.

2.05. MANHOLE STEPS

- A. Manhole steps are to be provided in manholes. Steps are to be cast in or grouted solid into the precast units at intervals of 12 inches. Steps shall be in conformance with OSHA requirements having drop front or equivalent. Bolted-on type are not acceptable. Manhole steps to be Neenah Casting Company R-1982F, or M.A. Industries, Inc. copolymer polypropylene reinforced with 1/2-inch steel rod

2.06. GRADE RINGS

- A. General - Grade adjustment for a manhole shall not exceed 12 inches.
- B. Precast Concrete Grade Rings - Precast concrete grade rings for leveling units shall be manufactured in compliance with the requirements of the Specifications for Precast Reinforced Concrete Manhole Sections, ASTM C478; and shall be as thick as necessary to provide the required grade adjustment but not less than 3 inches in height. Split grade rings are unacceptable. Broken or cracked concrete grade rings will not be acceptable.

2.07. CEMENT GROUT

- A. Cement grout shall be non-shrink, non-metallic.
- B. Use Type I cement where grout is not in contact with sewage.
- C. Use Type II (sulfate resistant) where grout is in contact with sewage.

2.08. EPOXY BONDING COMPOUND

- A. Provide a high modulus, low viscosity, moisture insensitive epoxy adhesive having the following characteristics:
 - 1. Mix Ratio - 200 percent solids, two-component, mixed one part by volume component B to two parts by volume component A.
 - 2. Ultimate Compressive Strength - 13,000 psi after cure at 73 degrees F and 50 percent relative humidity determined in accordance with ASTM D695.
 - 3. Acceptable Manufacturers
 - a. Sika Corporation, Sikadur Hi-Mod.
 - b. A.C. Horn, Inc., Epoxite Binder.
 - c. Euclid Chemical Company, 452 Epoxy System.

2.09. PIPE SEALS

- A. Sanitary sewer connections between manholes and pipes shall be made with flexible rubber sleeves in the manufactured sizes available, with stainless steel straps and bolts. Elastomeric waterstop gaskets are not permitted.
- B. Openings in manholes for 8-inch sewers shall be as follows:
 - 1. Influent Sewer Slope Less Than 6 Percent - Use 11-inch diameter boot.
 - 2. Influent Sewer Slope 6 to 12 Percent - Use 12-inch diameter boot.
 - 3. Influent Sewer Slope Greater Than 12 Percent - Use 13-inch diameter boot.
- C. The ends of the pipe shall be accurately positioned in the openings, properly secured against movement, and the remaining annular space between the pipe wall and the base completely packed with A-H Aexpandcrete by Anti-Hydro, Masterflow 713 Plus by Degussa, or Five Star® Grout by Five Star Products, Inc., or equal. Before the grout has set, the Contractor shall recheck invert elevations of the ends of the pipe, and perform any adjustments which are necessary to establish the required line and grade of the sewer.

2.10. CAST-IN-PLACE CONCRETE

- A. Cast-in-place concrete used in constructing manhole bench walls shall conform to requirements of Section 03001.
- B. Measuring, mixing, transporting and placing of concrete shall conform to American Concrete Institute (ACI) Publication 304.

- C. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical damage.
- D. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

2.11. WATERPROOFING

- A. The Contractor shall furnish manholes waterproofed over the entire exterior surface that will be below finished grade. The waterproofing shall not mar or interfere with the specified exterior finish for these structures. Waterproofing shall be accomplished prior to structure installation for precast sections, and shall be applied to dry surfaces under proper weather conditions.
- B. Waterproofing shall consist of a two-coat application of coal tar compound as manufactured by Koppers Bitumastic Super Service Black; Tnemec Heavy Duty Black 46-449; Preco Nitoproof 600; or equal, and shall be applied according to manufacturer's specification. Total thickness of the two-coat application shall not be less than 16 mils.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that subgrade elevations for manhole bases are correct and excavation is dewatered.
- B. Verify that rejected (tagged) units have been removed from the site.

3.02. PREPARATION

- A. Provide foundation mat of run-of-crusher stone per Section 02225 to support manhole base. Mat shall be 6 inches minimum depth and shall bear on sound undisturbed earth; excavate and remove subgrade material as necessary to reach sound stratum.
- B. Mat diameter shall be a minimum of 2 feet greater than outside diameter of manhole base, and shall be compacted to a uniform, level surface.

3.03. INSTALLATION

- A. Manholes
 1. Precast base shall be accurately located and uniformly supported on the foundation mat in a level position.
 2. Install required manhole wall sections in properly oriented position; follow manufacturer's instructions for joining together each section using the "snap-on" O-ring gasket joint. Pack joints with grout.
 3. All precast units shall be laid-up plumb and level to form a vertical manhole structure at each location.
 4. When grade adjustment exceeds 12 inches, barrel sections corresponding to the manhole diameter shall be used.

- B. Pipe Seals - Connect ends of sewer pipe to manholes with flexible rubber sleeves, straps and bolts, as shown on Drawings and specified in Article 2.09.
- C. Channels and Benches
1. Construct flow channels and bench walls in bottom of manholes, shaped to follow details on the Drawings. Flow channels shall match inverts and size of pipes, creating a channel of gradual slope and curvature such that smooth, uninterrupted flow through the manhole is assured. Extend channel wall vertically up to top of highest (flowing) pipe so as to form the bench wall. Bench surface shall extend horizontally to manhole walls, with slight pitch toward flow channel.
 2. Flow channels and bench walls shall be constructed of cast-in-place concrete, although half-sewer pipe sections may also be utilized to form portions of the flow, channel. All exposed concrete surfaces shall receive a steel troweled finish except horizontal surface of bench walls shall then be brushed finished.
- D. Grade Rings
1. Furnish and install grade rings at manhole top so as to adjust and support cast iron frame to finished grade, in accordance with requirements of Article 2.06.
 2. When grade adjustment of less than 3 inches is required, rubber grade rings shall be used.
 3. Joints between precast concrete grade rings for leveling units shall be made with two-bead preformed plastic sealing compound and shall be 1/2-inch thick and troweled or trimmed smooth on the inside of the manhole. In addition, the leveling units shall be sealed on the outside surface using non-shrink grout.
 4. Joints between rubber grade rings and rubber precast concrete grade rings or frame shall be made with polyurethane marine sealant compound.
 5. The joint between the bottom of the frame and the top of precast concrete grade rings, or the top manhole section as applicable, shall be made with preformed plastic sealing compound and shall be sealed on the outside surface using non-shrink grout.
- E. Frames and Covers
1. Frames and covers shall be firmly seated on two rings of bitumastic rope and be positioned to conform to the adjacent finished grade, or to the specific elevation shown on the Drawings.
 2. Frames to be set parallel to surface slopes.
 3. Covers shall seat uniformly in any position in the frame without rocking.
 4. In pavements and shoulder areas, set frame 1/2 inch below finished grade.
 5. In unpaved areas such as easements and rights-of-way, attach frame to manhole using four stainless steel bolts, nuts, and washers. If threaded inserts are not provided with manhole top, furnish and install bolts using epoxy bonding compound.

3.04. BACKFILLING

- A. Carry out backfilling operations in conformance with Section 02225, being careful to provide full support under connecting pipes using compacted bedding material specified for the sewer piping.

3.05. ACCEPTANCE TESTING

- A. Manholes shall be watertight. All visible leaks shall be permanently sealed in an approved manner. Repair of manhole sections using grout, either cementitious or polyurethane, is not permitted. Leakage tests of manholes can be performed in conjunction with leakage tests of connecting sewers.

END OF SECTION

SECTION 02740

SEWAGE FORCE MAINS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Sewage force main piping, including fittings, accessories and materials.
- B. Shop tests.
- C. Installation.
- D. Testing.

1.02. RELATED SECTIONS

- A. Section 01039 - COORDINATION
- B. Section 01300 - SUBMITTALS
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 01700 - RECORD DRAWINGS
- E. Section 02205 - PROTECTION OF EXISTING FACILITIES
- F. Section 02225 - TRENCHING
- G. Section 02228 - COMPACTION
- H. Section 02741 - PRESSURE TESTS OF FORCE MAINS
- I. Section 03001 - CONCRETE

1.03. REFERENCES

- American National Standards Institute (ANSI)
- American Water Works Association (AWWA)
- American Society for Testing Materials (ASTM)
- A. Ductile Iron and Gray Iron Pipe
 - 1. ANSI A21.4/AWWA C104 - Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water
 - 2. ANSI A21.4/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
 - 3. ANSI A21.10/AWWA C110 - Ductile Iron and Gray Iron Fittings, 3 inch through 48-inch, for Water and Other Liquids

4. ANSI A21.11/AWWA C111 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
5. ANSI A21.50/AWWA C150 - Thickness Design of Ductile Iron Pipe
6. ANSI A21.51/AWWA C151 - Ductile Iron Pipe Centrifugally Cast in Metal Molds and Sand Lined Molds for Water and Other Liquids
7. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals/
- B. Product Data - Provide data describing conformance to ANSI/AWWA/ASTM codes, material, sizes, class, dimensions, joint type, fittings, and pipe accessories.
- C. Manufacturer's Installation Instructions - Indicate special procedures required to install products specified.
- D. Results of shop tests, if required.
- E. Manufacturer's Certificate - Certify that products meet or exceed specified requirements

1.05. PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700, Record Documents.
- B. Submit marked-up contract drawings including location if different from plan, variations in specified depth of more than ± 6 inches, cleanouts, air relief valves, bends, and specials.
- C. Identify and locate (horizontally and vertically) on record drawings the exposed unmapped utilities or services.
- D. Mark up detail drawing(s) to indicate as-built conditions.

1.06. REGULATORY REQUIREMENTS

- A. Conform to requirements of regulatory agencies having jurisdiction over the work.
- B. Conform to permit requirements obtained by Owner.

1.07. FIELD MEASUREMENTS

- A. Prior to start of construction, verify by field measurements that existing conditions are as shown on Drawings, notify Engineer of specific discrepancies or potential interferences.
- B. If required by Engineer or shown on Drawings confirm location and elevation of existing utilities or sewers by exploratory excavations.

1.08. COORDINATION

- A. Coordinate field work under provisions of Sections 01039 and 01500, including field engineering, maintenance of traffic, access to private driveways, and emergency vehicle access.

- B. Coordinate work with local utility companies (private and municipal), including the organization identified in Section 02205 for location of existing utilities and protection thereof.

PART 2 PRODUCTS

2.01. SEWAGE FORCE MAIN AND PRESSURE PIPING MATERIALS

- A. Pipe material, sizes, classes, etc. shall be furnished and installed as listed herein
- B. Ductile Iron Pipe - ANSI A21.51/AWWA C151 - Ductile iron pipe material, thickness design conforming to ANSI A21.50/AWWA C150, pressure Class 350, rubber gasket push-on joint and fittings with mechanical or push-on joint conforming to ANSI 21.11/AWWA C111 and fittings conforming to ANSI A21.10/AWWA C110.
- C. Ductile iron pipe shall have cement mortar linings which shall conform to ANSI A21.4/AWWA C104 as follows:
 - 1. Double Thickness - Linings shall consist of cement mortar, centrifugally applied and shall not be less than 1/8 inch for 3 to 12 inches inclusive, 3/16 inch for 14 to 24 inches inclusive, and 1/4 inch for 30 to 54 inches inclusive. The inside shall be given a seal coat of asphalt material as described in ANSI A21.4/AWWA C104.
- D. Protective coatings for ductile iron pipe shall be an asphaltic coating approximately 1 mil thick and conform to requirements of ANSI 21.51/AWWA C151.
- E. All mechanical joint pipe and fittings shall be furnished with ductile iron retainer glands.
- F. Push-on joints shall provide the following maximum deflections:

PIPE SIZE	MAXIMUM DEFLECTION
4 inches through 12 inches	5 degrees
16 inches through 18 inches	3 degrees
24 inches through 36 inches	1.5 degrees

- G. If required, supply flange joints for use in cleanout manholes or air relief valve manhole to conform to ANSI 21.10/AWWA C110.
- H. Manufacturers shall be:
 - 1. American Pipe Product.
 - 2. U.S. Pipe Product.
 - 3. Griffin Pipe Product.
 - 4. McWane Group (Clow or Atlantic States).
 - 5. Or equal.

2.02. PIPE ACCESSORIES

- A. Fittings - Same materials, class, coatings and linings as pipe, unless under Article 2.01 it was specifically described otherwise. Fittings molded or formed to suit pipe size and end design and in required tee, bends, elbow, couplings, adapters, and other configurations.
- B. Where piping is to be installed, above ground or within structures provide adequate supports and bracing by means of hangers, brackets or concrete supports as may be required by the location.
- C. Hangers and supports shall be as manufactured by Anvil International, Providence, RI; Basic Engineering (BE), Pittsburgh, PA; or equal. They shall have stainless steel support rods, stainless steel mounting hardware, fasteners and beam clamps.
- D. Pipe openings in walls shall be precast or core drilled and completely sealed against water seepage with a mechanical type seal consisting of interlocking synthetic rubber links and nuts with pressure plates wider at ends, the seal shall be link seal manufactured by Thunderline Corporation, Wayne, MI, or equal.

2.03. IDENTIFICATION

- A. Each pipe length and fitting shall be clearly marked with:
 - 1. Manufacturer's name and trademark.
 - 2. Nominal pipe size and class.
 - 3. Material designation.

2.04. PLUG VALVES (BURIED)

- A. Plug valves shall be non-lubricated, eccentric type and shall close drop-tight at the rates pressure of 150 psig.
- B. Port areas shall be at least 80 percent of the full pipe area to provide clog-free operation.
- C. The valve body shall be cast iron or semi-steel with a welded-in-place nickel seat. The body shall have a bolted bonnet for permitting removal of the plug while body remains in line.
- D. Buried plug valves shall have mechanical joints and shall comply with ANSI/AWWA C111/A21.11.
- E. The plug shall be cast iron with synthetic rubber facing, suitable for frequent open-close operation and for flow throttling.
- F. Journal bearings shall be provided at each end of the plug and shall be of the wetted type to prevent binding. Bearings shall be fabricated from oil-impregnated 316 stainless steel so that the plug will operate freely after long periods of inactivity.
- G. Packing shall be adjustable U-rings, and shall be capable of being replaced under pressure without removal of the bonnet or plug.
- H. Valves shall be provided with adjustable stops.
- I. Valves shall be equipped with standard 2-inch nut for wrench operation.

- J. Valves 8 inches in diameter and larger shall be equipped with worm gear. Actuator shall be packed with grease and sealed for temporary submergence to 20 feet of water. Exposed worm shafts shall be stainless steel.
- K. Unless otherwise specified, valves shall be installed so that when closed, the plug is at the upstream end of the valve.
- L. All buried valves shall be provided with valve box and cover marked as "SEWER." A tee wrench shall also be provided. Stationary rods shall be provided and cotter pinned to the valve nut when valve boxes are longer than 7 feet and a T-handle stationary rod key shall be provided. Valve boxes shall be East Jordan Iron Works or equal.

2.05. PLUG VALVES

- A. Plug valves shall be non-lubricated, eccentric type and shall close drop-tight at the rates pressure of 150 psig.
- B. Port areas shall be at least 80 percent of the full pipe area to provide clog-free operation.
- C. The valve body shall be cast iron or semi-steel with a welded-in-place nickel seat. The body shall have a bolted bonnet for permitting removal of the plug while body remains in line.
- D. Flanges shall be 125-lb., faced, and drilled.
- E. The plug shall be cast iron with synthetic rubber facing, suitable for frequent open-close operation and for flow throttling.
- F. Journal bearings shall be provided at each end of the plug and shall be of the wetted type to prevent binding. Bearings shall be fabricated from oil-impregnated 316 stainless steel so that the plug will operate freely after long periods of inactivity.
- G. Packing shall be adjustable U-rings, and shall be capable of being replaced under pressure without removal of the bonnet or plug.
- H. Valves shall be provided with adjustable stops.
- I. Valves for interior installation and smaller than 8 inches in diameter shall be equipped with standard 2-inch nuts for wrench operation.
- J. Valves 8 inches in diameter and larger shall be equipped with worm gear and handwheels.
- K. Unless otherwise specified, valves shall be installed so that when closed, the plug is at the upstream end of the valve.
- L. In horizontal piping with the plug shaft installed horizontally, the plug shall be in the upper part of the valve body when open.
- M. Plug valves shall be as manufactured by DeZurik, Sartell, Minnesota; or equal.

2.06. AIR RELIEF VALVE

- A. Air relief valves shall be installed on pressure mains where shown on the Contract Drawings.
- B. A brass shutoff valve shall be installed on all connections between the air relief valves and the pressure mains.

- C. The air relief valves shall be designed to release air from the mains when pumps are started and the main is being filled and to admit air into the sewer main when pumps are stopped and the main is being drained by gravity.
- D. Manufacturer - A.R.I., D-020; Vent-O-Mat Series RGX; or equal.
 - 1. Type - Combination air valve for sewage.
 - 2. Operation - The valve is specially designed to operate with liquids carrying solid particles such as sewage and effluent. Provides separation of the liquid from the sealing mechanism. The air gap separation is sustained under pressure up to 230 psi by a conical body shape, and under vibration, by a spring-loaded joint.
 - 3. Air and Vacuum Component - The valve must discharge air at high velocity during filling of the system and admit air during its drainage. The valve should be designed to prevent premature closing.
 - 4. Automatic Component - The valve will release accumulated air from the system while the system is under pressure and operating. Large dimension automatic orifice of at least 0.0186 square inches attached to the kinetic orifice is less exposed to obstruction by debris. The same orifice for a wide pressure range (up to 230 psi).
 - 5. Pressure - 3 to 230 psi.
 - 6. Testing Pressure - 360 psi.
 - 7. Ends - Flanged ends, ANSI standard, or 2 inch male threads NPT.
 - 8. Body Material - Stainless steel.
 - 9. Drainage Outlet - For easy removal of excess fluids.

2.07. CHECK VALVES

- A. All check valves shall be of the horizontal single disc swing type designed to operate with a minimum loss of pressure.
- B. Check valves shall be so designed that when there is no flow through the line, the disc shall hang lightly against the seat and shall afford ample waterway with but a small angle of opening.
- C. All check valves shall be provided with screwed or bolted covers for access to the disc.
- D. Unless shown otherwise, all check valves shall be located in horizontal piping runs and shall be provided with extended hinge pin and outside lever and weight fully installed to assist the valve in closing.
- E. All check valves with outside lever and weights shall be provided with guards which protect operating personnel from the swinging action of the outside lever and weights.
- F. Guards shall be of a cage-type design using heavy duty wire mesh, easily removable.
- G. All check valves shall be manufactured by ITT Kennedy Valve Manufacturing Company, Inc. or equal.

2.08. PIPE COATINGS (FERROUS METAL PIPING)

- A. All piping within manholes, wet wells, or pump station shall be primed and have all rust, dust, and scale removed by abrasive blast cleaning in accordance with SSPC (Steel Structures Painting Council) procedures designated in the specifications or on Contract Drawings. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent rusting. If rusting beyond ASTM Rust Grade 8 occurs in the field, rusted portions of shop-primed ferrous metals shall be field-cleaned in accordance with SSPC blast cleaning specification appropriate for service and immediately field primed.
- B. All ferrous metal piping not primed in shop shall be abrasive blast cleaned to SSPC-SP10 Near White Blast or an SSPC-SP6 Commercial Blast, depending on exposure, prior to application of any primer, pretreatment, or paint.
- C. Ferrous Metal Piping Coating System Schedule

SYSTEM M-3	TNEMEC	DUPONT	REMARKS
Surface preparation	SSPC-SP10 Near White blast	SSPC-SP5 White blast	--
Prime coat	Series 66-1211 Hi-Build Epoxoline 3.0-5.0 mils	25P Epoxy 3.0-5.0 mils	Shop
Intermediate coat	Series 66-Color Hi-Build Epoxoline 3.0-5.0 mils	25P Epoxy 3.0-5.0 mils	--
Finish coat	Series 66-Color Hi-Build Epoxoline 3.0-5.0 mils	25P Epoxy 3.0-5.0 mils	Total DFT = 12.0 mils minimum

- D. Touchup Any abraded areas of shop or field applied coatings shall be touched up with the same type of shop or field applied coating, even to the extent of applying an entire coating, if necessary. Touchup coatings and surface preparations shall be in addition to and not considered as the first field coat.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that trench cut, excavated base and pipe bedding are ready to receive pipe and that excavations and pipe bedding dimensions and elevations are as shown on Drawings.
- B. All pipe or fittings which have been damaged in transit or which are obviously deformed or refinished in any way shall be rejected, marked, and removed from the site the work.
 - 1. Any pipe or fitting which the Engineer suspects is improper for the job shall be temporarily rejected, marked, and set aside for subsequent investigation to determine its conformity with the specifications.
- C. All pipe fittings and specials shall be carefully inspected in the field before lowering into the trench. Cracked, broken, warped, out-of-round, damaged pipe joints including damaged pipe lining or coatings or specials, as determined by the Engineer, shall be culled out and not installed.

1. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the Contractor at his own expense.
- D. The drawings and specifications may contain information relating to conditions below the ground surface at the site of proposed work, but such information is furnished without guarantee as to it being complete or correct. The Contractor shall assume all risk and responsibilities and shall complete the work in whatever manner and under whatever conditions he may encounter or create without extra cost to the Owner. Location of existing underground facilities at or contiguous to the site is based upon information and data furnished to the Engineer by owners of such underground facilities or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof.

The Contractor shall perform exploratory excavations in advance of this work to verify the location, depth, size, and material of existing utilities which may interfere with the work to be performed under this contract. All damage to existing utilities shall be the Contractor's cost to repair or replace.

3.02. PREPARATION

- A. The Contractor shall have on the job site with each pipe laying crew, all the proper tools, gauges, pipe cutters, lubricants, etc. to handle, cut and join the pipe.
- B. Flat-bottom trenches of required width shall be excavated to the necessary depth as required and maintained in accordance with Section 02225.
- C. Prior to installing the pipe foundation material, trenches shall have all water removed and all work performed in a dry trench. Pipe installation in frozen trench bottom is not permitted.
- D. All pipes, fittings and specials which are to be installed in the open trench excavation shall be properly bedded in and uniformly supported on pipe foundations of the type specified in Section 02225 and shown on the Drawings. In particular, stones 2 inches and larger shall be removed from the bearing surface of the pipe foundation.
- E. Pipe foundation bedding material shall be spread in maximum 8-inch layers and each layer shall be compacted up to the spring line of the pipe.
- F. Compaction methods include hand tamping with T-bars, flat heads, shovel slicing as well as mechanical compactors.
- G. The Contractor shall perform his bedding operations with care to maintain line and grades.
- H. Suitable holes or depressions shall be provide in the pipe bedding to permit adequate bedding of bells, couplings, or similar pipe projections.

3.03. LINES AND GRADES

- A. The Contractor shall furnish all labor, materials, surveying instruments, and tools to establish and maintain all lines and grades. The Contractor shall have personnel on duty or on standby call, at all times, who are qualified to check line and grade of pipe lines as they are installed.
- B. Property and other control lines necessary for locating the work are shown on the Drawings.
- C. During construction, the Contractor shall provide the Engineer, at his request, all reasonable and necessary materials, opportunities, and assistance for setting stakes and making

measurements, including the furnishing of one or two rodmen or chainmen as needed at intermittent times.

- D. The Contractor shall carefully preserve bench marks, reference points and stakes established by the Engineer or Owner, and in case of willful or careless destruction by his own operations he will be charged with the resulting expense to reestablish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the unnecessary loss or disturbance of such control data.

3.04. TOLERANCES

- A. Pipes shall be installed at the lines and grades shown on the Drawings.
- B. Minimum depth of cover shall be maintained shown on the Drawings or as described herein.

3.05. INSTALLATION

- A. Installation of ductile iron pipe or plastic pipe to be in conformance with AWWA C600 or ASTM D2774, respectively, except as modified in this section or referenced sections or as shown on the Drawings.
- B. The Contractor shall furnish slings, straps and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from storage areas to the trench shall be restricted to operations which can cause no damaged to the pipe or lining or castings.
- C. The pipe shall not be dropped from trucks onto the ground or into the trench.
- D. Each pipe section shall be placed into position in the trench on the pipe bedding in such manner and by such means required to cause no injury to the pipe, persons or to any property.
- E. The method of laying and jointing the pipe shall be in accordance with the recommendations of the manufacturer and as approved by the Engineer. Each pipe shall be aligned with that already in place, forced home completely with horizontal axial movement and held securely in position. The bell of each pipe length to be laid in the same direction the installation is proceeding.
- F. At the joints, enough depth and width shall be provided to permit the pipe layer to reach entirely around the pipe so that the joints may be made in accordance with the manufacturer's recommendations. Mechanical type joints shall be tightened within the AWWA recommended torque range.
- G. Pipes, fittings, and specials shall be firmly bedded in the pipe foundation and shall have full bearing throughout their entire length, which shall be accomplished by combination of shaping the bedding and adequately compacting the pipe bedding and backfill under and around the pipe to the spring line of the pipe. The remaining backfill placed in 12-inch lifts to 1 foot above the crown or the pipe in accordance with Table 1, Minimum Compaction Requirements, of Section 02228. The remaining backfill installed in accordance with Sections 02225 and 02228.
- H. When installed in tunnels, pipes shall be blocked in such a manner as to take the weight off the bells. Pipe laid in normal trench excavation shall not be laid on wood blocking.
- I. Backfill material within 12 inches of the pipe shall be free of stones greater than 2 inches in any dimension.

- J. Unless otherwise shown on the Drawings, the minimum total finished cover over the top of the pipe barrel of all pressure pipe shall be 4 feet.
- K. Refer to Section 02225 for other installation guidelines and requirements.
- L. To deflect a pipe joint, first join the pipe in the proper manner and then deflect the pipe within the allowable deflection recommended by the manufacturer.
- M. Manufactured pipe plugs or temporary bulkheads shall be placed in the open ends of sewer pipes whenever pipe installation is stopped overnight, over weekends, or whenever dirt or debris could enter the pipe during construction. Newly installed pipe shall not be used to remove groundwater from trench.
- N. Install magnetic locating tape, trace wire, minimum 2 inches wide with the words "Sewer Line Below" along the centerline of the installed sewer main for the entire length at a maximum depth of 2 feet 0 inches below finished grade.
- O. For ductile iron pipe installations, install two bronze wedges in each joint of pipe, fittings and specials.
- P. Installation of polyethylene sleeves to be preformed in accordance with the manufacturers instructions and ANSI A21.4/AWWA C105.

3.06. PIPE CONNECTIONS

- A. The following connection methods shall be used when connecting dissimilar pipe materials or when connecting new pipe to existing pipe:

Type to Type	Solvent Cement Socket Coupling	Cast Coupling	MJ Adapter	Butt Fused	Electro-fusion	PVC Gasketed Repair Sleeve	Flanged Coupling Adapter
Sch 40/80 PVC to Sch 40/80 PVC	✓						
SDR, Sch 40/80 PVC to CIP/DIP		✓					✓
SDR, Sch 40/80 PVC to asbestos cement		✓					
CIP/DIP to CIP/DIP		✓					✓
CIP/DIP to asbestos cement		✓					
PE to CIP/DIP			✓				✓
PE to asbestos cement			✓				
PE to PE				✓	✓		
SDR PVC to SDR PVC		✓				✓	

- B. Cast Couplings - For pipe sizes up to 16 inches, couplings to be ductile iron fittings, Smith-Blair Model 441 or 442, or equal with stainless steel bolts and nuts. The couplings shall receive two coats of coal tar epoxy paint on all exterior surfaces prior to installation.

- C. Mechanical Joint Adapter
 - 1. MJ adapters shall be provided with a stiffener.
 - 2. MJ adapters shall be provided by Driscoplex, ISCO, or Smith-Blair.
- D. Fused Joints - Butt fusion or electrofused joining methods shall be used in accordance with manufacturer's written instructions.
- E. Restrained Couplings - Restrained couplings shall be provided as necessary for pipe sizes up to 12 inches instead of cast couplings when connecting ductile iron pipe. Coupling shall be Series 3800 by EBAA Iron, Inc. or equal.

3.07. THRUST RESTRAINT SYSTEMS

- A. Concrete Thrust Restraint
 - 1. All bends, tees, crosses, plugs, etc., shall be braced and blocked with wood and then anchored with concrete thrust blocks so that there will be no movement of the pipe in the joints due to the internal or external pressures.
 - 2. The concrete shall be placed around the fittings and completely fill the space between the fittings and walls of the trench, from 6 inches below the fittings of pipe to 12 inches above the fittings and in accordance with the dimensions and details shown on the Drawings.
 - 3. The anchor concrete shall be so placed that the bell and spigot joints or other joints may be tightened, if necessary.
 - 4. Steel ties to be used only where shown on the Drawings.
 - 5. Prior to installation of the concrete anchor, the Contractor shall wrap all fittings with a minimum of 8-mil thick polyethylene.
 - 6. Refer to details shown on the Drawings.
 - 7. Cast-in-place concrete used on constructing concrete thrust blocks shall conform to requirements specified in Section 03001.
 - 8. Measuring, mixing, transporting and placing of concrete shall conform to American Concrete Institute (ACI) Publication 304.
 - 9. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - 10. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- B. Mechanical Joint and Harness Restraints
 - 1. Restraint devices for mechanical joint fittings and appurtenances shall conform to ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53. The gland shall be provided with multiple gripping wedges incorporated into the gland and shall meet the applicable requirements of ANSI/AWWA C110/A21.10. The restraints shall be designed with a factor of safety of 2.0. Restraint rings shall be constructed of

65-45-12 ductile iron in accordance with ASTM A536. Installation shall conform to AWWA C600. The restraints shall be Series 1100 as manufactured by EBAA Iron, Inc. or equal.

2. Ductile iron pipe bell restraint shall consist of a wedge action restraint ring on the spigot joined to a split ductile iron ring behind the bell. The restraint ring shall have individually actuated wedges that increase their resistance to pull out as pressure or external forces increase. The restraint ring and its wedging components shall be made of a minimum grade of 65-45-2 ductile iron conforming to ASTM A536. The wedges shall be heat treated to a minimum hardness of 370 BHN. Torque limiting twist-off nuts shall be used to ensure proper actuation of the restraining wedges. The split ring shall be made of a minimum grade of 65-45-12 ductile iron conforming to ASTM A536. The connecting tie rods that join the two rings shall be made of low alloy steel that conforms to ANSI AWWA C111/A21.11. The assembly shall have a rated pressure with a minimum 2 to 1 safety factor of 350 psi in sizes 16 inches and below, 250 psi in sizes 18 through 36 inch. Installation shall conform to AWWA C600. The restraints shall be Series 1700 as manufactured by EBAA Iron, Inc. or equal.
3. When connecting plain end pipe sections, refer to the pipe connection table for restrained coupling specification.
4. Refer to details shown on the Drawings.

3.08. TEMPORARY PLUGGING

- A. At all times when pipe laying is not actually in progress, the open ends of the pipes shall be closed temporarily with pipe plugs or by other means such that there is no possibility of any water or foreign material entering the line. If water is in the trench when work is resumed, the plugs shall not be removed until the water has been removed and work can proceed in a dry stable trench.

3.09. CLEANING PIPELINE

- A. At the conclusion of the work, the Contractor shall thoroughly clean all new pipes by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered during the construction period.
 1. If, after this cleaning, any obstructions remain, they shall be corrected to the satisfaction of the Engineer. Pipes shall be flushed at a rate of 2.5 feet per second for a suitable duration.
- B. Where required the Contractor shall use mechanical methods to clean pipes when flushing does not remove all obstructions or material.

3.10. TESTING

- A. Testing of the force main pipelines shall be performed in accordance with Section 02741.
- B. Any section of pipe that fails the pressure or leakage test shall be dug up and replaced or permanently repaired as approved by the Engineer. The replaced or repaired section shall be retested.

3.11. ENCASEMENT

- A. Where shown on the Drawings, pipes shall be encased in Class 2500 concrete. Details and requirements for encasement of pipes are described in Section 02225.
- B. Requirements for encasement of pipes 10 inches and smaller, shown under a base slab, are described in Section 02225.
- C. Where shown on the Drawings, pipes shall be encased in a polyethylene sleeve.
 - 1. Damage to wrapping during pipe laying or backfilling operations shall be repaired with additional sleeve material and adhesive tape.

3.12. VALVES

- A. Valve details are shown on the Drawings.
- B. Refer to drawings for locations of valves to be installed on this project.
- C. Valve boxes shall be installed vertically and valve box extensions shall not impede use of T-wrench.

3.13. PROXIMITY TO WATER MAINS

- A. Whenever possible, pressure sewers shall be laid with a minimum of 10 feet horizontal separation between the sewer and potable water lines. Should a lateral separation of 10 feet not be possible, the following methods of protection must be employed:
 - 1. Lay sewer and water main in separate trench.
 - 2. Lay the sewer and water main in same trench with the water main at one side on a bench of undisturbed earth.
 - 3. In both above cases, the water main invert shall be 18 inches above the sewer crown and there shall be a minimum of 3+ feet of horizontal separation between the pipe outside diameter.
- B. Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstruct the sewer line (per water line standards) with mechanical-joint, cement lined ductile iron pipe for a distance of 20 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible. The sewer shall not be located above the water main.

3.14. MAINTAIN EXISTING SANITARY SEWER SERVICE

- A. If, during installation of new sanitary sewer, Contractor disturbs existing leachfield, septic tank, or other type of existing sanitary sewer service, it shall be the Contractor's responsibility to maintain that homeowner's sanitary sewer service until such time that the new sewer has been tested and put on line.

END OF SECTION

SECTION 02741

PRESSURE TESTS OF FORCE MAINS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Pressure testing of force mains and pressure sewer systems.
- B. Test requirements.
- C. Required replacement or repair if test fails.
- D. Project records.

1.02. RELATED SECTIONS

- A. Section 01026 - LUMP SUM ITEMS: Requirements applicable to lump sum prices for the work of this section.
- B. Section 01700 - RECORD DOCUMENTS
- C. Section 02740 - SEWAGE FORCE MAINS

1.03. REFERENCES

- A. AWWA C-600 - Installation of Ductile Iron Water Mains and Their Appurtenances

1.04. TEST REQUIREMENTS

- A. All force mains and pressure sewer systems shall be tested in accordance with AWWA Standard C-600. The following procedure shall be used:
 - 1. All newly installed pipe or any valves section thereof, shall be subjected to a hydrostatic pressure 50 percent in excess of the working pressure at any point in the section being tested, but in no case less than 150 lbs. per square inch for a period of two hours.
 - 2. The Contractor shall accomplish the required tests by individually testing each section of the installed main. The maximum length of section permitted to be tested at any one time will be approximately 1 mile, and normally will be less.
- B. Test Pressure Restrictions - Test pressure shall:
 - 1. Not exceed pipe or thrust restraint design pressures.
 - 2. Be of at least two-hour consecutive duration.
 - 3. Not vary by more than ± 5 psi.
 - 4. Not exceed twice the rated pressure of the valves when the pressure boundary of the test section includes closed valves.

C. Leakage Test

1. All leakage tests shall be conducted concurrently with the pressure test.
2. Leakage Defined - Leakage shall be defined as the quantity of water that must be supplied into the newly installed pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure throughout the duration of the test after the pipe has been filled with water to the test pressure.
3. The rate of leakage shall not exceed 11.65 gallons per day, per mile of pipe, per inch of nominal pipe diameter based on a test pressure of 150 psi. To calculate allowable leakage in gallons per hour (gph) for other test pressures, refer to Table 4A of AWWA C600, a copy of which is at the end of this section, including the basic formula for calculating leakage.
4. If the section of force main tested does not meet the test pressure requirement within 5 psi or the allowable leakage rate is exceeded, the test shall be considered a failure.

1.05. SUBMITTALS

- A. For each test, submit completed "Flushing and Testing of Force Mains Tabulation Sheet," attached at the end of this section.

1.06. PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700.
- B. Contractor to complete and submit for each test the Flushing and Testing of Force Mains Tabulation Sheet for recording data for flushing and testing pressure pipe). Engineer shall fill out form and both Contractor and Engineer shall sign upon completion.

1.07. REGULATORY REQUIREMENTS

- A. Submit proof of testing as required by local, county or state agencies and this section of the specifications.

1.08. FIELD MEASUREMENTS

- A. Measure length of test section.
- B. Measure quantity of water used to maintain test pressure during test period.
- C. Measurements required to complete the Flushing and Testing of Force Mains Tabulation Sheet.

1.09. COORDINATION

- A. Contractor is responsible for obtaining water for flushing and pressure test.
- B. Provide 48-hour notice to local water department (Owner) when water for flushing and testing is required.
- C. Owner of existing water system to operate all valves and hydrants unless Contractor has been authorized by Owner to operate water systems valves and hydrants.

PART 2 PRODUCTS

2.01. WATER SUPPLY

- A. Contractor shall supply water for flushing from clean, clear potable sources acceptable to the Engineer.
- B. All water for flushing shall be furnished and disposed of in accordance with all federal, state, and local requirements by the Contractor at his expense.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Backfilling of the pressure pipe trench to ground surface or road surface shall be in place and completed, except for final paving, for seven calendar days or as approved by the Engineer prior to start of testing of each section of force main.

3.02. PREPARATION

- A. The Contractor shall supply all plugs, pumps, weirs, gauges, etc., necessary to conduct the tests, including means to accurately measure the quantity of water used to maintain test pressure during the test period.
- B. Flush all piping systems with water prior to testing. Flushing shall be sufficient to remove all dirt/debris from force main.

3.03. TESTING

- A. Pressure and leakage tests shall be conducted on all force main and pressure pipe.
- B. The Engineer shall witness all tests.
- C. All test results shall be recorded on the Flushing and Testing of Force Mains Tabulation Sheet attached at the end of this section.
- D. Contractor is responsible for temporary connections to facilitate filling of force main, release of air from force main, and pressure testing. Connection devices shall be reviewed by Engineer before starting testing. All temporary connections shall be plugged after a successful test.
- E. When filling force mains with water for flushing or testing, a direct connection from potable water source to force main is strictly prohibited.
- F. Pressurization - Each valved section of pipe shall be slowly filled with water. The specified test pressure, based on the elevation of the lowest point of the pipe or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe.
- G. Air Removal - Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.
- H. Examination - Any exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves that are discovered

following the pressure test shall be repaired or replaced with sound material and the test shall be repeated.

- I. All visible leaks, regardless of the amount, shall be repaired.
- J. If the section being tested fails to pass the pressure or leakage test, the Contractor shall determine, at his own expense, the source or sources of leakage, and he shall permanently repair or replace all defective materials and/or workmanship. The extent and type of repair as well as results, shall be subject to the approval of the Engineer. The completed pipe installation shall then be retested and required to meet the pressure and leakage requirements of this test.
- K. Testing and retesting shall be completed prior to final paving.
- L. The use of sealants, applied from outside or inside of pipe, is not acceptable.

(continued)

Table 4.A Hydrostatic testing allowance per 1,000 ft of pipeline*—*gpb*†

Avg. Test Pressure <i>psi</i>	Nominal Pipe Diameter—in.																	
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	64
450	0.43	0.57	0.86	1.15	1.43	1.72	2.01	2.29	2.58	2.87	3.44	4.30	5.16	6.02	6.88	7.74	8.60	9.17
400	0.41	0.54	0.81	1.08	1.35	1.62	1.89	2.16	2.43	2.70	3.24	4.05	4.86	5.68	6.49	7.30	8.11	8.65
350	0.38	0.51	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	3.03	3.79	4.55	5.31	6.07	6.83	7.58	8.09
300	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21	4.92	5.62	6.32	7.02	7.49
275	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03	4.71	5.38	6.05	6.72	7.17
250	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85	4.49	5.13	5.77	6.41	6.84
225	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65	4.26	4.86	5.47	6.08	6.49
200	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44	4.01	4.59	5.16	5.73	6.12
175	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22	3.75	4.29	4.83	5.36	5.72
150	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98	3.48	3.97	4.47	4.97	5.30
125	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72	3.17	3.63	4.08	4.53	4.83
100	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43	2.84	3.24	3.65	4.05	4.32

*If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.

†Calculated on the basis of Eq 1.

FLUSHING AND TESTING OF FORCE MAINS TABULATION SHEET

Job No. _____ Location _____
 Contract No. _____ Contractor _____
 Project _____
 Contractor's Representative _____

FLUSHING

Date _____ Weather _____ Temperature _____
 Section Flushed _____ ft. of _____-inch diameter pipe
 Line Flushed _____ hrs. _____ min. @ _____ gal/min
 Line Flushed Through _____ Manhole No. _____

PRESSURE AND LEAKAGE TESTING

Date _____ Weather _____ Temperature _____
 Section Tested _____ ft. of _____-inch diameter pipe
 _____ ft. of _____-inch diameter pipe in _____-ft. laying lengths
 Time Started _____ Time Finished _____ Elapsed Time _____
 Test Pressure: Start _____ psi Finish _____ psi
 Water to Make up Initial Pressure _____ gallons
 Allowable leakage, as calculated _____ gallons
 Pass _____ Fail _____

Ductile Iron Pipe/HDPE

PVC Pipe

$$L = \frac{SD \sqrt{P}}{133,200} *$$

$$L = \frac{ND \sqrt{P}}{7,400}$$

L = Allowable leakage in gallons/hour
 S = Length of pipe tested (linear feet)
 D = Nominal diameter of pipe (inches)
 P = Average pressure during test, psi
 N = Number of joints

*Refer to C600 for additional allowance leakage against closed metal-seated valves.

WITNESS: OWNER/ENGINEER _____ Name _____ Title _____ Signature _____	WITNESS: CONTRACTOR _____ Name _____ Title _____ Signature _____
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END OF SECTION

SECTION 02769

BYPASS PUMPING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Mobilization and demobilization.
- B. Nature and capacity of system to be bypassed.
- C. Flow bypass plan requirements.
- D. Backup and standby equipment requirements.
- E. Installation, operation, and removal of facilities.
- F. Sound attenuation.

1.02. RELATED SECTIONS

- A. Section 01026 - BID ITEM DESCRIPTIONS (LUMP SUM ITEMS)
- B. Section 01039 - COORDINATION
- C. Section 01500 - TEMPORARY FACILITIES
- D. Section 01700 - RECORD DOCUMENTS
- E. Section 02205 - PROTECTION OF EXISTING FACILITIES
- F. Section 02225 - TRENCHING
- G. Section 02740 - SEWAGE FORCE MAINS
- H. Section 15060 - INSIDE PROCESS PIPING

1.03. DEFINITIONS

- A. Bypass Pumping System - The bypass pumping system shall consist of all equipment, piping, valves, plugs, power supplies, and other appurtenances required to divert sewer flows from the influent gravity sewers at the pumping stations indicated in paragraph 1.04.A to the respective discharge force mains. The bypass pumping system shall be comprised of primary (pumping) setups and secondary (pumping) setups in addition to all bypass piping necessary to complete the work. The work shall be scheduled in such a manner that allows the completion of the work in a time frame that minimizes the duration of bypass pumping.
- B. Bypass Piping - The bypass piping shall consist of the piping, valves, supports, and other appurtenances including, but not limited to, air relief valves and dewatering connections. The bypass piping includes both the suction and discharge piping for each primary and backup bypass setup. Separate suction pipes shall be provided for each bypass pump.

1.04. BYPASS PUMPING SYSTEM DESCRIPTION

A. The following table identifies the bypass pumping set-ups.

PRIMARY SETUP NO.	PUMP STATION	PUMP CAPACITY (GPM)	MINIMUM DISCHARGE HEAD (FEET)	COMMENTS
2	Walden Woods	111	124	Discharge Location: Force main connection downstream of pumps
3	Jefferson Valley	690	85	Discharge Location: Force main connection downstream of pumps

The Contractor shall investigate these and/or other locations that may provide sufficient space or flexibility in order to perform this work. Each set-up shall include, at a minimum, the following equipment:

1. One trailer-mounted diesel-driven suction lift pump.
2. One backup trailer-mounted diesel-driven suction lift pump with equal capacity of primary pump. Backup pump shall be piped into discharge piping.
3. Required pump control panels and float switches for pump operations and alarm indication.

B. Primary Pumps - The primary pump is the main pump located at set-up. The primary pump shall be capable of pumping the peak flow from the above table, be connected to the bypass piping, be isolated with valves, and be complete with power supplies.

C. Backup Pump - The backup pump shall be capable of pumping the peak flow and be connected into the discharge piping.

1.05. SUBMITTALS

A. Provide product data describing conformance to ASTM and ANSI codes of the bypass pipe material.

B. The Contractor will retain the services of a licensed New York State engineer to design, review the installation, and approve the bypass pumping system. Calculations and review comments will be kept on file throughout the duration of the contract.

1. A letter of approval shall be submitted to the contract administrator stating that the design meets the requirements of the Contract Documents.

C. Flow Bypass Plan

1. The Contractor shall submit to the Engineer plans and descriptions pertaining to the bypass pumping provisions to be taken by the Contractor regarding the handling of peak flows. No construction shall begin until all submittals have been reviewed by the Engineer and are determined to be complete.

2. The plan shall include, but not be limited to, details of the following:

- a. Sewer plugging plan, including type, location, and manufacturer of plugs and emergency release procedures.
 - b. Material and location of suction piping installation.
 - c. Material and location of discharge piping installation and associated valves and pipe supports.
 - d. Locations and number of each bypass pump and power requirements.
 - e. Compliance with permits required by the New York State Department of Environmental Conservation or the Owner.
 - f. Plan for noise control for each pump and/or generator. Sound levels shall not exceed 40 dBA at 30 feet when diesel generator and pumps are operating. Electric pumps, when operating, shall generate sound levels of less than 50 dBA at 30 feet.
 - g. Cold weather operational plan to protect equipment and pipes from freezing, including provisions to remove water that is trapped in sections at road crossings or other low spots in the discharge line.
 - h. Standard and emergency shutdown plan indicating emergency (24-hour) contacts, drain points, drain down time, disinfection and disassembly.
 - i. Schedule for installation of and maintenance of bypass pumping lines.
 - j. Details for standard road/sidewalk crossings.
 - k. Plan to prevent odors from being generated, including seals at discharge manholes and primary and secondary setup manholes.
 - l. Alarm system(s) that will allow prompt determination of loss of bypass piping integrity during operation.
 - m. Schedule for routine inspection of bypass pumping lines.
3. The Engineer's and Owner's receipt of flow bypass plan does not relieve Contractor of responsibility for means, methods, and sequences of construction, requirement to pump peak flows, and for safety.

1.06. PROJECT RECORDS

- A. The Contractor shall maintain records which indicate the following:
 1. Dates of installation and operation of primary and secondary setups.
 2. Maintenance schedules for each pump.
 3. Dates and times of any flow loss from the bypass pumping system.
 4. Dates and times of any backups of flow into maintenance garage, and contractor action with corrective actions taken.
 5. Date of any public complaints with corrective actions taken.

1.07. REGULATORY REQUIREMENTS

- A. Conform to regulatory agencies having jurisdiction over the work.

1.08. FIELD MEASUREMENTS

- A. Prior to start of construction, verify by field measurements that existing conditions are as shown on Drawings. Notify Engineer of differences.

1.09. COORDINATION

- A. Coordinate field work under provisions of Section 01039, including maintenance of traffic, access to maintenance garage, sidewalks and emergency 911 service.
- B. Coordinate work with local utility companies (private and municipal) for location of existing utilities and protection thereof.
- C. Coordinate work which may disrupt school bus routes and dropoff/pickup locations with the local school system.
- D. Coordinate flow bypassing with Owner. If necessary, the Contractor shall coordinate snow removal operations with the governing municipality. The Contractor will be responsible for the removal or moving of snow surrounding the bypass system and piping.

1.10. SCHEDULING

- A. The Contractor shall be responsible for the installation, operation, and removal of all flow bypass facilities and surface restoration in accordance with the approved project schedule.
- B. Work shall be ready for installation when excavation around influent gravity sewers begins.
- C. Two Repair Clamps and Section of Repair Pipe – Shall be on site prior to excavating around the effluent force main.
- D. Work shall be scheduled to minimize the duration of bypass pumping.

PART 2 PRODUCTS

2.01. MATERIALS - BYPASS PIPING

- A. Rigid Piping - Hot dipped, galvanized steel piping. Each pipe joint shall have a ball and socket-type connection, rubber O-ring, and lever closure for positive sealing.
- B. Flexible Piping - Synthetic rubber core, reinforced with synthetic fabric with wire helix, covered with synthetic rubber wrapping. Joint fittings to match rigid piping fittings.

2.02. EQUIPMENT

- A. 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. All pumps must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of sewer discharges.
- B. The Contractor shall provide the necessary VFDs and stop/start controls for each pump.

- C. Sewer plugs shall be pneumatic and shall be capable of accommodating the maximum allowable surcharge heads that may be experienced during the construction of this project. The plugs shall also be readily removed from the system during emergency shutdown of the system.
- D. Contractor shall provide necessary protection for bypass pumping equipment from freezing during cold weather operation.
- E. Contractor shall provide necessary containment for raw sewage from pump priming operations or routine maintenance.

2.03. CONCRETE BARRIERS

- A. Contractor to provide concrete barriers to surround bypass pumping area along any boundary with a road.

PART 3 EXECUTION

3.01. DESIGN REQUIREMENTS

- A. Maintenance of Flow - Bypass pumping systems shall have sufficient capacity for peak flow as noted in Article 1.04.
- B. Noise Suppression
 - 1. Contractor shall equip all pump motors and engines to minimize the generation of noise.
 - 2. Contractor shall utilize sound enclosures around all primary setups or utilize "hospital muffles" on those pumps.
 - 3. Contractor shall utilize sound enclosures around all secondary setups.
 - 4. Contractor shall be responsible to implement additional sound reduction measures as directed by the Owner, including those specified to protect the interests of surrounding private property owners.
- C. Siting of Facilities - Contractor shall maintain traffic flow at each site. Contractor shall have one day to install any road crossings he proposes that require the closure of local roadways. In all instances traffic flow must be maintained around and past the stations.
- D. Contractor will not be allowed to begin bypass pumping until verification is forwarded to the Engineer that all equipment scheduled to be installed has been received by the Contractor(s).

3.02. PERFORMANCE REQUIREMENTS

- A. It is essential to the operation of the existing sewerage system that there be no interruption in the flow of sewage throughout the duration of the project. The Contractor shall provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment, conduits, all necessary power, and all other labor and equipment necessary to intercept the sewage flow before it reaches the point where it would interfere with work; carry it past this work; and return it to the existing sewer system downstream of the work.
- B. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

- C. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharge or damage to tributary sewers and that will protect public and private property from damage.
- D. The Contractor shall incorporate provisions to remove water from the primary bypass pumping system to protect against freezing and damage. During cold weather operations, diesel generators shall utilize block heaters and critical priming piping shall be protected with heat tracing. Contractor shall provide cold weather mix diesel fuel during cold weather operations.

3.03. FIELD QUALITY CONTROL AND MAINTENANCE

- A. Testing on Installation - The Contractor shall perform leakage and pressure tests of the bypass piping, using clean water, prior to actual operation if directed by the Engineer. The test pressures shall be 1.5 times the expected operating pressures. The Engineer will be given 24 hours' notice prior to testing.
- B. Testing Prior to Disassembly - Upon completion of the work within a particular flow bypass setup the Contractor shall flush the pipes with clean water and disinfect the system with chlorine prior to disassembly. A residual chlorine concentration of 20 mg/L must be maintained for one hour prior to final dewatering and disassembly.
- C. Routine Inspection and Maintenance
 - 1. The Contractor shall inspect all operating bypass pumping systems each weekday or more frequently as necessary to ensure the proper operation of the system. Suction and discharge piping shall be cleaned to maintain the required performance of the bypass pumping system. A qualified representative of the General Contractor familiar with the operation and maintenance of the bypass system shall be on call and shall respond to an alarm condition and/or request by the Town's operations staff within one hour of receipt of alarm notification (or Town request).
 - 2. The Contractor shall ensure that the bypass pumping system is properly maintained.
- D. Extra Materials
 - 1. Spare parts for pumps and piping shall be kept on site as required.
 - 2. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

3.04. PREPARATION

- A. Precautions
 - 1. The Contractor is responsible for locating any existing utilities in the area selected for installation of the bypass pipelines. The Contractor shall minimize the disturbance to existing utilities and shall obtain approval from the Owner and Engineer for any relocation of the bypass pipeline. All costs associated with the relocation of utilities and obtaining of approvals shall be paid by the Contractor.
 - 2. During all bypass pumping operations, the Contractor shall protect the bypass pumping facilities and existing collection system from damage inflicted by equipment. The Contractor shall be responsible for all intentional or accidental physical damage to the bypass pumping system caused by human or mechanical failure or interference.

3. During installation of the bypass pumping lines the Contractor shall make every effort to minimize the disruption of work at the pumping stations. The Contractor shall protect all mature vegetation and structures or other obstacles in the path of the pipeline from damage through the use of shields and buffering devices. All Town property that must be relocated to construct the work must be stored at a location acceptable to the Owner. In instances where fences must be disturbed for the construction of the pipeline the Owner shall be consulted to see if the installation of temporary fencing shall be required. Preconstruction videotapes will be produced by the Contractor to document the pre-construction condition of the pipeline route.

3.05. INSTALLATION AND REMOVAL

- A. The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures only as the access locations indicated on the Contract Drawings and as may be required to provide adequate suction conduit.
- B. Plugging or blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.
- C. The pipeline must be located off facility roads and sidewalks. When shown on the Contract Drawings, the Contractor must place the pipelines in trenches and cover. Upon completion of the bypass pumping operations, and after receipt of written permission from the Engineer, the Contractor shall remove all the piping, restore all property to pre-construction condition or better, and shall restore all pavement and sidewalks. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways from the Owner.
- D. Bypass pumping setups must be flushed with clean water and disinfected prior to dewatering and disassembly as indicated in paragraph 3.03.B. All rinse water shall be returned to the sewer system.

END OF SECTION

SECTION 02831

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Fence framework, fabric, and accessories.
- B. Excavation for post bases; concrete foundation for posts and center drop for gates.
- C. Manual gates and related hardware.
- D. Type I fence materials are acceptable.

1.02. RELATED SECTIONS

- A. Section 01300 - SUBMITTALS
- B. Section 01600 - MATERIAL AND EQUIPMENT
- C. Section 01700 - RECORD DOCUMENTS
- D. Section 03001 - CONCRETE: Concrete anchorage for posts.
- E. Sections as required per Electrical Specifications.

1.03. REFERENCES

- A. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
- B. ASTM F567 - Installation of Chain Link Fence
- C. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric
- D. ASTM A120 - Pipe, Steel, Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless, for Ordinary Uses
- E. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire
- F. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware
- G. ASTM A392 - Zinc Coated Steel Chain Link Fence Fabric
- H. ASTM A428 - Weight of Coating on Aluminum Coated Iron or Steel Articles
- I. ASTM A491 - Aluminum Coated Steel Chain Link Fence Fabric
- J. ASTM A569 - Steel, Carbon (0.15 Maximum Percent), Hot Rolled Sheet and Strip Commercial Quality
- K. ASTM A585 - Aluminum Coated Steel Barbed Wire

- L. ASTM C94 - Ready mixed Concrete
- M. ASTM F668- Poly (Vinyl Chloride) (PVC) Coated Steel Chain Link Fence Fabric
- N. Chain Link Fence Manufacturers Institute (CLFMI) - Product Manual

1.04. SYSTEM DESCRIPTION

- A. Fence Height - 8 feet nominal, excluding barbed wire.
- B. Line Post Spacing - At intervals not exceeding 10 feet. Straight runs shall not exceed 500 feet provide corner or pull posts for any change in direction of 15 degrees or more.

1.05. SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings - Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- C. Manufacturer's Product Data - Provide data on fabric, barbed wire, posts, accessories, fittings and hardware.

1.06. PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.07. QUALITY ASSURANCE

- A. Perform Work in accordance with manufacturer's instructions.

1.08. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum five years' documented experience.

1.09. FIELD MEASUREMENTS

- A. Field verify that measurements are as indicated on shop drawings and within Owner's property limits, if not notify Engineer immediately.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Page Aluminized Steel Corporation, or equal - Product: Type I.
- B. Cyclone Fence Division of USX Corporation, or equal - Product: Type I.
- C. Anchor Fence, Inc. or equal - Product: Type I.

D. Substitutions - Under provisions of Section 01600.

2.02. MATERIALS DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

2.03. MATERIALS

A. Framework - Type I steel pipe; may be used for pipe or fabric.

1. Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to ASTM F1083.
2. All coatings to be applied inside and out after welding.
3. Pipe shall be straight, true to section and conform to the following weights:

Pipe Size Outside Diameter	Type I Weight, lbs/ft
1-5/8"	2.27
2"	2.72
2-1/2"	3.65
3"	5.79
3-1/2"	7.58
4"	9.11
6-5/8"	18.97

B. Steel Fabric Wire (Type I) - ASTM F668 PVC-coated. Two-inch diamond mesh interwoven wire 9 gage thick, top selvage twisted tight, bottom selvage knuckle and closed, with minimum tensile strength of 80,000 lbs. per square inch.

C. Concrete - Type specified in Section 03001.

2.04. COMPONENTS

A. Fence Posts

Fabric Height	Type I	
	Line Post O.D.	Corner and Terminal Post O.D.
Under 6'	2"	2-1/2"
6' to 9'	2-1/2"	3"
9' to 12'	3"	4"

B. Gate Posts

Single Gate Width	Double Gate Width	Post O.D. Type I
Up to 6'	Up to 12'	3"
7' to 12'	13' to 25'	4"

C. Rails and Braces - 1-5/8-inches O.D.

- D. Gates - Frame assembly of 2-inch O.D. pipe Type I with welded joints. Weld areas repaired with zinc-rich coating applied per manufacturer's directions. Fabric to match fence. Gate accessories, hinges, latches, center stops, keepers and necessary hardware of quality required for industrial and commercial application. Latches shall permit padlocking.
- E. Fittings
 - 1. Post Caps - Pressed steel (with set screw retainer), cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone-type caps for terminal posts and loop type for line posts. All fittings to conform to ASTM F626.
 - 2. Rail and Brace Ends - Pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.
 - 3. Top Rail Sleeves - Tubular steel, 0.051 thickness x 7 inches long, expansion type.
 - 4. Tension Bars - Steel strip, 5/8-inch wide x 3/16-inch thick.
 - 5. Tension Bands - Pressed steel, 14 gauge thickness x 3/4-inch wide.
 - 6. Brace Bands - Pressed steel, 12 gauge thickness x 3/4-inch wide.
 - 7. Truss Ends - Steel rod, 3/8-inch diameter merchant quality with turnbuckle.
- F. Tension Wire - Marcellled 6 gauge steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A824.
- G. Tie Wires - Aluminum, 9 gauge, alloy 1100-H4 or equal.
- H. Hog Rings - Steel wire, 11 gauge, with a minimum zinc coating of 0.80 ounces per square foot of wire surface.
- I. Barbed Wire - If required, commercial quality steel, 12 1/2 gauge, two strand twisted line wire with 4-point barbs at 5-inch spacing. Coating shall consist of a minimum of 0.80 ounces of zinc per square foot of wire surface conforming to ASTM A121 or a minimum of 0.30 ounces of aluminum per square foot of wire surface conforming to ASTM A585.

2.05. ACCESSORIES

- A. Gate Hardware - Center plunger rod, catch, and semi-automatic outer catches to secure gates open in position; 180-degree ball and socket gate hinges per leaf and hardware for padlock accessible from both sides of gate.
- B. Padlocks - 2-inch size with 9-inch chain and stainless steel shackle as manufactured by Schlage #45-122.

2.06. FINISHES

- A. Components and Fabric - Vinyl coating, black color.
- B. Vinyl Components - Black color.
- C. Hardware - Galvanized to ASTM A153, 2.0 oz/sq.ft. coating.
- D. Accessories - Same finish as framing.

PART 3 EXECUTION

3.01. INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with manufacturer's instructions on previously-prepared surfaces, cleared of obstacles.
- B. Set intermediate, terminal, gate, and corner posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- C. Corner, Gate, Line, and Terminal Post Footing Depth Below Finish Grade - As indicated.
 - 1. Where bedrock is encountered, termination into bedrock shall be 12 inches minimum for line posts and 18 inches minimum for gate, pull, and termination posts.
- D. Provide top rail through line post tops and splice with 6 inch long rail sleeves. Top rail and fabric shall closely parallel finish grade without excessive angle changes. Accomplish good visual effects.
- E. Install center and bottom brace rail on corner gate leaves and all terminal posts.
- F. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- G. Position bottom of fabric 1 inch above finished grade.
- H. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- I. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- J. Install bottom tension wire stretched taut between terminal posts. Bottom wires to be within 8 inches of the respective fabric line.
- K. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt, retainer and locking clamp.
- L. Gates to be plumb, level, and secure for full opening without interference. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- M. Brace each gate and corner post to adjacent line post with horizontal center brace rail and 3/8-inch diameter diagonal truss rods. Install brace rail, one bay from end and gate posts.
- N. Compact concrete around posts by tapping or vibrating, then smooth trowel 2 inches above grade, sloped to drain. Posts to remain unburdened or undisturbed for seven days following concrete pour.

3.02. ERECTION TOLERANCES

- A. Maximum Variation From Plumb - 1/4-inch.
- B. Maximum Offset From True Position - 1-inch.
- C. Components shall not infringe adjacent property lines.

3.03. CLEANUP

- A. Remove waste fencing materials and other debris from site. Restore area around fence to finish grade.

END OF SECTION

SECTION 02980
SITE REHABILITATION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Site rehabilitation of lawns, existing cultivated or landscape items such as trees, shrubs, hedges, saplings, vines, ground cover vegetation, gardens, etc.
- B. Restoration of uncultivated lands.
- C. Topsoil, fertilizer, seeding, mulching and planting.
- D. Site rehabilitation of walls, terraces, fences, ditches, drains, culverts, drives, posts, patios, outdoor recreational equipment, garden decorations and appurtenances, small structures, and all other artificial features.
- E. Site modifications and development to meet new conditions.
- F. Removal and disposal of all excess materials, equipment, trash and debris used for, or resulting from, the work included in this section.

1.02. RELATED SECTIONS

- A. Section 01026 - LUMP SUM ITEM: Requirements applicable to lump sum prices for the work of this section.
- B. Section 01039 - COORDINATION
- C. Section 01300 - SUBMITTALS
- D. Section 02110 - SITE CLEARING
- E. Section 02223 - BACKFILLING: Rough grading.
- F. Section 02225 - TRENCHING: Basic site restoration.

1.03. REFERENCES

- A. The American Association of Nurserymen Standards - ANSI Standard 2-60.1, "Nursery Stock."
- B. Soil Conservation District of the Department of Agriculture.

1.04. QUALITY ASSURANCE

- A. Areas and Features to be Restored
 - 1. All areas, including natural features occurring thereon, which are damaged or disturbed by the Contractor's operations, shall be restored, repaired or replaced to the same or superior condition which existed prior to construction or as modified herein or as shown on the Drawings.

2. Artificial features shall be restored equal to a new condition or as modified herein or as shown on the Drawings.

1.05. SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Submit the source nursery for all plantings.
- C. Topsoil - Submit sieve analysis and characteristics of topsoil as listed in Part 2.
- D. Seed mixture data.

1.06. QUALIFICATIONS

- A. All planting material to be furnished from a nursery which meets the requirements of the American Association of Nurserymen.

1.07. PACKING AND SHIPPING

- A. All seed furnished for this project shall be delivered in standard size unopened bags of the vendor, showing weight, mixture, vendor's name and guaranteed analysis.

1.08. STORAGE

- A. Seed shall be properly stored in dry conditions at the site of the work.
 1. Any seed damaged or spoiled during storage shall be replaced by the Contractor.

1.09. ENVIRONMENTAL CONDITIONS

- A. Topsoil shall not be delivered or placed in a frozen or muddy condition.
- B. Seeding is to be done on dry or moderately dry soil.
 1. Seeding is to be done when the wind velocity does not exceed 5 miles per hour.

1.10. SCHEDULE

- A. The Contractor is advised to do all seeding during the periods of May 1st to June 15th, or August 15th to October 1st.
 1. Seeding may be conducted under unseasonable conditions without additional compensation, and at the option and full responsibility of the Contractor.

1.11. GUARANTEE

- A. Any new, reestablished, replaced or disturbed plant material that fails to respond properly within the one-year guarantee period shall be replaced as specified above at the Contractor's expense.

PART 2 PRODUCTS

2.01. MATERIAL

A. Topsoil

1. Topsoil shall be natural, fertile, friable agricultural soil capable of sustaining healthy vegetative growth.
2. Topsoil shall meet the following gradation requirements free of stones, roots, sticks and other foreign substances:

Grain Diameter	Sieve Size	Percent Passing by Weight
6.3 mm	6.3 mm	100
4.75 mm	No. 4	60-85
.075 mm	No. 200	20-45
.002 mm	--	7-27

- a. Topsoil shall contain less than 52 percent sand.
3. The pH of topsoil shall be between 5.0 and 7.0.
4. Topsoil shall contain no less than 6.0 percent organic matter.
5. Topsoil may be from previously excavated, stockpiled and protected materials, provided the materials meet the requirements for topsoil.

B. Fertilizer

1. General Fertilizer
 - a. Fertilizer shall be a complete, partially organic, commercial 10-6-4 fertilizer.
 - b. All fertilizer shall contain a minimum of 10 percent nitrogen, 6 percent available phosphorous and 4 percent potash.
 - c. Other commercially available fertilizers, such as 20 10-10 and 12-6-6, may be utilized provided that spreading rates are adjusted to provide the aforementioned minimum requirements for nitrogen.
2. Plant Fertilizer - As recommended by local Soil Conservation District of the Department of Agriculture for the type(s) of soil(s) and plant(s).

C. Seed

1. All seed shall be fresh, re-cleaned and of the latest crop year.
2. Each component shall meet or exceed the minimum State and Federal requirements for purity and germination for that component.
3. The weed content of each component shall not exceed 0.1 percent.
 - a. The following seed mixture is suggested for lawns or cultivated (landscape) areas:

Percent by Weight	Variety	Purity	Germination
50	Kentucky Blue Grass	85%	80%
20	Red or Chewing Fescue	97%	80%
30	Red Top	92%	90%

- b. Variations may be recommended by qualified personnel, but shall not be used without approval by the Engineer.
- 4. For uncultivated areas furnish perennial rye grass seed.
- D. Mulch for Tree or Shrub Plantings - Mulch shall consist of dry, clean, hardwood chips.
- E. Mulch for Seeded Areas - Mulch shall be oat, wheat or rye straw, or hay, free from noxious weeds and other materials which may interfere with the establishment of a healthy stand of grass.
- F. Plantings - Trees, shrubs, vines, ground cover and other vegetation to be replaced or installed new as specified which meet the requirements of the American Association of Nurserymen.
 - 1. Classifications of plants, dimensions, planting procedures, etc., shall conform to ANSI Standard Z 60.1, "Nursery Stock."
- G. Peat Moss - As recommended by the supplier of nursery stock.
- H. Metal Edging
 - 1. Edging shall be 3/16-inch thick by 4-inches high steel in 16- and 20-foot lengths.
 - a. Secure edging with 16-inch long tapered steel stakes at 30 inches on center.
 - b. All steel materials shall be painted with one coat of epoxy primer and two coats of epoxy finish.
- I. Weed Barrier - Weed barriers shall consist of two plies of 6-mil thick black polyethylene film.
- J. Stones
 - 1. All stones used for landscape surfacings shall be between 2 and 4 inches in maximum dimension and average to about 3 inches.
 - a. Stones shall be well-rounded.
 - 2. All stones used for mowing strips shall be a washed crushed stone, size 1/2-inch to 1-inch size.
- K. Tree Wrapping - Wrapping for trees shall be 8 ounce first quality burlap.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Determine that surface area is ready for fine grading and/or to receive topsoil and seeding or plantings.
 - 1. Remove trash, debris, large stones and other foreign materials from surface areas to be restored or rehabilitated.
 - 2. Topsoil shall be free of frozen fragments, debris, large stones, and other foreign materials.

3.02. PREPARATION

- A. Fine Grading - Areas requiring topsoil shall be fine graded to within 4 inches of finished grade to provide a minimum compacted thickness of 4 inches of topsoil at all locations.
- B. All such areas, whether in cut or fill, shall be raked to a depth of 1 inch, be parallel to finished grade as shown or required and shall be free of all stones, larger than 1 inch, roots, rubbish and other deleterious material.

3.03. INSTALLATION

- A. Areas to be Developed
 - 1. When the project site is to be modified and developed to meet new conditions, the Contractor shall perform all required grading, topsoiling, fertilizing, seeding, planting, mulching and maintenance of areas, all in accordance with the Drawings and as specified herein.
 - 2. Unless shown otherwise on the Drawings, the entire unpaved area within the grading limits and within the overall areas excavated and backfilled shall be so developed.
 - 3. New landscaping work and artificial features, if any, are shown on the Drawings and specified elsewhere.
- B. The Contractor shall reestablish all existing cultivated or landscape items, trees, shrubs, vines and ground covers as practicable.
 - 1. He shall provide additional or modify existing vegetation, as shown on the Drawings.
 - 2. Existing trees, plants, shrubs, saplings, ground cover, vines, etc., which are disturbed or damaged by the Contractor's operations shall be replaced with new plant materials.

3.04. TOPSOILING

- A. Topsoil shall be furnished and spread in the required areas to a depth of approximately 4 inches.
 - 1. Stockpiled topsoil may be used if it is acceptable to the Engineer.

2. In the event this topsoil is not satisfactory, or is inadequate to cover the required areas, the Contractor shall furnish the required amount of satisfactory topsoil from approved sources off the site.
- B. The soil shall be uniformly compacted with a light hand roller to a final depth of not less than 2 inches.
1. When finished, the surface shall conform to the finished grades shown or required and shall have a smooth pulverized surface at the time of seeding.
 2. Any irregularities shall be corrected before the fertilizer and seed are placed.
 3. Any subsequent settlement or displacement of the topsoil shall be restored to an acceptable condition at the Contractor's expense.

3.05. FERTILIZING

- A. The fertilizer shall be uniformly spread by a mechanical spreader at the rate of 25 lbs. per 1,000 square feet.
1. The fertilizer shall be incorporated into the upper 2 inches of topsoil immediately after spreading.
 2. Other commercial fertilizers, such as 20-10-10 or 12 6-6 may be used at rates adjusted to provide the same quantity of nitrogen per 1,000 square feet.

3.06. SEEDING

- A. Seed shall be applied at a rate of not less than 5 lbs. per 1,000 square feet, using a mechanical spreader.
1. Upon completion of the seeding, the area shall be raked lightly and rolled with a light hand roller.
- B. The process of spraying grass seeds, water, fertilizer and mulch known as hydro-seeding or hydro-mulching may be utilized provided that water hazards are minimized.
1. Presoaking, the spraying of the materials and watering after spraying shall be in strict accordance with the manufacturer's instructions.
 2. All materials, protection, maintenance, etc., shall be in conformance with this specification.
 3. The mulch may be a wood fiber material compatible with the spray equipment.

3.07. PLANTING

- A. All new plant materials which are to replace existing plant materials shall be of the same genus and species as the original, and shall be placed in the same location as the item being replaced.
1. The size of the new plant materials shall, if practical, match that of the item being replaced, consistent with normally available sizes from nursery stock.

2. Depending on the size and type of material, and when ordered by the Engineer, guy wires, stakes, anchors and wrappings shall be furnished and installed in a proper manner to brace and protect the plant.
 3. The Contractor shall, as soon as practicable, water and maintain all reestablished, replaced or disturbed plant materials until final acceptance of total.
- B. Plant shall be set plumb and true.
1. Shape area around saucer to form drainage grades as shown on the Drawings.
- C. Install wooden posts, guy wires and hose section for protection as shown on the Drawings.
1. Provide three guy wires per planted item.
- D. For all trees of 2-inch caliber or larger, wrap with tree wrap.
1. Begin at base of tree and work upward to the first branches.
 2. Tie the burlap wrap with cord (no synthetic cord nor wire) at 2-foot intervals and at the bottom and top.
- E. Place weed barriers on prepared subgrade at depth shown on the Drawings.
1. Turn up weed barrier at all edges and corners.
- F. Place washed stone over weed barriers to the specified depths.
1. Rake stone to produce a smooth, uniform surface.
- G. Install metal edging such that the top edge projects 1/4 inch above surrounding soil and stone.

3.08. MULCHING AND PROTECTION

- A. The Contractor shall protect and maintain seeded areas to assure a full even stand of grass.
1. Immediately after seeding and rolling, the Contractor shall apply oat, wheat or rye straw, or hay, free from noxious weeds, as a mulch, to a loose depth of about 1 inch.
 2. The Contractor shall perform all watering and reseeding as necessary for a minimum of 30 days and until final acceptance of the Contract, to ensure the establishment of a uniform stand of specified grasses.

3.09. MAINTENANCE

- A. Any portion of seeded areas failing to produce a full uniform stand of grass from any cause, shall be reseeded at full rate and refertilized at one-half rate and protected and maintained until such a full stand has been obtained.
- B. Plantings to be maintained for one year.

3.10. RESTORATION OF UNCULTIVATED LANDS

- A. Areas of uncultivated land shall be restored as follows:

1. The disturbed surfaces shall be rough-graded to the original elevations (± 1 inch) and general appearance which existed prior to construction (or to the new elevations and grades which are required), all debris, loose stones over 1 inch, boulders, etc., being removed in the process.
2. The surface shall then be seeded with perennial rye grass, being spread at the rate of 1 lb. per 800 square feet.
3. The area need not be raked or rolled after completion of seeding.

3.11. SPECIAL CONDITIONS

- A. Damaged Trees - Vegetation which has been damaged by site preparation activities and deemed non-functional by the Owner or engineer, shall be replaced by the Contractor with vegetation of the same caliper, genus and species at no additional compensation to the Contractor.

END OF SECTION

SECTION 03001

CONCRETE

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. All cast-in-place concrete structures.
- B. Equipment (and housekeeping) pads.
- C. Sidewalks.
- D. Formwork.
- E. Reinforcing steel bars and accessories.
- F. Concrete mixes.
- G. Concrete testing.
- H. Concrete finishes.
- I. Concrete curing and protection.
- J. Bonding agent.
- K. Concrete slab sealer.
- L. Repair to new (defective) and existing (damaged) concrete.
- M. Saw cutting concrete and repair to exposed steel reinforcement.
- N. Leakage testing.
- O. Non-shrink grout.
- P. Chemical adhesive system to install dowels and anchor bolts (rods) into hardened concrete or masonry.
- Q. Waterstops.
- R. Joint filler and sealant.
- S. Restrictions regarding embedments in concrete.

1.02. RELATED SECTIONS

- A. Section 03481 - PRECAST CONCRETE WET WELLS
- B. Section 05500 - MISCELLANEOUS FABRICATIONS

1.03. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Concrete Institute (ACI)

ACI 201.1	Guide for Conducting a Visual Inspection of Concrete in Service
ACI 211.1	Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 301	Specifications for Structural Concrete
ACI 302.1	Guide for Concrete Floor and Slab Construction
ACI 304	Measuring, Mixing, Transporting and Placing Concrete
ACI 305	Hot Weather Concreting
ACI 306	Cold Weather Concreting
ACI 308	Guide to Curing Concrete
ACI 309	Guide for Consolidation of Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 315R	Manual of Engineering and Placing Drawings for Reinforced Concrete Structures
ACI 318	Building Code Requirements for Structural Concrete
ACI 347	Recommended Practice for Concrete Formwork
ACI 350	Code Requirements for Environmental Engineering Concrete Structures

B. American Society for Testing and Materials (ASTM)

ASTM A185	Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A497	Steel Welded Wire Reinforcement, Deformed, for Concrete
ASTM A615	Deformed and Plain Billet Steel Bars for Concrete Reinforcement
ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C33	Concrete Aggregates
ASTM C39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C88	Soundness of Aggregates
ASTM C94	Ready-Mixed Concrete
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Portland Cement
ASTM C172	Sampling Freshly Mixed concrete
ASTM C231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Air-Entraining Admixtures for Concrete
ASTM C309	Liquid Membrane Forming Compounds for Curing Concrete
ASTM C494	Chemical Admixtures for Concrete
ASTM C595	Specification for Blended Hydraulic Cements
ASTM C618	Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

1.04. SUBMITTALS

- A. Submit Concrete Mix Designs - Concrete mixes used on this project shall be either established mixes verified by "Field Test Data" or new custom laboratory designed "Trial Mixtures." Requirements for either option are as follows.

All data shall be dated within the last 12 months. Partial submittal will not be reviewed.

1. List amount and sources of mix ingredients:
 - a. Cement.
 - b. Pozzolans (fly ash and slag).
 - c. Fine aggregate.
 - d. Coarse aggregate.
 - e. Water.
 - f. Admixtures (including fibers).
 2. Strength Test Reports - The average strengths shall be higher than the required average compressive strengths (f'_{cr}) as per ACI 301, paragraph 4.2.3.3.
 3. Typed letter signed by an official from concrete supplier stating that all ingredients for proposed mix(es) are identical and from the same source as ingredients used for concrete in provided strength test reports.
 4. Certified tests of fine and coarse aggregates meeting requirements in Part 2 of this specification.
 5. Certified statement from source of fine and coarse aggregates pertaining to history of alkali-aggregate reactivity (ASR) or State DOT confirmation that ASR issues are not evident at the aggregate source.
 6. Certified mill test of cement and fly ash or slag.
 7. Certified test for amount of water-soluble chloride ion (CL-) in concrete.
 8. One-page admixture catalog cuts.
- B. Submit one-page catalog cut for bonding agent.
- C. Submit one-page catalog cut for retarding admixture.
- D. Submit one-page catalog cut for surface-applied hot weather evaporation reducer.
- E. Submit a written statement regarding Contractor's anticipated curing procedures.
- F. Reinforcing Steel - Submit shop drawings in accordance with ACI 301, ACI 315 and ACI 315R, as modified below.

1. Drawings shall be clearly drawn and show enough details to locate every bar without the need to refer to the Contract Drawings. All construction and control joints must be shown. Photocopies of Contract Drawings, in whole or in part, will not be acceptable.
 2. No fabrication shall commence until shop drawings are approved. All bars shall be shop fabricated.
- G. Submit catalog cuts for non-shrink grout.
- H. Submit catalog cuts for chemical adhesive system used to install dowels and threaded anchor bolts (rods) into hardened concrete and masonry.
- I. Submit catalog cuts for joint filler and sealant.
- J. Submit catalog cut for slab sealer.
- K. Submit catalog cuts for waterstops and waterstop accessories, clearly indicating which item(s) are to be used.
- L. Submit catalog cut for curing compound with fugitive dye specifically indicated.
- M. If concrete repairs are needed, the Contractor shall submit proposed repair products and procedures specified in Part 3 of this specification.
- N. Submit special requests for embedment of conduit, etc. Reference restrictions in Part 3 of this specification.
- O. After material sources have been established and approved, these sources shall not be changed for the duration of the project.

1.05. COORDINATION

- A. Coordinate all concrete placements with work (general, civil, architectural, structural, mechanical, electrical, plumbing, HVAC, etc.) indicated in all specifications and on all Contract Drawings.
- B. Coordinate the installation of all cast-in (embedded) items (i.e., grating frames, anchor rods, etc.) prior to start of concrete placement. Post-installation of cast-in (embedded) items will not be allowed.
- C. Contractor shall receive approval on anticipated curing and protection procedures prior to placement of all concrete.
- D. Coordinate all concrete placements with testing and inspection requirements specified herein.

1.06. QUALITY ASSURANCE

- A. The concrete batch plant providing concrete to this project shall be certified by the NYSDOT.
- B. Bar Identification and Mill Test Reports - All reinforcing bars shall have the manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type, and grade.
- C. Concrete testing shall be performed prior to and during placement.

PART 2 PRODUCTS

2.01. FORMWORK

- A. Form materials shall be new wood, new plywood, or steel. Worn, used forms will not be allowed on exposed work.
- B. Chamfer forming strips for exposed edges of concrete.
 - 1. Exposed edges and outside corners of concrete shall be formed with 3/4-inch by 3/4-inch chamfer forming strips.
 - 2. Downstream side of weir plates shall be formed with 3-inch by 3-inch chamfer forming strips.
- C. Forms shall be coated with a release agent which will not stain concrete or absorb moisture.
- D. Form Ties
 - 1. Form ties shall leave no metal closer than 1-inch to the surface of the finished concrete. The ends of the form ties shall create cone-shaped tie holes for sealing with plug mortar.
 - 2. Ties used for watertight (containment) structures shall consist of a waterstop.

2.02. REINFORCING STEEL

- A. Deformed Reinforcing Bars - ASTM A615, Grade 60.
- B. Threaded rebar splicing system shall be a fabricated assembly with a mechanical splice capable of developing 125 percent of the specified yield strength (75 ksi for Grade 60 bars).

Use Barsplice Products, Inc. "BPI Barsplicer System," ERICO "Lenton Form Saver," Dayton Superior "Threaded Splicing Systems," or equal.
- C. Welded Wire Reinforcement (WWR)- ASTM A185 for plain wire or A497 for deformed wire, supplied in flat sheets only.
- D. Bar Supports and Bolsters
 - 1. Bar supports and bolsters shall be a non bleeding and non staining material where concrete surfaces remain exposed. Plastic, plastic tipped, or stainless steel bar supports shall be used for this purpose.
 - 2. Bar supports bearing on grade, insulation, or fill material shall be continuous runner type supplied with continuous welded on plates, or minimum 4000 psi precast concrete blocks specifically cast for this intended use to assure proper support of reinforcement. Individual high chair supports will not be considered adequate.

The use of pavers, brick, or concrete masonry units (CMU) to support reinforcement shall not be permitted.

2.03. CONCRETE

A. Concrete Classes and Their Use

1. Mix A - All general uses (including liquid containment structures not otherwise specified or provided for below]
2. Mix C - Concrete fill/topping and pipe supports and encasements

Mix	28-Day Compressive Strength (psi)	Coarse Aggregate Size per ASTM C33	Minimum Total Cementitious Content (lbs/CY)	Maximum Water/Cement Ratio (w/c) ⁽¹⁾	Air Content % ⁽²⁾	Maximum Water-Soluble Chloride Ion (CL ⁻)
A	5,000	#57	600	0.40	6.0	0.15
C	4,000	#7	550	0.44	7.0	0.30

- (1) These maximum water/cement ratios shall be considered for selection of supplier's mix designs. The water/cement ratio specified in the approved mix designs shall be the maximum used in production.
- (2) Tolerance for air content is $\pm 1-1/2$ percent.

B. All concrete shall be air-entrained as specified in the above chart.

C. Concrete Slump

1. Without plasticizers, concrete slump for flatwork shall not exceed 3 inches. Wall concrete and other vertical placements (without plasticizers) shall be placed with a maximum slump of 4 inches.
2. Concrete with superplasticizer shall be designed for a target slump of 6 inches. Mixed concrete with a slump greater than 7 inches shall not be placed on this project.

2.04. MATERIALS

A. Cement shall be Portland cement Type I or Type II and shall conform to ASTM C150.

B. Pozzolans

1. Fly ash shall meet the requirements of ASTM C618 Class F, except as modified below:
 - a. Loss of Ignition, Maximum - 5.0 percent.
 - b. Maximum Retained on #325 Sieve - 30 percent.

A blend of Portland cement and fly ash shall be between 15 to 25 percent of total cementitious content.

2. Blastfurnace slag shall meet the requirements of ASTM C989 and be specifically manufactured to produce higher concrete strengths and provide greater resistance to chloride penetration and sulfate attack.

A blend of Portland cement and ground iron blastfurnace slag shall contain no more than 50 percent slag. The resulting blend of cementitious material shall meet the requirements of ASTM C595.

C. Aggregates

1. Fine Aggregate (Sand)
 - a. Natural or manufactured siliceous sand.
 - b. Quantity of deleterious substances as approved by State DOT or as limited by Table 1 of ASTM C33.
 - c. Graded within the specified limits of ASTM C33.
2. Coarse Aggregate
 - a. Crushed stone or crushed gravel.
 - b. Quantity of deleterious substances as approved by State DOT or as limited by Table 3 of ASTM C33 for Class 4S aggregates.
 - c. Graded within the specified limits of ASTM C33.
3. Five cycle soundness tests for fine and coarse aggregates shall meet the requirements of ASTM C33.

PERCENT LOSS

	MAGNESIUM SULFATE	SODIUM SULFATE
Fine aggregate ⁽¹⁾	15	10
Coarse aggregate ⁽²⁾	18	12

- (1) If provided results of soundness tests exceed these limits, it would be acceptable to provide a certified letter attesting to the favorable performance of the fine aggregates as outlined in ASTM C33, Article 8.
- (2) Soundness tests for coarse aggregates do not need to be provided if they are approved by State DOT for use with concrete. Submit verification of such.

4. Source of fine and coarse aggregates shall not have a history pertaining to alkali-aggregate reactivity. In the event that aggregate source with potential alkali-aggregate reactivity is unavoidable, at least two of the following measures shall be taken to minimize this reaction:
 - a. Provide low alkali cement (<0.60 percent alkalies).
 - b. Use lithium-based additives.
 - c. Test aggregates to show non-reactive.
 - d. Use fly ash (minimum 20 percent content) or slag (minimum 30 percent content).

D. Mixing Water - Clear and potable.

- E. Acceleration admixtures are only allowed to shorten cold weather protection periods.

2.05. ADMIXTURES

- A. General - Admixtures other than those specified may only be used after written approval by the Engineer.
- B. Admixtures shall be as manufactured by BASF Chemical Company; Sika Corporation; Euclid Chemical Company; W.R. Grace, Inc.; or equal.
- C. Air Entrainment Admixture - All concrete shall contain an air entrainment admixture meeting the requirements of ASTM C260.
- D. Water Reducing Admixture - All concrete shall contain a water reducing admixture that meets the requirements of ASTM C494 Type A (water reducing) or Type F (superplasticizer). This admixture shall not contain chlorides.
- E. Retarding Admixture - If air temperatures are expected to exceed 85 degrees F during the placement and/or finishing of any flatwork, a retarding admixture shall be used that meets the requirements of ASTM C494 Type D.
- F. Evaporation Reducer - For all concrete flatwork during hot and/or windy weather conditions, apply to freshly placed concrete prior to finishing. Use BASF Chemical Company "Confilm," L&M Construction Chemicals "E-Con," Conspec (by Dayton Superior) "Aquafilm," or equal.
- G. Acceleration admixture shall meet the requirements of ASTM C494, Type C, and shall not contain calcium chloride. Acceleration admixture is only allowed for placing concrete during cold weather conditions.

2.06. OTHER PRODUCTS

- A. Bonding Agent - When placing freshly-mixed concrete against existing hardened concrete, use a corrosion inhibiting, non-vapor barrier, extended open time bonding compound.

Use Sika Corporation "Armotec 110 EpoCem," Euclid Chemical Company "Duralprep A.C.," BASF Chemical Company "Emaco P24," or equal.
- B. Liquid curing compound shall only be used during cold weather conditions. When allowed, use a dissipating, VOC-compliant, water-based membrane forming with fugitive dye, conforming to ASTM C309, Type 1-D. Curing compound shall be applied at twice the manufacturer's recommended application rate.

Use Euclid Chemical Company "Tammsecure WB 30D," SYMONS Corporation "Resi-Chem Clear Cure 1D," W.R. Meadows, Inc. "1100-Clear" (with optional fugitive dye), or equal.
- C. Slab sealer shall be Sika Corporation "Sikagard 701W," Euclid Chemical Company "Euco-Gard 100," BASF Chemical Company "Enviroseal 20," or equal.
- D. Waterstop material shall be PVC 6-inch x 3/8-inch ribbed center bulb waterstop No. CR-6380 by Wirestop of Paul Murphy Plastics Company; No. RB6-38 by Vinylex; No. 705 by Greenstreak; or equal.
- E. Where shown on the Drawings and where new concrete is cast against hardened concrete:

1. Provide a premolded 1-inch by 3/4 inch hydrophilic self-adhering waterstop strip which expands on contact with water, applied with primer adhesive. The bentonite waterstop material shall meet the requirements of ASTM D217. Waterstop and adhesive shall be "Waterstop-RX" and "CetSeal" by CETCO Building Materials Group; "Swellstop" and "Swellstop Primer" by Greenstreak; "Superstop" and "Paraprimer" by Tremco; or equal.
 2. Use a bolt-on (retrofit), L-shaped PVC waterstop with a nominal 3-inch stem set in epoxy adhesive applied on existing concrete and fastened down with stainless steel fasteners through stainless steel batten strips. Provide Item #581 by Greenstreak, Item KK611 by Vinylex, or equal.
- F. Joint filler material shall be preformed, closed cell, high grade polyethylene or non-extruding PVC, such as "Expansion Joint Filler" by BASF Chemical Company; "Plastic Expansion Board" by Westec Barrier Technologies; "Deck-O-Foam" by W.R. Meadows, Inc.; or equal.
1. Joint fillers shall be held back for sealants.
 2. The joint filler shall be compatible as a back-up material, with regard to the sealant not bonding to or being stained by the backup.
- G. Sealant for joints in concrete structures shall be a two-component polyurethane material designed for submerged conditions.
- Use Sika Corporation "Sikaflex-2c," Euclid Chemical Company "Eucolastic II," BASF Chemical Company "Sonolastic NP 2," or equal.
- H. Non-Shrink Grout - Shall be a fluid or flowable non gas liberating cement base product which is manufactured premixed, requiring only the addition of water at the job site. All components shall be inorganic.
- Non-shrink grout (mixed as a plastic state) shall have a minimum compressive strength of 5000 psi in 7 days and 7000 psi in 28 days.
- I. Chemical adhesive anchor system to install threaded anchor bolts (rods) and dowels into concrete or masonry shall be a high-strength, premeasured, two part, self mixing, cartridge-type epoxy adhesive, such as "HIT RE 500" by Hilti; "Epcon G5" by ITW Red Head; "ET Epoxy-Tie" by Simpson Strong-Tie Company, Inc.; or equal.
1. All framing connections for steel or aluminum members into concrete shall be a minimum of two bolts. Bolts into concrete and masonry shall not be closer than 6 inches on center, unless indicated otherwise.
 2. Grout fill masonry cores to accept adhesive anchors. Where otherwise indicated or allowed by the Engineer, manufacturer's masonry screen tube shall be used to install anchors into hollow (ungrouted) masonry.

PART 3 EXECUTION

3.01. FORMS

- A. Earth cut forms shall not be used; all footings, base slabs, etc., shall be formed.

- B. Contractor is responsible for design and bracing of all forms for strength, integrity, and to produce the desired tolerances and finishes.

3.02. TOLERANCES FOR FORMED SURFACES

- A. Tolerances apply to concrete dimensions only, not to positioning of reinforcing steel or cast-in (embedded) items.

1. Variation from plumb:	
a. In the lines and surfaces of walls and other vertical members:	1/4 inch
b. For exposed corners of walls, construction/control joint grooves, and other conspicuous vertical lines:	1/4 inch
2. Variation from level or from grades specified:	
a. Along tops of walls, slab edges, and other conspicuous horizontal lines:	1/4 inch
3. Variation of the linear lines of structures from position in plan and related position of walls:	1/2 inch
4. Variation in the sizes and location of sleeves, floor openings, and wall openings:	+1/4 inch
5. Variation in thickness of slabs and walls:	-1/4 inch +1/2 inch

3.03. CONCRETE COVER

- A. Clear concrete cover not indicated on Contract Drawings shall conform to ACI 318 and ACI 350, as applicable. However, in no case shall the clear cover be less than 1 1/2 inches.
- B. Contrary to the practice permitted by CRSI, the use of brick or CMU block supports for reinforcement shall not be permitted. Only special made wire or plastic bar supports or special cast, precast concrete blocks shall be allowed.
- C. All metal and plastic bar supports bearing on grade shall have continuous runners to prevent settlement during construction activities.

3.04. CLEANING

- A. Prior to concrete deposition, reinforcing steel shall be free from mortar, mud, loose mill and rust scale, grease, oil or any other coatings, including ice, that would destroy or reduce bond with the concrete.

3.05. PREPARATION, MIXING, AND HANDLING OF CONCRETE

- A. Batch Plant Requirements - Measurement of materials at the batch plant shall be in accordance with ASTM C94.
- B. Mixing Methods - All concrete shall be ready mixed to meet the requirements of ASTM C94.

A written delivery slip or ticket, prepared and signed by the plant operator shall be made out at the proportioning plant for each truck load batch. Each slip shall show the following information:

1. Truck number.
2. Date and time truck is batched.
3. Ticket number.

4. Mix designation of concrete (per paragraph 2.03.A).
5. Cubic yards of concrete.
6. Cement brand, type and weight in pounds.
7. Weight in pounds of each size and type of aggregate.
8. Admixtures, brand and weight in pounds and ounces.
9. Moisture content of fine and coarse aggregates.
10. Water added to the batch at the plant.
11. Water added to the batch during transport.
12. Water added to the batch at the job site.

The driver shall record the number of gallons of water added during transport and at the job site. In no case shall the w/c ratio be exceeded.

Any truck delivering concrete to the job site without a delivery slip will be rejected and shall immediately depart from the job site.

- C. Heating and Cooling of Materials - The batch plant shall be equipped to heat aggregates and water, or cool water with ice, and cool aggregates by shading and/or spraying with cool water to obtain acceptable concrete delivery temperatures in the range of 55 to 85 degrees F. Aggregates shall not contain ice or have frozen lumps nor shall they be heated to a temperature over 120 degrees F.

3.06. EMBEDMENTS IN CONCRETE

- A. Install and secure all cast-in components in accordance with manufacturer's recommendations, prior to concrete placement.
- B. Embed no pipes other than electrical conduit in structural concrete.

Obtain approval from Engineer for any variation from the following requirements unless shown on the Contract Drawings. Make request in writing accompanied by suitable sketch.

1. Do not cut or displace any reinforcement.
2. Do not place conduit between concrete surfaces and reinforcement.
3. Restrict O.D. of conduit to 1/4 of slab thickness. Keep within middle half of that thickness.
4. Place parallel conduits apart at least six times O.D. of conduit being used.
5. Conduits that cross must be bent such that they cross between 45 and 90 degrees from each other.
6. Conduits that cross can touch each other, but no more than three conduits can cross at any given location.

3.07. CONCRETE PLACEMENT

- A. The Contractor shall notify the Engineer a minimum of 48 hours in advance of placement to allow sufficient time for inspection and for any corrective measures which are subsequently required.
- B. Concrete shall be placed in accordance with ACI 304 and ACI 318.
- C. Concrete shall be placed and vibrated in lifts not exceeding 30 inches.
- D. Curing and protection of the concrete shall begin immediately after completion of the finishing operation.
- E. Adjacent concrete placements (sections) shall not be placed any sooner than three days since newly cast sections.

3.08. FORM REMOVAL

- A. The Contractor shall assume full responsibility for the strength of all components from which forms are removed.
- B. Forms and supports shall remain undisturbed until the concrete has attained sufficient strength to support its own weight in addition to any anticipated loads (temporary or permanent) that may be placed upon it during subsequent work. In no event shall forms be loosened or removed prior to 24 hours' wet cure time. Re shore at midspan where necessary.
- C. Vertical forms such as wall forms may be removed at any time after 24 hours, provided that stripping does not damage surfaces and such action does not endanger any part of the structure. Coordinate timing of form removal with rub finish requirements.
- D. Residue of the form release agent shall be completely cleaned off the concrete surface.

3.09. FINISHING

- A. The finish of all walls and slabs (vertical and horizontal surfaces, respectively) shall be as described below and in accordance with the schedules at the end of this Article.
- B. As-Cast (Vertical) Wall Finishes
 - 1. Type I - Rough Form Finish - Tie holes and defects shall be filled with patching mortar. Fins exceeding 1/4 inch in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imprinted by the forms.
 - 2. Type II - Smooth Form Finish -The form facing material shall produce a smooth, hard, uniform texture on the concrete.

Tie holes and defects (including bugholes) shall be patched with a grout rubbing mixture as defined below for Type IV finish. All fins shall be completely removed.
- C. Rubbed Wall Finishes - The following finishes shall be produced on concrete with a Type II smooth form finish. Where a rubbed finish is to be applied, the forms shall have been removed and necessary patching completed.
 - 1. Type III - New Concrete, Smooth Rubbed Finish - New concrete is defined here as concrete less than seven days old.

- a. The finishing shall be applied no later than the day following form removal (green concrete maximum seven days old). Surfaces shall be wetted and rubbed with a carborundum brick until uniform color and texture are produced.
 - b. No cement grout shall be used other than the cement paste drawn from the concrete itself by the rubbing process. Delayed application of Type III finish will not be accepted. A Type IV finish will be required.
2. Type IV - Old Concrete, Grout-Cleaned Rubbed Finish - Old concrete is defined here as concrete over seven days old that cannot be "green rubbed."
- a. The walls shall have previously received a Type II finish. This finish will not hide projections caused by form slippage and alignment problems.
 - b. A grout rubbing mixture shall be 1 part Portland cement and 1 1/2 parts fine sand mixed to a stiff masonry mortar consistency.

The sand and the Portland cement shall be obtained from the concrete plant where the concrete was purchased and shall be the same as used in the concrete.
 - c. The surface shall be soaked with water. The surface being worked on shall not be in direct sunlight while finishing. Curing in direct sunlight is acceptable.
 - d. Immediately after soaking, apply the grout rubbing mixture with a rubber or cork float. The material is spread to form a paste over the area being worked on.

The applicator shall always work to a wet edge.

If the area starts to visually lighten up or dry, water can be added by shaking a wetted brush onto the surface.

The coated area shall be permitted to set similar to waiting for a concrete floor to set.
 - e. The applicator shall use a carborundum brick to vigorously work the material in a circular motion to a smooth rubbed finish. It is not intended to leave a thin grout coating, or a "swirl" or "fan" pattern in the surface.
 - f. Should the mixture start to dry out or get too stiff to work, the applicator may re wet the wall with either a pump or brush.
 - g. When the area is complete, it will be smooth and dark to medium grey in color. The smooth surface will be equal to a medium grade of sand paper with no evidence of patterns or individual rubbing strokes. No globs of excess material shall remain.
 - h. Spray surface with liquid curing compound.
 - i. When viewed from a distance about 10 to 20 feet, the concrete will appear to be a uniform grey, creamy smooth surface.

D. Slab Finishes - The finish of all slabs and horizontal surfaces shall be described below:

1. Type A - Floated Finish - After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Preferably a magnesium float will be used.

Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, planeness of surface shall be checked with a 10 foot straightedge.

If water has been brought to the surface by the rough floating operation, additional floating shall not proceed until this water has evaporated.

The slab is further floated, with all high spots cut down and all low spots filled during this procedure. The slab shall be finish floated to a uniform sandy texture.

2. Type B - Troweled Finish - The surface shall first receive a Type A floated finish. It shall then be power troweled and finally hand troweled for thorough consolidation. Additional trowelings shall be done by hand after the surface has hardened sufficiently. The final troweling shall produce a ringing sound as the trowel is moved over the surface.

The finished surface shall be essentially free of trowel marks, uniform in texture and appearance.

Apply only a light troweled finish on tank base slabs.

3. Type C - Broom Finish - First, finish the concrete with a Type A floated finish. The concrete shall be given a transverse scored texture by drawing a coarse broom across the surface, perpendicular to the line of travel along the walking surface.
4. Type D - Concrete Floor Sealer - All concrete surfaces identified in the Finish Schedule, not scheduled to receive other coatings or coverings, shall be sealed as follows:
 - a. Prior to applying floor sealer, thoroughly clean the concrete surface to remove all dirt, oil, grease, and other foreign matter with caustics and detergents.
 - b. Thoroughly rinse and apply two coats of sealer in accordance with manufacturer's recommendations. The first coating shall be applied as soon as possible after finishing and curing. The second coating shall be applied near project completion after installation of all equipment and piping and after completion of other related construction activities.

E. Finish Schedules

TABLE 03001 1 WALL (VERTICAL) FINISHES

Type I	Rough Form Finish - All concrete not exposed to view or not in contact with liquid, including below-grade walls.
Type II	Smooth Form Finish - The interior of all liquid containment structures.
Type III ⁽¹⁾	Smooth-Rubbed Finish - Exterior exposed-to-view concrete wall areas. This finish shall be carried to a minimum of 6 inches below finished grade.

(1) Unacceptable Type III finish areas shall be refinished with a Type IV grout-cleaned rubbed finish.

TABLE 03001 2 - SLAB (HORIZONTAL) FINISHES

Type A	Floated Finish - At tops of walls and footings and for surfaces to receive a Type C broom finish.
Type B	Troweled Finish - For all horizontal surfaces (including slabs and concrete toppings) not indicated to receive other finish. Apply a light troweled finish for tankage base slabs and concrete toppings.
Type C	Broom Finish - For sidewalks, exterior slabs, and other exterior walking surfaces.
Type D	Concrete Floor Sealer - For exposed surfaces of view slabs, sidewalks, etc.

3.10. CONCRETE EQUIPMENT PADS

- A. If sizes are not shown on the Drawings, provide concrete pads 6 inches wider than the approved equipment in all directions.
- B. Prior to placing concrete for equipment pads, apply a bonding agent.
- C. The sides and top of the equipment pad shall be finished similar to a Type III or Type IV rubbed wall finish and Type B troweled finish, respectively.

3.11. CURING AND PROTECTION

- A. All freshly placed concrete shall be protected from adverse weather elements, and from defacement. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provision shall be made for providing sufficient water for hydration and preventing loss of moisture from the concrete for at least a seven day period.
- B. For the first 24 hours after concrete finishing, no work shall commence nor shall any material be placed on newly cast concrete. The exposed concrete surfaces shall be protected from any potential damage with plywood or other means for the remaining six days of the curing period.
- C. Interruptions, not to exceed a total of four hours are permitted for the purpose of layout or other required construction needs as long as the surface is not allowed to completely dry. Be prepared to spray the exposed surface every 15 to 30 minutes.
- D. Walls and Other Vertical Members
 - 1. Immediately after the concrete surface has hardened enough to prevent dilution of the cement paste, provide continuous moisture for at least the first 24 hours. The forms shall be intermittently re-moistened and the concrete shall remain tightly formed and covered thereafter for a total curing period of at least seven days.
 - 2. If wall (vertical) forms are left in place for the entire seven-day cure, the forms can be loosened only after 24 hours to allow water to soak the sides of the concrete. If forms are loosened, continuous moisture shall be provided for the entire seven-day curing period.

3. If forms are removed in less than seven days, the vertical surfaces shall be sprayed with water and tightly sealed with polyethylene or burlap combined with continuous water spray for the remainder of the seven-day period.
 4. If patching and finishing is done after the seven-day curing is completed, the walls shall be further cured by immediately spraying the entire wall surface with a heavy coating of liquid curing compound.
- E. Slabs and Other Flatwork
1. After finishing and immediately after the concrete surface has hardened enough to prevent dilution of the cement paste, spray the surface with water to provide continuous moist curing for at least the first 24 hours.
 2. After the initial 24-hour period, soak with water and cover for an additional six days with white polyethylene blankets. Wet burlap coverings may be used if the burlap is kept wet by continuous sprinkling with water. Lap the cover material at least 12 inches, covering the top and sides of the concrete.
 3. If cover material is not used, the concrete surfaces shall be kept continuously wet by spraying or other approved methods.
- F. During hot weather conditions (defined in ACI 305), provide curing procedures as outlined above along with additional provisions required by ACI 305.
- G. During cold weather conditions (defined in ACI 306) where heated enclosures are provided or when continuous moist curing of walls and slabs is not practical, use liquid membrane forming curing compounds with fugitive dye, applied at twice the manufacturer's standard rate of application.

3.12. LEAKAGE TESTING

- A. Watertight Structures - All liquid containment structures shall be watertight and not allow any leakage into or out of the structure. The Contractor shall repair leaks which appear during construction of the project or within the project guarantee period.
- B. Successful leak testing shall be completed before any surface treatment (including sealers and other finishes) is applied to the concrete, and prior to backfilling. No testing shall be conducted when the following day is not a normal work day.
- C. Leak Test - After liquid containment concrete structures have been completed and have gained sufficient structural strength, and before any backfilling takes place and fill or toppings are cast in, they shall be tested by filling with water to within 2 inches below the top of wall.

The rate of filling shall be such as to require at least 24 hours. Should leakage become evident at any point, the structure shall be emptied and the leaks repaired by an approved method.

This test procedure shall commence after a minimum 48 hour saturation period and shall be repeated until no leaks are observed and until the observed water level does not lower by more than 1/4-inch within a 96-hour (4-day) period.

The Contractor shall furnish all water, labor and other materials, and shall perform the above described tests.

Note - The above testing shall not be started until all related structural elements are in place and have gained full strength.

3.13. TESTING FOR QUALITY ASSURANCE

- A. The Owner shall hire and pay for the services of an independent testing laboratory to perform the testing for quality assurance.
- B. This testing shall consist of calculation of w/c ratio; measuring slump; air content; and tests for the compressive strength. Four 6-inch diameter cylinders shall be made with 1 cylinder to be tested at 7 days, 2 cylinders to be tested at 28 days, and 1 cylinder to be tested at 56 days if the 28-day strengths are inadequate. These test results will be used by the Contractor to assist his control of quality.
- C. The Contractor shall schedule and provide 48 hours' notice to the independent testing laboratory. The Contractor shall provide free access to work and cooperate with the testing laboratory.
- D. In general, testing shall be required for each concrete placement.
- E. Copies of all test reports shall be mailed directly to the Owner, Engineer, and concrete supplier by the testing laboratory as soon as they become available.
- F. The Contractor shall accept all test results reported by the testing laboratory. Any disputed results shall be validated by an independent testing laboratory hired by the Contractor at their expense.

3.14. REPAIR OF NEWLY CAST CONCRETE

- A. Areas of concrete in which cracking, spalling, or other signs of deterioration develop during initial curing or thereafter until the end of the guarantee period shall be removed and replaced, or repaired in accordance with this Article.

Existing concrete components and surfaces that have become damaged during construction operations shall be repaired in accordance with this Article.

The Contractor may propose to use a specific method most suitable to the situation and have the method approved by the Engineer prior to repair. The Contractor shall submit manufacturer's product data sheets and recommended application procedures to the Engineer for approval prior to performing repairs.

- B. Structural Cracks (as determined by Engineer) - Random shrinkage or structural cracks shall be repaired utilizing a low viscosity, 100 percent solids, two-component epoxy resin system.

Crack or void must be dry at time of application. Remove all dust, debris or disintegrated material from crack or void by use of oil-free compressed air or vacuuming or by other approved methods as may be required by manufacturer. After successful crack repair, remove temporary seal and excess adhesive. Clean surfaces adjacent to repair and blend finish.

Surface preparation, mixing, and application shall be in conformance with manufacturer's recommendations.

- C. Leaking and/or Active Cracks (that are not structural cracks) - Leaking and active cracks shall be repaired utilizing a low viscosity, hydrophobic, closed cell polyurethane foam injection system.

Inject water into the crack to thoroughly flush out the crack and remove dirt, dust, and contaminants. Follow flush water by injecting urethane foam with accelerating catalyst as required. After successful crack repair, continue wall preparation by removing injection ports and grind to remove excess injection material and surface seal. Patch port holes and blend wall finish with surrounding area.

Surface preparation, mixing, and application shall be in conformance with manufacturer's recommendations.

- D. Excessive surface cracking in concrete slabs as defined herein shall receive a penetrating epoxy resin sealer to seal the cracks.

Excessive cracking shall be defined as areas containing "craze cracking" or "map cracking" as defined by ACI 201.1. In the event that excessive cracking occurs in isolated areas of a given concrete slab, sealer could only be required in the area of the cracks bounded by construction or control joints pending Engineer approval.

Surface preparations, priming, mixing, application and finishing shall be in accordance with the manufacturer's recommendations.

Epoxy resin penetrating sealer shall be "Sikadur 55 SLV" by Sika Corporation, or equal. Contractor shall submit a suitable remedial product and installation procedures to the Engineer for approval.

- E. All spalled, weakened, damaged or disintegrated concrete and areas of honeycomb shall be removed to sound concrete and repaired in accordance with this Article.

For spalled or honeycombing areas involving depths generally less than 3 inches, utilize a polymer-modified cementitious repair mortar, such as Sika Corporation "Sikatop 122 or 123," Euclid Chemical Company "Verticoat," BASF Construction Chemicals "HB2 Repair Mortar," or equal.

Surface preparation, mixing, priming and application shall be in conformance with manufacturer's recommendations.

3.15. REPAIR AT SAW CUTS TO CONCRETE

- A. After saw cutting concrete, repair exposed rebar as follows:
1. Chip back concrete around rebar end with maximum 20-lb. chipping hammer.
 2. Cut off exposed rebar minimum 1-1/2 inches past concrete surface.
 3. Coat area with bonding agent and patch hole with repair mortar.

END OF SECTION

SECTION 03481

PRECAST CONCRETE WET WELLS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Design and manufacture of reinforced precast concrete wet well structures.
- B. Quality assurance and control.
- C. Field installation of precast concrete structures.
- D. Interior coating (epoxy lining) of wet wells.
- E. Supply and installation of miscellaneous accessories.
- F. Schedule of Precast Structures.

1.02. RELATED SECTIONS

- A. Section 02222 – EXCAVATING
- B. Section 02223 – BACKFILLING
- C. Section 05500 - MISCELLANEOUS FABRICATIONS

1.03. REFERENCES

- A. American Concrete Institute
 - 1. ACI 301 - Specifications for Structural Concrete
 - 2. ACI 315 - Details and Detailing of Concrete Reinforcement
 - 3. ACI 315R - Manual of Engineering and Placing Drawings for Reinforced Concrete Structures
 - 4. ACI 318 - Building Code Requirements for Structural Concrete
 - 5. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures
- B. American Society for Testing and Materials
 - 1. ASTM A185 - Steel Welded Wire Reinforcement, Plain, for Concrete
 - 2. ASTM C478 - Precast Reinforced Concrete Manhole Sections
 - 3. ASTM A497 - Steel Welded Wire Reinforcement, Deformed, for Concrete
 - 4. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement

5. ASTM C890 - Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
 6. ASTM C891 - Installation of Underground Precast Concrete Utility Structures
 7. ASTM C913 - Precast Concrete Water and Wastewater Structures
- C. Concrete Reinforcing Steel Institute
1. CRSI 63 - Recommended Practice for Placing Reinforcing Bars
- D. Certifications
1. NPCA - National Precast Concrete Association
 2. PCI Precast/Prestressed Concrete Institute

1.04. DESIGN

- A. All precast structures shall be designed by a licensed Professional Engineer registered in the State of New York and engaged by the precast manufacturer.
- B. The calculations and drawings shall be prepared by the licensed Professional Engineer in a neat and legible manner. The prepared calculations shall include a design summary page to list all design loads, most current design standards, material specifications, and design criterion used in the calculations. This summary page shall be sealed by the licensed Professional Engineer.
- C. All wet wells shall be designed for the design loadings specified in ASTM C890. These loadings shall include all dead loads, live loads, hydrostatic loads, lateral earth loads, surcharge loads, bearing loads, and erection (lifting loads). In addition to these typical loads, the designs shall include:
1. Groundwater assumed at grade and a flotation check with a 10 percent factor of safety.
 2. Wet wells designed full of water with no counteracting backfill and no top slab in place.
 3. All precast structures shall be designed for H-20 traffic load applied as a surcharge load on the walls.

Refer to the Contract Drawings for precast structure configurations and loading conditions.

1.05. SUBMITTALS

- A. Submit evidence that shows precast supplier has a current PCI, NPCA, and/or NYSDOT certification.
- B. Submit shop drawings of wall section(s) and base proposed for each precast structure. Include joint design detail(s) and other related details for field assembly. Indicate conformance with Contract Documents and ASTM C913 and C478 as applicable.
- C. Submit catalog cut for epoxy lining (coating) system.

- D. Under a separate submittal, provide two file copies of calculations with a sealed design summary page for each precast structure design. (Other than the design summary page, prepared calculations will not be reviewed by the Engineer.) Calculations will not be returned to the Contractor.

1.06. COORDINATION

- A. Contractor shall verify all precast structure penetration sizes, elevations, and locations.
- B. Contractor shall verify elevations of proposed final grades and pipe invert elevations to determine overall height of precast structure.
- C. Contractor shall supply all cast-in accessories to the precast supplier.

1.07. QUALITY ASSURANCE

- A. Manufacturer shall be a PCI-, NPCA-, and/or NYSDOT-certified plant for production of precast structures as specified herein.
- B. Concrete used in producing precast structures shall be from a NYSDOT approved batch plant.

1.08. QUALITY CONTROL INSPECTION

- A. The quality of all materials, the production process of the precast plant, and the finished cast structures shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, and/or on the work site after delivery.
- B. All sections of precast structure shall be inspected for general appearance, dimensions, soundness, etc. The surfaces shall be dense, close-textured and free of honeycomb, cracks, roughness, exposure of reinforcement, damaged joints, or other irregularities.
- C. All precast sections which have been damaged after delivery will be rejected, or if already installed, shall be repaired or removed and replaced entirely at the Contractor's expense.
- D. Rejected precast sections shall be marked as such, segregated from other sections, and removed from the job site.

PART 2 PRODUCTS

2.01. CONCRETE

- A. Minimum 28-Day Compressive Strength - 4500 psi.
- B. All concrete components shall be air entrained for severe exposure in accordance with ACI 301.

2.02. REINFORCEMENT

- A. Deformed Reinforcing Bars - ASTM A615, Grade 60.
- B. Welded Wire Reinforcement (WWR) - ASTM A185 for plain wire and ASTM A497 for deformed wire.

- C. Fiber Reinforcement - ASTM C1116, polypropylene fibers.

2.03. PRECAST CONCRETE BASES

- A. Design and manufacture of precast concrete bases shall conform to the requirements of this section and ASTM C913 and C478 as applicable.
- B. Bases shall conform to the dimensions indicated on the Contract Drawings or as required by design. The horizontal joint at the top of the base shall be compatible with that of the adjoining precast wall section.
- C. Slab extensions (beyond outside face of walls) shall be provided for flotation resistance, regardless of whether or not shown on the Contract Drawings.

2.04. PRECAST CONCRETE WALL SECTIONS

- A. Design and manufacture of precast concrete wall sections shall conform to the requirements of this section and ASTM C913 and C478 as applicable.
- B. Inside dimensions of walls shall conform to the dimensions indicated on the Contract Drawings.
- C. All tongue-and-groove joints in the precast wall sections, including the joint at the top of the base, shall consist of gaskets. Joints may also consist of butyl joint sealant rope material in lieu of a gasket.

The tongue-and-groove joints shall be constructed with a special groove to receive and hold the gasket in position during joint assembly.

2.05. OPENINGS AND INSERTS

- A. All openings required in the concrete shall be reinforced with additional diagonal bars tied to each layer of wall reinforcement.
- B. Any required inserts and wall openings shall be coordinated with mechanical requirements prior to casting the precast sections.

2.06. PIPE SEALS

- A. Where polyethylene, plastic or PVC pipe is utilized, connections between precast openings and pipes shall be made using flexible rubber sleeves with stainless steel straps and bolts. Provide an elastomeric waterstop gasket where sleeve sizes are not commercially available.
- B. For steel or ductile iron pipe, provide a pipe sleeve sized to accept the pipe plus a mechanical link seal. The remaining annular space between the pipe wall and sleeve shall be packed with non-shrink grout. Before the grout has set, the Contractor shall recheck invert elevations of the pipe.

2.07. EPOXY LINING SYSTEM

- A. On the interior walls and floor of the wet well, Contractor shall install a polymer epoxy lining system. This lining system shall also be applied on the underside portion of the slab-on-grade that covers the wet well. The system shall be designed specifically for protection of the concrete surfaces from hydrogen sulfide corrosion. Minimum properties of lining system are as listed:

1. Compressive strength (ASTM C579) - 6800 psi.
 2. Flexural strength (ASTM C580) - 4600 psi.
 3. Modulus of elasticity (ASTM C580) - 5.5×10^5 psi.
 4. Tensile strength (ASTM C307) - 2500 psi.
 5. Bond strength to dry or damp concrete manhole (ASTM C478) - Concrete failure.
 6. Thermal expansion coefficient - 3.8×10^{-5} .
- B. Thickness shall be 60 to 125 mils. Lining shall be Sauereisen SewerGard Rotary Spray No. 210RS or equal. In accordance with manufacturer's recommendations, surface shall be high pressure washed (4,000 to 7,000 psi) and any voids filled in with Sauereisen Filler Compound No. 209 and/or Substrate Resurfacer No. F-121. All work shall be done in accordance with manufacturer's recommendations.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that subgrade elevations are correct, excavation is dewatered, and subgrade is firm and precompacted.
- B. Verify that rejected precast sections have been either clearly marked "REJECTED" or removed from site.

3.02. PREPARATION

- A. Provide foundation layer of compacted fill material as specified on the Contract Drawings to support precast structure base. Foundation layer shall be minimum of 12 inches in depth or as shown on the Contract Drawings, and shall be placed over firm, sound subgrade. Excavate and remove subgrade material as necessary to reach firm, sound subgrade.
- B. Foundation layer shall be a minimum of 1 foot greater than the footprint of the precast structure base, and shall be compacted to a uniform, level surface.

3.03. INSTALLATION

- A. Base of precast structure shall be accurately located and uniformly supported on the compacted foundation layer in a level position.
- B. Precast sections shall be laid-up plumb and level.
- C. Install precast wall section(s) in properly oriented position, following manufacturer's instructions for joining together each section using the gaskets. After joint assembly, the gap between precast sections shall be packed on the inside and outside with non-shrink grout and shall be troweled smooth so that no projections remain on the inside. There shall be concrete to concrete bearing between the various sections. The gasket shall not support the weight of the section after erection.
- D. The Contractor is responsible for the integrity of all materials and protection against flotation during the installation and backfilling process.

3.04. LEAK TESTING OF WET WELLS

- A. Prior to application of epoxy lining system, and prior to backfilling, the wet wells shall be leak tested.
- B. Contractor shall temporarily plug all openings of the precast structure and fill the entire structure with water. The Contractor shall be responsible to obtain the water and dispose of it properly after the leak test is complete.
- C. The leak test is considered complete when all visible leaks are sealed in an approved manner.

3.05. APPLICATION OF EPOXY LINING SYSTEM

- A. The coating system shall be applied on all interior surfaces and shall be seamless throughout the transition of all these surfaces.
- B. After installation of all equipment and accessories, provide touch-up patching of damaged coating system.

3.06. BACKFILLING

- A. Prior to backfilling of wet wells, a successful leak test shall be completed.
- B. Backfill structure, being careful to provide full support under connecting pipes using compacted bedding material.
- C. Backfill operations shall not damage exterior surface of precast structure.
- D. Once backfilling is complete, the structure shall be checked for leaks. All visible leaks shall be sealed in an approved manner.

3.07. SCHEDULE OF PRECAST STRUCTURES

PRECAST STRUCTURE IDENTIFICATION	REFERENCE DRAWING
Walden Woods Pump Station Wet Well	M002 and S004

END OF SECTION

SECTION 05500

MISCELLANEOUS FABRICATIONS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Ferrous and non-ferrous metal and fiberglass components, including miscellaneous framing, structural and miscellaneous shapes, plates, anchor rods, bolts and accessories, etc.
- B. Shop-fabricated items including custom pipe supports, cast iron bar screens, etc.
- C. Manufactured items including floor grating, etc.

1.02. RELATED SECTIONS

- A. Section 03001 - CONCRETE
- B. Section 09900 - PAINTING
- C. Section 15140 - SUPPORTS AND ANCHORS
- D. Section 16191 - ELECTRICAL SUPPORT, ANCHORS AND FASTENERS

1.03. REFERENCES

AAMA	American Architectural Manufacturers Association
ASTM A6	General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A36	Specification for Carbon Structural Steel
ASTM A48	Gray Iron Coatings
ASTM A53	Specification for Pipe, Steel, Black and Hot-Dipped
ASTM A123	Zinc (Hot-Dip Galvanized) Coatings on Steel Products
ASTM A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A276	Specification for Stainless Steel Bars and Shapes
ASTM A307	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A325	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A489	Carbon Steel Lifting Eyes
ASTM A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A536	Ductile Iron Castings
ASTM A572	High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A992	Specification for Structural Steel Shapes
ASTM B209	Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B221	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B241	Aluminum-Alloy 6063 Seamless Pipe and Extruded Tube
ASTM B308	Aluminum-Alloy 6061-T6 Standard Structural Profiles
ASTM B632	Aluminum-Alloy Rolled Tread Plate
ASTM D4385	Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products
ASTM E84	Class 7, Fire Retardant Fiberglass Materials
ASTM F593	Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F1554	Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength
ASTM F2329	Zinc Coating, Hot-Dip, Requirements for Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
AWS A2.4	Standard Symbols for Welding, Brazing, and Nondestructive Examination
AWS D1.1	Structural Welding Code - Steel
AWS D1.2	Structural Welding Code - Aluminum
AWS D1.3	Structural Welding Code - Sheet Steel
AWS D1.6	Structural Welding Code - Stainless Steel
NAAMM MBG 531	Metal Bar Grating Manual
NAAMM MBG 533	Welding Specifications for Fabrication of Steel, Aluminum, and Stainless Steel Bar Grating
SSPC	The Society for Protective Coatings

1.04. SUBMITTALS

A. Shop Drawings

1. Include detailed fabrication drawings with Bill of Materials and finishes, erection drawings, and applicable details such that the Contractor does not need to reference the Contract Drawings.
2. Indicate profiles, sizes, connections, attachments, reinforcing, anchorage, size and type of welds, holes, fasteners, and accessories.
3. Shop drawings shall be submitted in sets of similar fabricated items. Large submittals, generally over 10 sheets, consisting of several different fabricated items will be returned to the Contractor unreviewed.
4. All resubmittals of shop drawings shall have all revisions/corrections clearly highlighted to the Engineer (e.g., labeled, clouded, etc.).

- B. Submit manufacturer's product data (i.e., catalog cuts) for floor grating and other manufactured items that include details of manufactured product with installation instructions.

1.05. COORDINATION

- A. Coordinate work with existing field conditions.
- B. Field verify all dimensions prior to submittal of shop drawings.

- C. Coordinate placement of concrete with installation of cast-in (embedded) items.

1.06. QUALIFICATIONS

- A. Weld procedures and welder personnel shall be AWS qualified. Keep procedures and certifications on file. Submit only when requested.

PART 2 PRODUCTS

2.01. MATERIALS

- A. "W"-Shaped Steel Beams - ASTM A992, Grade 50.
- B. "S"-Shaped Steel Beams - ASTM A36.
- C. "C"-Shaped or "MC"-Shaped Steel Channels - ASTM A36 or ASTM A572 Grade 50.
- D. Steel Angles and Plates - ASTM A36.
- E. Hollow Structural Sections (HSS)
 - 1. Rectangular and Square Sections - ASTM A500, Grade B, 46 ksi.
 - 2. Round Sections - ASTM A500, Grade B, 42 ksi.
- F. Aluminum Sections - ASTM B308, Alloy 6061-T6. Use Aluminum Association shapes.
- G. Aluminum Sheet and Plates - ASTM B209, Alloy 5052.
- H. Aluminum Checkered Floor Plate - ASTM B632, Alloy 6061-T6.
- I. Aluminum Rectangular Bars - ASTM B221, Alloy 6061-T5.
- J. Stainless Steel Structural Shapes – ASTM A276, Type 316 or Type 316/316L, annealed.
- K. Stainless Steel Angles and Plates - ASTM A276, Type 316 or Type 316/316L.
- L. Pipe
 - 1. Steel - ASTM A53, Grade B.
 - 2. Aluminum Alloy - 6061-T6.
- M. Fiberglass Fabrications - All structural shapes shall be manufactured using the pultrusion process with a minimum glass content of 45 percent. Use extra corrosion-resistant vinyl ester resin material for all shapes and plates. All fiberglass resin shall contain an integral UV inhibitor and be produced with a resin-rich surface to protect against exposure and wear.
- N. Bolts - ASTM F593 stainless steel, Type 316; ASTM A325N carbon steel; galvanized (A325) bolts as a manufactured fastener assembly to comply with ASTM A153 or F2329.

All bolt accessories including nuts, washers, etc. shall be of the same material as the bolt. Dielectric separation (i.e., neoprene washers) shall be used when a fastener material may be reactive to the base material.

- O. Bolted Attachment to Concrete and Masonry – For structural connections, use stainless steel threaded rods with chemical adhesive anchor system as specified in Section 03001. (Expansion anchors are not allowed unless specifically requested by Contractor for a particular application and approved by Engineer.)
- P. Cast-In Anchor Rods (Bolts) – ASTM F1554 anchor rods galvanized to ASTM A153.
- Q. Welding Filler Metals and Electrodes - AWS D1.1, D1.2, D1.3, and D1.6.
 - 1. For steel welding, filler metal shall conform to AWS 5.1 or 5.5 and E70xx SMAW electrodes shall be used.
 - 2. Required type(s) for other materials being welded.
- R. Touch Up Primer for Galvanized Surfaces - Zinc-rich paint.

2.02. SHOP-FABRICATED ITEMS

- A. Pipe Supports
 - 1. Provide pipe supports constructed of structural shapes as detailed on the Contract Drawings.
 - 2. Entire pipe support assembly shall be hot-dip galvanized after fabrication, unless specifically indicated otherwise in the Contract Documents.
- B. Bar Screen
 - 1. Provide custom manually cleaned bar screen constructed as detailed on the Contract Drawings.
 - 2. Bar screen assembly shall be constructed of 6061-T6 aluminum with a mill finish.
- C. Anchorage for miscellaneous metal items cast in concrete shall have, as a minimum, welded-on strap anchors 2 feet o.c., made from 1/4 inch thick x 1-inch wide x 6-inch long bar stock with each end bent 90 degrees.

2.03. MANUFACTURED ITEMS

- A. Aluminum Grating
 - 1. Provide aluminum grating, 3/8-inch wide rectangular bar with serrated surface. Clear spacing between bearing bars shall be 1-inch or less. Use Type BS by IKG Industries; Type 19-SG-4 by Ohio Grating, Inc.; or equal.
 - 2. Grating shall be able to withstand a uniform live load of 150 psf and a concentrated load of 300 lbs., with a maximum deflection of 1/240 of span.
 - 3. All grating panels shall be edge banded.
 - 4. Provide grating manufacturer's aluminum extruded frames. Frames shall be 1/4-inch deeper than thickness of grating to allow 1/4-inch cover plates to be installed flush with top of frame.

2.04. FINISHES

- A. Prepare steel surfaces in accordance with SSPC SP 6.
- B. Shop prime paint steel items, not galvanized, and top coat after installation. Prime paint shall be compatible with paint (coating) system specified in Section 09900. Do not prime surfaces where field welding is required.
- C. Galvanized items shall be hot-dip galvanized in accordance with ASTM A123 or A153. Provide minimum 2.0 oz/sq.ft. galvanized coating.
- D. Unless noted otherwise, aluminum shall be mill finish.
- E. Aluminum in contact with concrete or masonry shall be backpainted with bituminous paint.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Ensure that field conditions are acceptable and are ready to receive work. Measurements and dimensions to be field verified.
- B. Beginning of installation means Contractor has verified and accepts existing conditions.

3.02. FABRICATION

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Welds shall be continuous unless noted otherwise. Grind down welds smooth to remove excess material.
- D. Exposed Mechanical Fastenings - Unobtrusively located, consistent with design of component.
- E. Supply components required for anchorage of fabrications.
- F. Fiberglass Fabrications - All cuts and drilled holes shall be sealed with vinyl ester resin to provide maximum corrosion resistance.
- G. Aluminum grating panels (80 lbs. maximum weight per panel) shall have continuous edge banding along the cut ends of the bearing bars. The cross bars shall be cut back flush to face of bearing bars and ground smooth to remove sharp edges.
 - 1. Edge banding shall be installed flush with top and bottom of grating/panel and surrounding construction. In exception to NAAMM MBG 533 (2.1 Welding Standards), welds to be within center 75 percent of depth of bearing bar, not extending to top or bottom edge of grating/panel.
 - 2. Grating shall be fabricated in panels that can be easily removed. Provide smaller panels where special access to equipment is required.

- H. Aluminum Grating Frames - Shop fabricated, miter cut and welded corners. Frames to be four-sided fabrications where practical, of 1/4-inch thick aluminum sections, as indicated. Welds to be ground smooth.

3.03. FABRICATION TOLERANCES

- A. Squareness - 1/8-inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces - 1/16-inch.
- C. Maximum Misalignment of Adjacent Members - 1/16-inch.
- D. Maximum Bow - 1/8-inch in 48 inches.
- E. Maximum Deviation From Plane - 1/16-inch in 48 inches.

3.04. INSTALLATION

- A. Allow for erection loads, and provide sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- B. Install items plumb and level, accurately fitted, free from distortion or defects.
- C. Install manufactured items in accordance with manufacturer's instructions.
- D. Install and secure all cast-in (embedded) items prior to placement of concrete.
- E. Perform field welding in accordance with AWS.
- F. Fasten aluminum fabrications using Type 316 stainless steel bolts and accessories.
- G. Fasten galvanized steel fabrications using A325 galvanized bolts and accessories. Type 316 stainless steel bolts and accessories shall be provided for applications otherwise indicated in the Contract Documents.
- H. Fasten fiberglass fabrications using Type 316 stainless steel bolts and accessories.
- I. Carbon steel bolts shall only be used for painted carbon steel framing connections.
- J. Isolate dissimilar metals with dielectric and use appropriate fasteners.
- K. Obtain Engineer approval prior to site cutting or making adjustments not indicated on shop drawings.
- L. Prior to installation, aluminum surfaces in contact with concrete and/or masonry require backpainting.
- M. After erection, touch up paint welds, bolts, connection material, and abrasions.
- N. Top paint all exposed steel that is not galvanized.
- O. Touch up all galvanized surfaces with zinc-rich paint.
- P. Fiberglass Fabrications - All field cuts and drilled holes shall be sealed with vinyl ester resin as supplied by the manufacturer to provide maximum corrosion protection.

3.05. INSTALLATION OF GRATING

- A. Install components in accordance with manufacturer's instructions.
- B. Place frames in correct position, plumb and level.
- C. Mechanically cut aluminum components.
- D. All grating bearing bars shall be banded and completely supported and not allowed to deflect by hanging off cross bars.
- E. Brackets, supports, and other details not shown on the Contract Drawings, but necessary for the work, shall be furnished by the Contractor.
- F. Install removable sections over all stop plates and where indicated on Contract Drawings.
- G. Install grating panels around piping, conduits, and other penetrations and up to all sluice gate and slide gate guides. Openings and penetrations greater than 3 inches in grating shall be edge banded. Completed installation shall not leave gaps larger than 1-inch around perimeter of penetrations and more than 2 inches in front of gates.
- H. The Contractor shall be responsible to provide and install all components to perform the work described above.

3.06. INSTALLATION TOLERANCES

- A. Maximum Variation From Plumb - 1/4-inch.
- B. Maximum Offset From True Alignment - 1/4-inch.
- C. Maximum Out-of-Position - 1/4-inch.

END OF SECTION

SECTION 06112
FRAMING AND SHEATHING

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Supply, deliver and install:
 - 1. Dimensional softwood lumber for use as:
 - a. Sub-fascia.
 - b. Blocking and nailers.
 - c. Other locations where shown on Drawings.
 - 2. Plywood roof sheathing.
 - 3. Foam plastic sill seals.
 - 4. Fasteners and metal plate connectors.
 - 5. Temporary closures.
 - 6. Temporary centering, bracing and shoring.

1.02. RELATED SECTIONS

- A. Section 03001 - CONCRETE
- B. Section 06200 – FINISH CARPENTRY
- C. Section 07190 – VAPOR AND AIR BARRIERS
- D. Section 07241 – EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)
- E. Section 07900 - SEALANTS

1.03. REFERENCES

- A. Lumber

Southern Pine Inspection Bureau (SPIB)	Standard Grading Rules for Southern Pine Lumber - 2002
American Lumber Standard Committee (ALSC)	American Softwood Lumber Standard – Voluntary Product Standard PS 20
Northeast Lumber Manufacturers Association (NeLMA)	Standard Grading Rules for Northeastern Lumber

B. Preservative Treatment

American Wood Protection Association (AWPA)	AWPA U1-12 Use Category System: User Specification for Treated Wood
ICC Evaluation Services, Inc.	ESR-1980 Naturewood and MicroPro/Smart Sense Pressure Treated Wood

C. Plywood

APA – The Engineered Wood Association	
APA PS 1-09	Voluntary Product Standard – Structural Plywood
APA PS 2-10	Performance Standard for Wood-Based Structural-Use Panels

D. Steel Fabrications

ASTM International	
ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A653	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.04. SUBMITTALS

- A. Submit in conformance with Section 01300, Submittals, and as supplemented herein.
- B. Samples - Provide two samples of each of the following:
 - 1. Each kind of nail, screw, bolt, connection plate, or other fastener or connector proposed for use in this project.
- C. Lumber and plywood grades. Provide an illustration or photograph of the grade stamp for each type of plywood or lumber that is proposed for use on the project.

1.05. DELIVERY, STORAGE AND HANDLING

- A. Protect site framing lumber from warping or other distortion by stacking horizontally, allowing air circulation. Position with spacers to allow ventilation.
- B. Do not store products in building until wet trade materials are dry.

1.06. SIZES AND SURFACING

- A. PS 20 for dressed sizes of yard and structural lumber; surfaced four sides (S4S). Size references are nominal sizes; actual sizes shall be within manufacturing tolerances of standard under which product is produced.

1.07. MOISTURE CONTENT

- A. Moisture content at delivery.
 - 1. Framing Lumber 2 Inches and Less in Thickness - 19 percent maximum.
 - 2. Boards - 19 percent maximum.
 - 3. Framing Lumber Over 2 Inches Thick - 25 percent maximum.
 - 4. Materials Other Than Lumber - Moisture content shall be in accordance with standard under which product is produced.

1.08. COORDINATION

- A. Coordinate the work of this section with all sections referencing this section or referenced by this section.

PART 2 PRODUCTS

2.01. LUMBER PRODUCTS

- A. Sawn Lumber
 - 1. Lumber Grading Rules – NeLMA Standard Grading Rules for Northeastern Lumber, and SPIB Standard Grading Rules for Southern Pine.
 - 2. Structural Light Framing – Spruce-Pine-Fir South No. 1; minimum Fb for single use up to 12-inch wide: 875 psi; E = 1,200,000 psi.
 - 3. Non-Structural Light Framing – Spruce-Pine-Fir South No. 2; minimum Fb for single use up to 12-inch wide: 750 psi; E = 1,100,000 psi.
 - 4. Studding - Spruce-Pine-Fir South No. 2; minimum Fb for single use up to 6-inch wide: 775 psi; E = 1,100,000.
 - 5. Blocking and Miscellaneous Framing - Spruce-Pine-Fir South No. 2; minimum Fb for single use up to 12-inch wide: 775 psi; E = 1,100,000 psi.

2.02. SHEATHING MATERIALS

- A. Plywood Wall Sheathing - APA 1/2-inch Rated Sheathing, span rating 32/16; Exposure Durability 1.
- B. Plywood Wall Finish – 23/32-inch APA Rated Sturd-I-Floor; Exposure 1.

2.03. ACCESSORIES AND ROUGH HARDWARE

- A. Fasteners and Anchors
 - 1. Fasteners - Stainless steel for securing wood treated with CBA and ACQ formulations, coated or galvanized steel for securing wood treated with MCQ formulations, and unfinished steel elsewhere.

2. Rough hardware shall be the type and size necessary for project requirements. Sizes, types, and spacing of fastenings of manufactured building materials to be as recommended by product manufacturer. Rough hardware exposed to the weather, embedded in or in contact with exterior masonry, concrete walls, or slabs shall be stainless steel. Nails and fastenings for fire retardant treated lumber and woodwork exposed to the weather shall be copper alloy.
- B. Die-Stamped Connectors and Metal Framing Anchors - 18 gage minimum thickness, stainless steel when in contact with CBA or ACQ preservative-treated lumber. Hot-dip galvanized in other locations. Fastener quantity and type shall be as shown by manufacturer to attain full potential load capacity. Fastener material to comply with paragraph 2.03.A.1.
 - C. Sill Seal - 1/4 inch thick, plate width, closed cell polyethylene foam from continuous rolls.
 - D. Metal Bridging Where not indicated or specified otherwise, No. 16 U.S. Standard gage, cadmium plated or zinc coated; stainless steel where in contact with treated wood of CBA or ACQ formulation.
 - E. Toothed Rings and Shear Plates NFPA National Design Specification for stress grade lumber and its fastenings.
 - F. Panel Edge Clips – Galvanized steel; H configuration; 20 gauge minimum; sized to match panel thickness.
 - G. Bearing Plates – Galvanized 3-inch x 3-inch bearing plates, 9/16-inch minimum thickness. Provide bearing plates at all anchor bolts. Use Model No. LBPS5/8 by Simpson Strong-Tie or equal.
 - H. Stud Plate Tie – Galvanized plate connector, minimum 18 gauge, connecting the double studs to the top plate and bottom plate. Provide at all shear panel ends where indicated on the Drawings. Use Model No. DSP by Simpson Strong-Tie or equal.

2.04. STEEL CONNECTORS AND FASTENERS

- A. Fabricated Steel Connectors
 1. Steel Plate – ASTM A36.
 2. Steel Pipe – ASTM A53, Type E or F, Grade B, Standard weight.
 3. Finish – Factory prepared, primed and coated with semi-gloss coating suitable for exterior exposure. Coating is to be applied to all surfaces, including those concealed from view or in contact with wood.
- B. Fasteners
 1. Bolts – ASTM A307.
 2. All bolts are to be galvanized in conformance with ASTM A153, G90.
 3. Connectors are to be wrapped or otherwise protected to prevent damage to finishes during shipment.

PART 3 EXECUTION

3.01. INSTALLATION - GENERAL

- A. Closely fit rough carpentry, set accurately to required lines and levels, and secure in place in rigid and substantial manner. Do not splice framing members between bearing points. Set joists, rafters, and purlins with their crown edge up. Frame members for the passage of pipes, conduits, and ducts. Do not cut or bore structural members for the passage of ducts or pipes without County Engineer's approval. Reinforce all members damaged by such cutting or boring by means of specially formed and approved sheet metal or bar steel shapes, or remove and provide new, as approved. Provide as necessary for proper completion of work all framing members not indicated or specified. Spikes, nails, and bolts shall be drawn up tight.
- B. Set structural members level and plumb, in correct position.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Place horizontal members flat, crown side up.
- E. Construct load bearing framing members full length without splices.
- F. Lumber in contact with concrete or masonry shall be preservative treated by treatment with an approved preservative treatment system per paragraph 2.04.A.
- G. Tolerances
 - 1. Framing Members - 1/4 inch from true position, maximum.

3.02. FRAMING

- A. Wall Framing
 - 1. Studs - Select studs for straightness then set plumb, true, and in alignment. Walls and partitions more than 8 feet tall require horizontal bridging, not more than 8 feet o.c., using nominal 2 inch material of the same width as the studs; install the bridging flat. Sizes and spacing of studs shall be as indicated. Double studs at jambs and heads of openings and triple at corners to form corner posts. Frame corner posts to receive sheathing and interior finish materials. Truss over openings exceeding 4 feet in width or use a header of sufficient depth. Nail studs to sills or sole plates with two 16-penny nails or fasten with metal nailing clips or connectors. Double studs at shear panel ends shall be fastened to the top plate and bottom plate with a stud plate tie. Anchor studs abutting concrete or masonry walls thereto near top and bottom and mid height of each story using expansion bolts or powder actuated drive studs.
 - 2. Plates - Use plates for walls and partitions of the same width as studs to form continuous horizontal ties. Splice single plates; stagger the ends of double plates. Double top plates in walls and bearing partitions, built up of two nominal 2-inch thick members. Top plates for non bearing partitions shall be double plates of the same size as the studs. Nail lower members of double top plates to each stud and corner post with two 16 penny nails. Nail the upper members of double plates to the lower members with 10 penny nails, two near each end, and stagger 16 inches on centers intermediately between. Anchor sole plates on concrete with 5/8-inch diameter

stainless steel J-bolts; 1-foot 2-inch minimum concrete embedment. Place one J-bolt within a foot of each side of each corner, and at not more than 2 feet on center. Provide plate washers at each J-bolt.

3.03. SHEATHING

A. Wall Sheathing

1. Plywood and Structural Use Panel Wall Sheathing Apply horizontally or vertically. Extend sheathing over and nail to sill and top plate. Abut sheathing edges over centerlines of support. Allow 1/8 inch spacing at panel ends and 1/4 inch at panel edges. If sheathing is applied horizontally, stagger vertical end joints. Nail panels with 8 penny nails spaced 6 inches on centers along edges of the panel and 12 inches on centers over intermediate supports. Provide blocking of 2 inches by 4 inches for horizontal joints not otherwise supported.

3.04. MISCELLANEOUS

- A. Wood Blocking Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.
- B. Wood Furring Provide where shown and as necessary for facing materials specified. Except as shown otherwise, furring strips shall be 2-inch by 3-inch, horizontal, continuous, and spaced 24 inches on centers vertically. Erect furring as shown on Drawings. Provide furring strips around openings, behind bases, and at angles and corners. Furring shall be plumb, rigid, and level and shall be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required.
- C. Temporary Closures Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.
- D. Temporary Centering, Bracing, and Shoring Provide for the support and protection of masonry work during construction. Forms and centering for cast in place concrete work are specified in Section 03001, Concrete.

3.05. APPLICATION

- A. Cutting of wood members that becomes necessary for the installation of mechanical equipment, such as ductwork, fans, piping, electrical equipment, etc., is the responsibility of the Contractor. Fit woodwork around equipment, etc., as required.
- B. Fit joints tightly to avoid opening later. Keep work plumb, true and in place, free from stains and tool marks. Provide longest pieces possible. Make splices neatly. Blind nail when possible.

END OF SECTION

SECTION 06200
FINISH CARPENTRY

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Supply, deliver and install:
 - 1. Standing and running factory finished PVC trim boards.
 - 2. Factory finished PVC soffit panels.
 - 3. Aluminum circular soffit vents.
 - 4. Fasteners, flashings and other incidental materials necessary for proper installation of soffits and trim.

1.02. RELATED SECTIONS

- A. Section 06112 – FRAMING AND SHEATHING
- B. Section 07241 – EXTERIOR INSULATION AND FINISH SYSTEM

1.03. REFERENCES

- A. ASTM D638 – Tensile Property of Plastics.
- B. ASTM D696 – Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer.
- C. ASTM D790 – Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- D. ASTM D1761- Mechanical Fasteners in Wood.
- E. ASTM E84 – Surface Burning Characteristics of Building Materials

1.04. SUBMITTALS

- A. Submit in conformance with Section 01300, Submittals, and as supplemented herein. Submittals shall include, but not be limited to, the following:
- B. For each trim type, sheet material, soffit vent, fastener and installation accessory:
 - 1. Product data showing product materials, dimensions, finishes, and performance data.
 - a. Mark proposed option selections by circling, underlining or checking with an opaque marker that contrasts with product literature background. Markings, such as translucent highlights, that lose visibility when scanned or photocopied are not acceptable.
 - 2. Samples – Provide two samples of each proposed product.

- a. Finishes and profiles to be identical to that proposed for the project.
 - b. Trim material samples are to be at least 6 inches long.
 - c. Sheet material samples are to be at least 6 inches by 6 inches.
3. Manufacturer's instructions and recommendations for preparation, storage, handling and installation, where relevant.

1.05. DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in manufacturer's original, unopened containers with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Protect materials during handling and installation to prevent damage.

1.06. ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during, and after installation.

1.07. COORDINATION

- A. Coordinate the work of this section with all sections referencing this section or referenced by this section.

PART 2 PRODUCTS

2.01. PVC TRIM BOARD AND SHEET MANUFACTURERS

- A. Azek Building Products.
- B. CertainTeed Corporation.
- C. Or equal.

2.02. PVC TRIM BOARD AND SHEET

- A. Trim – Pre-finished PVC trim boards and shapes, smooth texture.
 1. Size
 - a. Nominal 5/4-inch.
 - b. Width – As shown on Drawings.
 - c. Length – 12 feet or maximum available length.
 2. Provide the following trim:
 - a. Fascia and rake trim boards.

- b. Trim boards for end panels where soffits meet rake trim.
- B. Sheet – Pre-finished PVC sheet, smooth texture.
- 1. Size
 - a. Nominal 1-inch.
 - b. Width – As shown on Drawings.
 - c. Length – 12 feet or maximum available length.
 - 2. Provide the following trim:
 - a. Sheet material for soffits.
- C. Physical properties of trim and sheet materials.

Property	Units	Value	ASTM Method
Tensile strength	psi	1,200 minimum	D638
Tensile modulus	psi	79,000 minimum	D638
Flexural strength	psi	3,300 minimum	D790
Nail hold	Lbf/in of penetration	35 minimum	D1761
Screw hold	Lbf/in of penetration	590 minimum	D1761
Coefficient of linear expansion	in/in/ ^o F	3.2 x 10 ⁻⁵ maximum	D696
Flame Spread Index	-	25 maximum	E84

- D. Manufacturing Tolerances
- 1. Variation in Component Length - -0.00 +1.00 inch.
 - 2. Variation in Component Width - $\pm 1/16$ inch.
 - 3. Variation in Component Edge Cut - ± 2 degrees.
 - 4. Variation in Density - -0 percent to +10 percent.

2.03. TRIM AND SHEET INSTALLATION ACCESSORIES

- A. Adhesives – As manufactured by or recommended by PVC trim board and sheet material manufacturer.
- B. Fasteners – Stainless steel of size and geometry designed for wood siding and trim installation.
- C. Sealants – Urethane, polyurethane or acrylic based.
 - 1. Silicone content is not permitted in sealants.
 - 2. Match sealant color to trim color.

2.04. SOFFIT VENTS

- A. Round vent with aluminum trim ring and insect screen.
 - 1. Nominal 4-inch diameter.
 - 2. Minimum of 7 square inches of net free area per vent.
 - 3. White factory finish on trim ring.
- B. Products
 - 1. RWS-100 Series by Maurice Franklin Louver Co., Inc. of Georgetown, SC.
 - 2. Or equal.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that blocking, sub-fascia and other support framing or surfaces are in place, secure, acceptably aligned and ready to accept the work.

3.02. INSTALLATION

- A. Comply with trim and sheet manufacturer's published instructions and recommendations, including, but not limited to:
 - 1. Recommendations regarding cutting, drilling, milling, routing, and edge finishing.
 - 2. Fastener types, sizes and spacing.
 - 3. Techniques to accommodate thermal expansion and contraction.
- B. Glue all PVC-to-PVC joints with recommended adhesive except at movement joints.
- C. All trim board and sheet materials to be installed within 1/8 inch in 8 feet of length from true, plumb and level. Except where a reveal is detailed on the Drawings: all miter, scarf or butt joints to be flush and aligned to within 1/32 inch.
- D. Install 4-inch diameter soffit vents at a center-to-center spacing of 24 inches. Align soffit vents halfway between the exterior wall finish and the eave fascia. Center vents between trusses or rafters so that air movement is not obstructed by framing.

3.03. PROTECTION OF FINISHED WORK

- A. Do not permit adjacent or subsequent work to damage work of this section.

END OF SECTION

SECTION 07190

VAPOR AND AIR BARRIERS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish and install vapor retarders, air barriers, and required accessories in accordance with the Contract Documents including, but not limited to, the following:
 - 1. Sheet Vapor Retarder – For installation beneath concrete floor slabs.
 - a. Seam tape and other accessories for use with sheet vapor retarders.
 - 2. Air and Vapor Barrier – Fluid-applied elastomeric air and vapor barrier for installation to the exterior of concrete masonry unit walls; designated “AVB” on Drawings.
 - a. System includes all detail tapes, flashings, sealants, control joint treatment and adhesives required to provide:
 - 1) Continuity of the air and vapor barrier across the masonry surface and connections to adjacent construction.
 - 2) Weather protection including positive drainage from the masonry wall cavity.
 - b. AVB, in conjunction with insulation, and veneer masonry, must comply with the regulatory requirements stated in Article 1.05 of this section.
 - 3. Cold-Applied, Single-Component Waterproofing – For exterior insulated slabs with heated spaces below

1.02 RELATED SECTIONS

- A. Section 07900 – JOINT SEALERS
- B. Section 08390 – WATERTIGHT (FLOOD) DOORS

1.03 REFERENCES

- A. Sealant, Waterproofing, and Restoration Institute (SWRI) – Sealants: The Professionals Guide
- B. ASTM D882 – Tensile Properties of Thin Plastic Sheeting
- C. ASTM D4833 – Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
- D. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- E. ASTM E96 – Standard Test Method for Water Vapor Transmission of Materials
- F. ASTM E1643 – Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

- G. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
- H. ASTM E2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
- I. ICC Evaluation Service (ICC-ES) – Evaluation Reports
- J. NFPA 259 – Standard Test Method for Potential Heat of Building Materials
- K. NFPA 285 – Standard Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.04 PERFORMANCE REQUIREMENTS

- A. Materials of this section shall provide continuity of the building enclosure vapor or air barrier as indicated in the Contract Documents.
- B. Where foam plastic insulation forms part of an exterior wall assembly, such assembly must comply with the regulatory requirements stated in Article 1.05.

1.05 REGULATORY REQUIREMENTS

- A. Completed exterior wall assemblies, including insulation, vapor barrier, air barrier, weather barrier, flashing, sealants, and adhesives are to match that of an assembly that has been tested and met the requirements of NFPA 285, or match that of an assembly described in an ICC-ES Evaluation Report that certifies the assembly as meeting IBC Section 2603.5

1.06 SUBMITTALS

- A. Provide in accordance with Section 01300, Submittals, and as supplemented herein. Submittals shall include, but not be limited to, the following:
- B. Product Data
 - 1. For all sheet and fluid-applied materials, provide manufacturer's technical literature indicating composition, tensile strength, permeability, and other relevant characteristics.
 - 2. For all vapor retarder, vapor barrier or air barrier materials, provide manufacturer's technical literature describing all accessory materials required for a complete installation; including, but not limited to, flashings, detail membranes or tapes, edge sealants and adhesives.
 - 3. Provide detailed installation instructions indicating conditions necessary for fluid-applied membranes and associated accessories to function as an effective barrier system, integrated with the wall, window and door configurations specific to this project.
- C. Submit manufacturer's samples of sheet products.
- D. Shop Drawings - Provide standard details, special details, and assistance to Contractor for use by suppliers of products listed in Article 1.02 in preparing detailed coordination drawings.
- E. Where foam plastic insulation forms part of an exterior wall assembly, submit proof of compliance with the regulatory requirements of Article 1.05.

1.07 QUALITY ASSURANCE

- A. Where relevant, perform work in accordance with SWRI Sealant and Caulking Guide Specification requirements for materials and installation

1.08 MOCK-UP

- A. Provide mock-up of vapor and air barrier materials under the following provisions:
 - 1. Construct as a part of a typical exterior wall panel as shown on Contract Drawings, incorporating window or louver opening with frame and sill installed, insulation, building corner condition, illustrating materials interface and seals.
 - 2. Locate where directed.
 - 3. Mock-up may not remain as part of the work.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in manufacturer's original, unopened containers with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Protect materials during handling and installation to prevent damage.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during, and after installation.

1.11 SEQUENCING

- A. Sequence work to permit installation of materials in conjunction with other materials and seals.

1.12 COORDINATION

- A. Coordinate the work of this section with all sections referencing this section or referenced by this section.

PART 2 PRODUCTS

2.01 SYSTEMS

- A. Sheet Vapor Retarder – For installation beneath concrete floor slabs. To meet or exceed the requirements of ASTM E1745 for Class A. To include all accessories and components of a complete system by a single manufacturer, or with all components approved in writing by the sheet manufacturer.
 - 1. Griffolyn® 10 Mil Green by Griffolyn® Division of Reef Industries, Inc., Houston, TX.
 - 2. RUFECO® 400 SSB by Raven Industries, Sioux Falls, SD (also marketed as Shelter TUFF4 by Shelter Supply, Inc., Burnsville, MN).

3. Or equal.
- B. Air and Vapor Barrier – Fluid-applied elastomeric air and vapor barrier for installation to the exterior of concrete masonry unit walls and to the top surface of precast concrete ceiling planks, designated “AVB” on Drawings. To include all accessories and components of a complete system by a single manufacturer, or with all components approved in writing by the membrane manufacturer.
1. Performance
 - a. Volatile organic compounds less than 52 µg/L.
 - b. Water vapor permeance per ASTM E96.B less than one Perm.
 - c. Air Leakage 0.0075 CFM/ft² or less per ASTM E2357.
 - d. Flame Spread Index less than 25, and Smoke Generation 200 or less per ASTM E84.
 2. Fire Resist Barritech NP by Carlisle Coatings and Waterproofing Incorporated
 3. Or equal.
- C. Cold –Applied, Single-Component Waterproofing - For exterior insulated slabs with heated spaces below. To meet or exceed the requirements of ASTM C 836. To include all accessories and components of a complete system by a single manufacturer, or with all components approved in writing by the manufacturer.
1. Hydralastic 836 - W. R. Meadows Company
 2. Henry CM100 – Henry Company
 3. ConSeal CS-1800 Waterproofing Membrane – Concrete Sealants Inc.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work.

3.02. PREPARATION

- A. Remove objects which might impale/puncture sheet material.
- B. Remove loose or foreign material which might impair adhesion of seam and flashing tapes
- C. Prime surfaces where directed by manufacturer’s instructions

3.03. INSTALLATION OF SHEET MATERIALS

- A. Install sheet materials in accordance with manufacturer’s instructions; tape all seams
- B. Lap sheet materials and seal with tape. Position lap seal over firm bearing.

- C. Cut sheet materials tight to pipes and other slab penetrations. Seal to penetrating objects with tape. At pipe penetrations, seal with prefabricated pipe boots
- D. Repair holes or punctures with self-adhesive tape.

3.04. INSTALLATION OF FLUID-APPLIED SYSTEMS

- A. Install fluid-applied systems in accordance with manufacturer's instructions.
- B. Use self-adhesive flashing or detail material, in combination with compatible sealants and adhesives, to provide continuity between barrier membrane and window, door and louver frames.
- C. Connect barrier membrane to flashings to provide continuous weather protection and positive drainage in wall assemblies.
- D. Provide flexible and air-tight connections between membrane surfaces on either side of substrate movement joints.

3.05. PROTECTION OF FINISHED WORK

- A. Do not permit adjacent or subsequent work to damage work of this section.

END OF SECTION

SECTION 07213

BATT AND BLANKET INSULATION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Batt insulation in ceiling and roof construction, as indicated.

1.02. RELATED SECTIONS

- A. Section 06112 - FRAMING AND SHEATHING
- B. Section 07190 - VAPOR AND AIR BARRIERS

1.03. REFERENCES

- A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.04. PERFORMANCE REQUIREMENTS

- A. Materials of this section shall provide continuity of thermal barrier at building enclosure elements.

1.05. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Product Data - Provide manufacturer's data on product characteristics, performance criteria, limitations and insulation value.
- C. Submit certifications for iron and steel products in accordance with AIS requirements and Section 01300.

1.06. COORDINATION

- A. Coordinate Work under provisions of Section 01039, Coordination.
- B. Coordinate the work of Section 07190 for installation of vapor and air barrier seals.

PART 2 PRODUCTS

2.01. MANUFACTURERS - INSULATION MATERIALS

- A. Owens-Corning, Toledo, OH.
- B. CertainTeed, Valley Forge, PA.
- C. Johns Manville.

2.02. MATERIALS

- A. Batt Insulation - For framed roof/ceiling construction, ASTM C665; Type I unfaced, 24 inches wide roll by longest length possible. R Value 38 unless otherwise noted on the Drawings.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.
- B. Verify that vapor and air barriers, where shown on Drawings, are in place and properly sealed at seams and penetrations.

3.02. INSTALLATION

- A. Friction fit insulation in accordance with insulation manufacturer's instructions.
- B. Install in roof and ceiling spaces with no gaps or voids, where indicated.
- C. Coordinate lay-in of insulation with other affected trades and after ceiling and roof have been installed.
- D. Trim insulation neatly to fit spaces.
- E. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.

END OF SECTION

SECTION 07241

EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Composite barrier wall system and air moisture barrier system wall cladding of rigid insulation, drainage components, and applied coating.
 - 1. Composite system applied directly to concrete masonry substrate.
- B. Provide air-and-water-resistive barrier (AWRB) with vapor retarder properties Composite barrier wall system and air moisture barrier system wall cladding of rigid insulation, drainage components

1.02. RELATED SECTIONS

- A. Section 07190 – VAPOR AND AIR BARRIERS
- B. Section 07900 - JOINT SEALERS

1.03. REFERENCES

- A. ASTM Standards
 - 1. B117 - Test Method for Salt Spray (Fog) Testing.
 - 2. C578 - Specification for Preformed, Cellular Polystyrene Thermal Insulation.
 - 3. D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
 - 4. D3273 - Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 5. E84 - Test Method for Surface Burning Characteristics of Building Materials.
 - 6. E96 - Test Methods for Water Vapor Transmission of Materials.
 - 7. E2273 - Standard Test Method for Determining the Drainage Efficiency of EIFS Clad Wall Assemblies.
 - 8. E2430 - Standard Specification For Expanded Polystyrene ("EPS") Thermal Insulation Boards For Use In Exterior Insulation and Finish Systems ("EIFS").
 - 9. E2485 - Standard Test Method for Freeze-Thaw Resistance of EIFS and Water-Resistant Barrier Coatings.
 - 10. G154 - Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.

11. G-154 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
 - B. National Fire Protection Association (NFPA) Standards
 1. NFPA 285 - Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus.
- 1.04. SYSTEM DESCRIPTION
- A. Exterior Insulation and Finish System - EIMA Class PB drainage type system.
- 1.05. PERFORMANCE REQUIREMENTS
- A. Refer to Table 07241-1 at the end of this section.
- 1.06. QUALITY ASSURANCE
- A. System manufacturer is required to be a manufacturer member in good standing of the EIFS Industry Members Association.
 - B. Installing personnel are to have successfully completed training approved by the system manufacturer.
- 1.07. SUBMITTALS
- A. Provide manufacturer's specifications, details, installation instructions, and product data, including color and texture data.
 1. Product data to show conformance to performance requirements listed in Table 07241-1
 - B. Provide manufacturer's code compliance report.
 - C. Provide manufacturer's standard warranty.
 - D. Provide applicator's certificate of instruction.
 - E. Provide 6-inch square samples of preliminary color and texture choices for final approval.
 - F. Provide EPS board manufacturer's product data indicating compliance with the current edition of ASTM E2430.
 - G. Prepare and submit project-specific details.
- 1.08. DELIVERY, STORAGE, AND HANDLING
- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
 - B. Protect adhesives and finish materials from freezing and temperatures in excess of 90 degrees. Store away from direct sunlight.

- C. Protect Portland cement-based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.09. ENVIRONMENTAL REQUIREMENTS

- A. Do not install finish when ambient temperature is below 40 degrees F.
- B. Maintain this temperature during and 24 hours after installation of finish, by providing heat and enclosing work, if necessary.

1.10. COORDINATION/SCHEDULING

- A. Provide site grading such that EIFS terminates above finished grade a minimum of 6 inches or as required by code.
- B. Coordinate installation of foundation waterproofing and wall penetrations to provide a continuous air and moisture barrier.
- C. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.
- D. Install copings and sealant immediately after installation of the EIFS system and when EIFS coatings are dry.
- E. Attach penetrations through EIFS to structural support and provide water tight seal at penetrations.

1.11. WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Dryvit - West Warwick, RI
System – Outsulation Plus MD
- B. STO Corp., Atlanta, GA.
System – StoTherm ci Classic
- C. Or equal.

2.02. MATERIALS

- A. Air-and-Water-Resistive Barrier
 - 1. Provide AWRB with vapor retarder properties.
 - a. Backstop NT by Dryvit Systems, Inc.
 - b. StoGuard by Sto Corp.
 - c. Or equal.

- B. Flashing Materials - Supplied or obtained by system manufacturer.
- C. Adhesives
 - 1. Compatible with water-resistive barrier coating and insulation.
 - 2. Applied with notched trowel to provide drainage grooves.
- D. Expanded Polystyrene (EPS) Board Insulation Board - ASTM C578-01, Type I; cellular type, as manufactured by Dow Chemical, Thermal Foams, or approved equal, conforming to ASTM E2430 and ASTM C578 Type 1 requirement and the following:
 - 1. Thermal Resistance - R of 4.2 per inch.
 - 2. Thickness - As indicated on Drawings, but no less than 2 inches.
 - 3. Compressive Strength - Minimum 10 psi.
 - 4. Water Absorption - In accordance with ASTM D2842, 0.3 percent by volume maximum.
 - 5. Edges - Square edges.
 - 6. Flame/Smoke Properties - 25/450 in accordance with ASTM E84.
 - 7. Manufactured by system-approved supplier.
- E. Base Coat - Recommended by manufacturer.
- F. Coating Reinforcement - Glass fiber mesh type, woven, treated for improved bond with coating.
 - 1. Provide extra-high impact mesh (achieving Ultra-High Impact Classification) at all areas up to a height of 6 feet 0 inches above finish grade; standard mesh (achieving Standard Impact Classification) at all other areas
- G. Finish Coat
 - 1. Ready mixed, acrylic-based exterior textured finish meeting performance requirements in Table 07241-1. Approved for use by manufacturer for specified systems.
 - a. STO Essence DPR Finishes - Medium Sand Finish 306.
 - b. Dryvit QuartzputzSand Pebble DPR finishes.
 - c. Equal product by approved manufacturer.
 - 2. Color – As indicated in the Exterior Color and Finish Schedule in the Drawings.

2.03. ACCESSORIES

- A. Drainage Accessories - As supplied or obtained from system manufacturer.
- B. Insulation Fastening - Adhesives per paragraph 2.02.C.

- C. Trim and Control Joints - As supplied or obtained from system manufacturer.
- D. Sealant Materials - Specified in Section 07900, Joint Sealers.
 - 1. Meeting ASTM C1382 requirements.
 - 2. Accepted by EIFS system manufacturer.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Ensure that substrate and adjacent materials are dry, flat, and free of irregularities and materials deleterious to system application.

3.02. INSTALLATION – AIR-AND-WATER-RESISTIVE BARRIER

- A. Install AWRB in accordance with system manufacturer's instructions, including all necessary primers, conditioners, and reinforcing mesh.
 - 1. Coordinate installation of flashing and other moisture protection components of other trades to achieve complete moisture protection.

3.03. INSTALLATION - INSULATION

- A. Install insulation in accordance with system manufacturer's instructions.
- B. Place boards in a method to maximize tight joints. Stagger vertical joints. Butt edges and ends tight to adjacent board and to protrusions.
- C. Install starter strips and drainage accessories per system manufacturer's instructions.
- D. Secure boards to substrate with manufacturer-approved adhesive to achieve a continuous flush insulation surface.
 - 1. Apply adhesive with notched trowel per manufacturer's instruction to provide vertical drainage channels.

3.04. INSTALLATION - COATING

- A. Install base coat, glass fiber mesh reinforcement, and coating, in accordance with manufacturer's instructions.
- B. Apply base coat to a minimum thickness of 1/4-inch to fully embed reinforcement, wrinkle free.
- C. Lap reinforcement edges and ends 2 inches.
- D. Install trim and control joints using practices outlined by ASTM Manual Series, MNL 16.
- E. Install trim in full lengths only to minimize moisture intrusion; cut horizontal trim tight to vertical trim.
- F. Apply finish to a total minimum thickness of 1/4-inch. Finish to a uniform texture and color.

- G. Rout surface finish to pattern as indicated.
- H. Apply sealant at finish perimeter and movement joints in accordance with Section 07900, Joint Sealers.

3.05. PROTECTION OF FINISHED WORK

- A. Do not permit finish surface to become soiled or damaged.

(continued)

TABLE 07241-1**AWRB PERFORMANCE TABLE**

Test	Method	Criteria
Water penetration resistance after cyclic wind loading	ASTM E331	No water penetration beyond the innermost plane of the wall after 15 minutes water spray at 2.86 psf (137 Pa) differential
Water resistance testing	ASTM D2247	Absence of deleterious effects after 14-day exposure
Water vapor transmission	ASTM E96 Method B (Water Method)	No less than 7.0 perms
Air barrier (assembly)	ASTM E2357	<0.04 cfm/ft ² (0.2L/s•m ²)
Surface burning	ASTM E84	Flame Spread \leq 25; smoke developed \leq 450
Tensile adhesion	ASTM C297	>15 psi (103 kPa)

EIFS WITH AWRB FIRE PERFORMANCE

Test	Method	Criteria
Intermediate scale multi-story fire test	NFPA 285	Required for insulation thickness shown on drawings: 1. Resist vertical spread of flame within the core of the panel from one story to the next. 2. Resist flame propagation over the exterior surface. 3. Resist vertical spread of flame over the interior surface from one story to the next. 4. Resist lateral spread of flame from the compartment of fire origin to adjacent spaces.

EIFS WEATHER RESISTANCE AND DURABILITY PERFORMANCE

Test	Method	Criteria
Accelerated weathering	ASTM G154 (formerly ASTM G53), ASTM G155, Cycle 1	No deleterious effects* at 2,000 hours when viewed under 5x magnification
Freeze/thaw resistance	ASTM E2485	No deleterious effects* at 10 cycles when viewed under 5 x magnification
Drainage efficiency	ASTM E2273	90 percent minimum
Water resistance	ASTM D2247	No deleterious effects* at 14-day exposure
Salt spray	ASTM B117	No deleterious effects* at 300 hours
Mildew resistance	ASTM D3273	No growth supported during 28 day exposure period

*No deleterious effects: no cracking, checking, crazing, erosion, rusting, blistering, peeling or delamination.

END OF SECTION

SECTION 07311
ASPHALT SHINGLES

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Supply, deliver and install:
 - 1. Granule surfaced asphalt shingle roofing.
 - 2. Self-adhering, polymer-modified bituminous sheet underlayment.
 - 3. Metal drip flashing.
 - 4. Ridge vent.
- B. Supply and deliver:
 - 1. One bundle of asphalt shingles for Town's future maintenance use.

1.02. RELATED SECTIONS

- A. Section 06112 – FRAMING AND SHEATHING
- B. Section 06200 – FINISH CARPENTRY

1.03. REFERENCES

- A. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used as Steep Roofing Underlayment for Ice Dam Protection.
- B. ASTM D3462 – Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- C. ASTM D7158 - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method).
- D. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings.

1.04. SHINGLE PERFORMANCE REQUIREMENTS

- A. Wind Resistance – Class H per ASTM D7158.
- B. Fire Exposure – Class A per UL 790.
- C. Construction of Shingles – Compliant with ASTM D3462.

1.05. SUBMITTALS

- A. Submit in conformance with Section 01300, Submittals, and as supplemented herein. Submittals shall include, but not be limited to, the following:

- B. Product Data - Provide manufacturer's printed product information indicating material characteristics, performance criteria and product limitations.
- C. Manufacturer's Installation Instructions - Provide published instructions that indicate preparation required and installation procedures.
- D. Certificate of Compliance - Provide Certificate of Compliance from an independent laboratory indicating that the asphalt fiberglass shingles made in normal production meet or exceed the requirements of the following:
 - 1. Class H per ASTM D7158.
 - 2. Class A per UL 790.
 - 3. ASTM D3462.

1.06. DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in manufacturer's original, unopened containers with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Protect materials during handling and installation to prevent damage.

1.07. ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during, and after installation.

1.08. COORDINATION

- A. Coordinate the work of this section with all sections referencing this section or referenced by this section.

1.09. WARRANTY

- A. Provide warranty with protection for Town equal to or exceeding the standard warranties of named manufacturers.
- B. Minimum warranty duration is 25 years.

PART 2 PRODUCTS

2.01. SHINGLE MANUFACTURERS

- A. CertainTeed Corporation.
- B. GAF.
- C. Or equal.

2.02. ASPHALT SHINGLES

- A. XT25 by CertainTeed.
- B. Marquis WeatherMax by GAF.
- C. Or equal.

2.03. SELF-ADHERING, POLYMER-MODIFIED BITUMINOUS SHEET UNDERLAYMENT MANUFACTURERS

- A. CertainTeed Corporation.
- B. Owens Corning.
- C. Or equal.

2.04. SELF-ADHERING, POLYMER-MODIFIED BITUMINOUS SHEET UNDERLAYMENT

- A. Approved by shingle manufacturer for use in warranted assembly.
- B. Conforming to ASTM D1970.
- C. WinterGuard by CertainTeed.
- D. WeatherLock Flex by Owens Corning.
- E. Or equal.

2.05. METAL DRIP FLASHING

- A. T-style with 3-inch leg across roof surface.
- B. 26 gauge galvanized steel with factory paint.
 - 1. Color – White.
- C. Part #WH6TSREWF as manufactured by Union Corrugating Company, Fayetteville, NC.
- D. Or equal.

2.06. RIDGE VENT

- A. Shingle-over ridge vent with 18 square inches of net free venting area per lineal foot of vent length.
- B. Rigid material (not roll type) with features to prevent snow entry.
- C. Cobra Snow Country exhaust vent for roof ridge.
- D. Or equal.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that deck surfaces are dry and free of ridges, warps or voids.
- B. Verify that deck is neatly and uniformly cut back from ridge the required amount for proper fit and function of ridge vent.

3.02. INSTALLATION

- A. Install metal drip flashing along eaves and rakes. Install flashing tight with fascia boards. Weather-lap joints 2 inches (50mm). Secure flange with nails spaced 8 inches (200 mm) on center.
- B. Install self-adhering sheet underlayment over entire surface of roof deck. Install in compliance with manufacturer's instructions.
- C. Install shingles per manufacturer's instructions and as required for warranty.
- D. Install ridge vent sections in a continuous line over the entire attic space, in accordance with ridge vent manufacturer's instructions. Cover ridge vent with shingles in a manner consistent with both ridge vent and shingle manufacturer's instructions.

3.03. PROTECTION OF FINISHED WORK

- A. Do not permit adjacent or subsequent work to damage work of this section.
- B. Do not permit traffic over finished roof sections.

END OF SECTION

SECTION 07631

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Precoated aluminum gutters.
- B. Precoated aluminum downspouts.

1.02. RELATED SECTIONS

- A. Section 07241 – EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)
- B. Section 07311 – ASPHALT SHINGLES

1.03. REFERENCES

- A. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.
- B. SMACNA - Architectural Sheet Metal Manual.
- C. AAMA 2605 - Voluntary Specifications, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

1.04. SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1 contract requirements.
- B. Shop Drawings - Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- C. Product Data - Provide material data on prefabricated components. Provide manufacturer's extended color range charts.

1.05. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the Division 1 contract requirements.
- B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.06. COORDINATION

- A. Coordinate the work with downspout discharge pipe inlet.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Hickman - Product: Commercial grade gutters (G66) and downspouts (DS66).
- B. MM Systems - Product: Standard gutter and downspout.

2.02. MATERIALS

- A. Aluminum Sheet - ASTM B209, aluminum alloy, .040-inch thick; plain finish, shop pre-coated with Kynar 500 coating of color selected by Engineer.

2.03. COMPONENTS

- A. Downspouts - SMACNA square profile.
- B. Accessories - Profiled to suit gutters and downspouts.

2.04. ACCESSORIES

- A. Anchorage Devices - Heavy duty type recommended by manufacturer.
- B. Downspout Supports - Brackets and straps; type recommended by manufacturer.
- C. Fasteners - Stainless steel with soft neoprene washers.
- D. Protective Back Coating - FS TT-C-494, bituminous.

2.05. FABRICATION

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; solder seal watertight.

2.06. FINISHES

- A. Superior Performance Organic Coatings
 - 1. Comply with requirements of AAMA 2605.
 - 2. Color - As required by the Exterior Color and Finish Schedule on the Drawings.
- B. Apply bituminous protective backing on surfaces in contact with dissimilar materials.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that surfaces are ready to receive work.

3.02. INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions for a secure installation.
- B. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- C. Slope gutters 1/8 inch per foot minimum.
- D. Seal metal joints watertight.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Furnish and install joint sealers and accessories in accordance with the Contract Documents including, but not limited to the following:
 - 1. Sealants and caulking for non-submerged uses.
 - 2. Backer rods and accessories.

1.02. RELATED SECTIONS

- A. Section 07190 – VAPOR AND AIR BARRIERS
- B. Section 08390 – WATERTIGHT (FLOOD) DOORS
- C. Section 09900 – PAINTING
- D. Section 10441 – SIGNS

1.03. REFERENCES

- A. ASTM C834 - Standard Specifications for Latex Sealants.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- E. SWRI - Sealant, Waterproofing Restoration Institute. ANSI A117.1 – Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People

1.04. SUBMITTALS

- A. Provide in accordance with Section 01300, Submittals, and as supplemented herein. Submittals shall include, but not be limited to, the following:
 - 1. Manufacturer's Product Data – Manufacturer's literature describing performance characteristics validating product compliance with performance criteria specified and application procedures.
 - 2. Samples – Submit samples illustrating manufacturer's extended color range.

1.05. QUALITY ASSURANCE

- A. Manufacturer Qualifications - Company regularly engaged in manufacturing and marketing of products specified in this section.

- B. Installer Qualifications - Qualified to perform work specified by reason of experience or training provided by product manufacturer.
- C. Installation per manufacturer's instructions and SWRI.
- D. Perform acoustical sealant application work in accordance with ASTM C919.

1.06. DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.
- B. Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight in strict accordance with manufacturer's recommendations.
- C. Condition products to approximately 60 to 70 degrees F for use in accordance with manufacturer's recommendations.
- D. Handle all products with appropriate precautions and care as stated on Material Safety Data Sheet.
- E. Do not use material that has exceeded manufacturer's shelf life.

1.07. PROJECT CONDITIONS

- A. Do not use products under conditions of precipitation or freezing weather. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.
- B. Ensure substrate is dry.
- C. Protect adjacent work from contamination due to mixing, handling, and application of flexible epoxy joint filler.

1.08. WARRANTY

- A. Provide manufacturer's five-year standard material warranty.
- B. Include coverage for replacement of sealant materials which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

1.09. COORDINATION

- A. Coordinate the work of this section with all sections referencing this section or referenced by this section.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Provide all joint sealers of the same type from a single manufacturer.
- B. Provide USDA and NSF approved sealants when indicated.

2.02. MATERIALS AND MANUFACTURERS

- A. Multi-Component, Non-Sag Polyurethane Sealant - Sika "Sikaflex 2cNS," BASF "Sonolastic NP 2," or equal with +50 percent movement capability for vertical joints; ASTM C920, Type M, Grade NS, Class 25. USDA approved; SWRI validated; UL classified (fire resistance).
- B. Two-Component, Self-Leveling Polyurethane Sealant - Sika "Sikaflex 2cSL," BASF "Sonolastic SL 2," or equal with +25 percent movement capability for horizontal joints; ASTM C920, Type M, Grade P, Class 25; USDA approved.
- C. Silicone Sealant - Sika "SikaSil C990 or 995," BASF "OmniPlus or Omniseal," Pecora "864," or equal. ASTM C920, Type S, Grade NS, Class 25 or 50.
- D. Single-Component Siliconized Acrylic Latex Sealant – BASF "Sonolac," Bostik "Chem-Calk 600," Pecora "AC 20+ Silicone," or equal with +15 percent movement capability; ASTM C834.
- E. Single-Component Non-Sag Acrylic Latex Sealant - USG "Sheetrock Acoustical Sealant," Pecora "AC20 FTR," or equal. ASTM C834; SWRI validated; UL classified (fire resistance).
- F. Single-component pre-pressurized expanding polyurethane foam sealant equal to Sika "Sika Boom."

2.03. ACCESSORIES

- A. Low VOC Primer - As recommended by manufacturer for particular sealant and substrate.
- B. Joint Cleaner - Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.
- C. Soft Backer Rod - Industrial Thermo Polymers Limited "104 Soft-Type Backer Rod," Backer Rod Mfg. Inc. "Denver Foam" or equal; non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants.
 - 1. Comply with ASTM C1330.
 - 2. Size required for joint design.
- D. Closed-Cell Backer Rod - Industrial Thermo Polymers Limited "101 Standard Backer Rod," Deck-o-Seal "Kool-Rod" or equal closed-cell polyethylene rod designed for use with cold-applied joint sealants for on-grade or below-grade applications.
 - 1. Comply with ASTM C1330.
 - 2. Size required for joint design.
- E. Joint Filler - Canzac "Expansion Joint Filler," Sonneborn(R)/ChemRex "Expansion Joint Filler," or equal closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than 1/4 inch (6 mm).
 - 1. Size required for joint design.
- F. Bond Breaker - Pressure-sensitive tape recommended by sealant manufacturer to suit application.

2.04. COLOR

- A. Sealant Colors – From manufacturer's extended range of colors. Match to adjacent materials as directed by the Schedule of Joint Sealers at the end of this section.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Inspect all areas involved in work to establish extent of work, access, and need for protection of surrounding construction.
 - 1. Verify that substrate surfaces and joint openings are ready to receive work.
 - 2. Verify that joint backing and release tapes are compatible with sealant.

3.02. PREPARATION

- A. Remove loose materials and foreign matter which impair adhesion of joint filler.
- B. Clean joints and saw cuts by grinding, sandblasting, or wire brushing to expose a sound surface free of contamination and laitance. Prime joints.
- C. Ensure structurally sound surfaces, dry, clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing, curing and parting compounds, membrane materials, and other foreign matter.
- D. Where the possibility of joint filler staining of adjacent areas or materials exists, mask joints prior to application.
 - 1. Do not remove masking tape before joints have been tooled and initial cure of joint filler has taken place.
 - 2. Work stained due to failure of proper masking precautions will not be accepted.

3.03. INSTALLATION

- A. Back-Up Material
 - 1. Install appropriate size backer rod, larger than joint where necessary according to manufacturer's recommendations.
 - 2. Install polyethylene joint filler in joints wider than 1/4 inch (6 mm) to back-up material per manufacturer's recommendations.
 - 3. Do not install epoxy joint filler over backer rod
- B. Bond Breaker - Install bond-breaker strip in joint to be sealed on top of back-up material to prevent adhesion of sealant to back-up material. Install per manufacturer's recommendations.
- C. Sealant
 - 1. Prepare sealants that require mixing. Follow manufacturer's recommended procedures, mixing thoroughly.

2. Mix only as much material as can be applied within manufacturer's recommended application time period.
 3. Apply materials in accordance with manufacturer's recommendations. Take care to produce beads of proper width and depth, tool as recommended by manufacturer, and immediately remove surplus sealant.
 4. Apply materials only within manufacturer's specified application life period. Discard sealant after application life is expired or if prescribed application period has elapsed.
- D. Expansion Joint Systems - Install per manufacturer's instruction for the system as shown on Drawings and as required by substrates and conditions encountered.

3.04. CLEANING

- A. Remove uncured sealant and joint filler with sealant manufacturer's recommended solvent. Remove cured sealant and joint filler by razor, scraping, or mechanically.
- B. Remove all debris related to application of sealants from job site in accordance with all applicable regulations for hazardous waste disposal.

3.05. SCHEDULE OF JOINT SEALANTS

SEALANT TYPE	LOCATIONS FOR APPLICATION	COLOR	COMMENTS
Two-component, non-sag polyurethane (UL classified)	Metal or FRP door, window, or louver frames at masonry openings	Match frame color	Prime frame as recommended by sealant manufacturer for particular factory finish
Multi-component, non-sag polyurethane	Vertical control or movement joints in masonry	Match mortar color	
Two-component, self-leveling polyurethane sealant	Control, movement, or perimeter joints in horizontal concrete	Match finished concrete color	
Silicone sealant	Glass at metal	Clear	
Silicone sealant	Plumbing fixtures abutting other materials	Match color of plumbing fixture	
Single-component acrylic latex	Intersections of non-structural interior finish materials	White	Paint to match adjacent material
Single-component, non-sag acrylic latex (UL classified)	Acoustical sealant in non-visible uses at base and top of M.S/drywall partitions	Manufacturer's standard	
Polyurethane foam sealant	Gaps at windows, doors, louvers, and other openings	--	--

END OF SECTION

SECTION 08390

WATERTIGHT (FLOOD) DOORS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Stainless steel watertight (flood) doors with frames and hardware.
- B. Design by manufacturer to meet specified performance requirements.
- C. Field testing of door installation, including wet testing as described in Part 3 of this section.

1.02. RELATED SECTIONS

- A. Section 05500 - MISCELLANEOUS FABRICATIONS

1.03. REFERENCES

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures including Supplement No. 1 and excluding Chapter 14 and Appendix 11A.
- B. ASCE 24 - Flood Resistant Design and Construction.
- C. ASTM A36 - Standard Specification for Carbon Structural Steel.
- D. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- E. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
- F. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- G. AISI CL 304 - American Iron and Steel Institute.
- H. ASME Structural Welding Code Section IX.
- I. AWS D1.1 - Structural Welding Code - Steel.
- J. 2010 Building Code of New York State, Section 1612 Flood Loads.
- K. FEMA 543 - Design Guide for Improving Critical Facility Safety from Flooding and High Winds.
- L. FM Approvals Class Number 2510 - Approval Standard for Flood Abatement Equipment.

1.04. PERFORMANCE REQUIREMENTS

- A. Calculate design loads in conformance with Section 1612 of the 2010 Building Code of New York State.

- B. Design safety factor for all watertight door flood door models of a minimum 2:1. Base on material ultimate yield strengths.
- C. Design safety factor for anchors, minimum of 4:1 for cast-in-place concrete, or minimum of 6:1 for clay brick masonry unit construction.
- D. Door, door frame and gasketing design to have been tested and passed FM Approvals Class Number 2510 testing at a water elevation of no less three feet. Deviations from tested design are to be limited to additional internal reinforcing and additional anchorage as required to meet the structural requirements stated above.

1.05. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Testing Data - Submit evidence of passing FM Approvals Class Number 2510.
- C. Product Data - Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions.
- D. Shop Drawings - Provide shop drawings showing layout, profiles, and product components, including anchorage, hardware, and finishes. Include dimensional plans, applicable material specifications, elevations and sections detailing mounting and connections, and load diagrams.
- E. Closeout Submittals - Provide operation and maintenance data to include methods for maintaining installed products, precautions against cleaning materials and methods detrimental to finishes and performance.
- F. Manufacturer's Certificates - Certify products meet or exceed specified requirements.

1.06. QUALITY ASSURANCE

- A. Manufacturer Qualifications - Manufacturer must demonstrate a minimum of five years' successful experience in design and manufacture of similar flood related closures. Upon request, provide supporting evidence including list of installations, descriptions, name and method of contact.
- B. Welder Qualifications - Welders Certified in accordance with American Welding Society Procedures: AWS-1-GMAW-S, WPS No. B2.004.90 for applicable material used in production of specified product.

1.07. DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging container with identification labels intact until ready for installation.
- B. Protect materials from exposure to moisture.

- C. Store materials in a dry, warm, ventilated weathertight location. If outdoor storage is required, block materials to store at an incline, to prevent pooling of any moisture and promote runoff. Tarp materials in a tent-like arrangement, elevated above the product with open sides to allow airflow. Store all other hardware in a dry controlled environment.
- D. Use caution when unloading and handling product to avoid bending, denting, crushing, or other damage to the product.
- E. When using forklifts, use forks of proper length to fully support product being moved. Consult shop drawings or consult with factory for proper lift points.

1.08. PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09. COORDINATION

- A. Coordinate work with other operations and installation of adjacent materials to avoid damage.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Basis of Design Manufacturer - PS DOORS, located at 1150 South 48th Street, Grand Forks, ND 58201; toll-free Tel: 800-284-0623; Tel: 701-746-4519; Fax: 701-746-8340; Email: 4info@psdoors.com; Web: www.flooddoors.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600, Materials and Equipment.
- C. Obtain all watertight (flood) doors and door assemblies from single manufacturer.

2.02. EQUIPMENT

- A. Watertight Doors - Provide the following doors:
 - 1. Side-hinged Door, Mechanical Room Flood Door - PS DOORS Model PD 520R.
- B. Products Details
 - 1. Sealing Requirements - Door and gasket design shall provide an effective barrier against short-term high water situations, to the protection level indicated in Article 1.04 of this section.
 - 2. Operation - Provide with latching operable from both sides.
 - 3. Mounting/Load Transfer - Anchor to existing structure. Flood door shall be designed for specified hydrostatic pressure and other loads as specified and will transfer loads to adjacent structure.
 - 4. Frames to be anchored utilizing mechanical, chemical or other anchor types as designed. Manufacturer to include all anchors, waterstop, and sealants as designed.

5. Loading Direction Selection - Positive pressure loading (direction of loading against flood door so as to further compress gaskets against flood door frame-"seating").
6. Provide rectangular door opening with square corners to facilitate easy passage.
7. Provide compression gasket which requires no inflation.

2.03. MATERIALS

A. Door

1. Stainless Steel - Stainless steel conforming to ASTM A276.
2. Aluminum - 6063 alloy conforming to ASTM B211.

B. Panel Sheeting - Flood door to be sheeted with stainless steel sheeting or plate:

1. Stainless Steel - Stainless steel conforming to ASTM A316 alloy with welded construction.

C. Gaskets to be factory mounted to flood door assembly. Gaskets to be compressible rubber type, typically EPDM unless otherwise noted and to be field replaceable.

D. Frame to include jamb, head, and sill members for field locating and installation on structure. Jamb members to be designed and fabricated with appropriate material as required for the loading.

1. Stainless Steel - Stainless steel conforming to ASTM A167 using 316 alloy with welded construction

E. Threshold

1. Aluminum - 6063T-5 alloy conforming to ASTM B26.

F. Frame Mounting Hardware - Provide anchors, sealant, and waterstop as required.

G. Operating Hardware - Provide hardware sized for the size and weight of the door and all loads. Hardware to be factory located on jambs and door panels, as practical. All loads are transferred to building structure. Flood door panel to be factory prepared for applicable latching devices.

1. Stainless steel latching and locking hardware provided by door manufacturer.
 - a. Door to be operable, without the use of tools or special mechanisms, from the interior at all times, regardless of lock status.
 - b. Door to be lockable by key from the exterior, and lock is to be equipped with an interchangeable lock core compatible with the Owner's master key system.
 - c. Door is to be capable of secure latching from the exterior without the use of tools or special mechanism.
2. Hinges - Continuous hinge, sized for weight of door, of manufacturer's standard.

- H. Stainless steel and aluminum products to be mill finish, welds are ground smooth, not polished, and are factory acid washed, neutralized and rinsed.
 - 1. Doors are to be field-painted with System M-4 as specified in Table A-1 in Section 09900.
 - a. Color to be selected by Owner.
 - 2. Do not paint hinges, hardware, or any labels attached to doors.
- I. Labeling - Each watertight door and frame will be individually identified for matched installation.
- J. Instruction Placard - Provide pictorial and written operation instruction placards on flood door.

2.04. FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02. PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03. INSTALLATION

- A. Install in accordance with manufacturer's installations instructions, approved shop drawings, shipping, handling, and storage instructions, and product carton instructions for installation.
- B. Frames shall be installed level, square, plumb, and rigid.
- C. Sealants, waterstop, and grouting to be applied per product application directions and in accordance with manufacturer's instructions.
- D. Field grouting to be completed by appropriate personnel, and in accordance with product application directions and manufacturer's instructions.

- E. Tolerances - All dimensional requirements must be in accordance with manufacturer's installation instructions and shop drawings.
- F. Field Testing
 - 1. Dry Testing - Perform visual dry test for gasket alignment, continuity contact, and pre-compression.
 - 2. Wet Testing - Confine standing water from the door sill up to the dry floodproofing elevation for duration of not less than six hours. Identify any leaks and repair installation to eliminate leaks. Contractor is responsible for all materials, labor or equipment required to complete wet testing for each door.

3.04. FIELD QUALITY CONTROL

- A. Manufacturer's representative to verify that installation of assembly and that the perimeter conditions are in conformance to the manufacturer's recommendations.
- B. Products to be operated and field verified including the sealing surfaces to assure that they maintain contact at the correct sealing points.
- C. Verify that hinging and latching assemblies operate freely and correctly.
- D. Verify all anchorage is in accordance with manufacture's installation instructions and applicable data sheets.

3.05. CLEANING

- A. Repair or replace damaged installed products or components.
- B. Clean all sealing surfaces.
- C. Touch up damaged finish.

3.06. PROTECTION

- A. Protect installed products until completion of project.
- B. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

A. Field preparation and painting of:

1. Surfaces and materials indicated to receive paint on the Contract Drawings.
2. Equipment and surfaces listed in Table A-2, Equipment Finish Schedule.
 - a. Any equipment, whether listed in Table A-2 or not, that is not provided by its manufacturer with surface preparation, prime coat, and finish coats suitable to protect the equipment for its service life in the environment where it is to be installed.
 - b. In addition to all new piping, all existing interior piping to remain in buildings in which work is being performed shall be repainted and relabeled in accordance with the provisions listed herein.
3. All miscellaneous steel fabrications, steel stairs and structural steel. This includes galvanized steel where a paint finish is called for in schedules, on Drawings, or in the specifications. Stainless steel is not to be painted except where specifically noted or scheduled.
4. Any equipment or fabrications where field preparation or painting is called for in the specification for that equipment or fabrication.
5. Any surface or object indicated as painted in the Drawings.

B. Work not to be painted under this section includes:

1. Any surfaces not listed, specified, noted or scheduled to receive paint as listed in paragraph 1.01.A.
2. Cast-in-place concrete surfaces scheduled, specified, or noted to receive other finishes specified in Section 03001, Concrete, and 03481, Precast Concrete Wet Wells.
3. Clay masonry or concrete masonry unless specifically scheduled or called out.
4. Factory finished interior or exterior equipment, furnishings or materials except as listed in paragraph 1.01.A.
5. Safety labels, equipment tags, UL, or other standards compliance certification labels, or other features required to be visible to meet codes or regulations, or to facilitate equipment operation.

1.02. RELATED SECTIONS

A. Section 03001 - CONCRETE

B. Section 03481 - PRECAST CONCRETE WET WELLS

C. Section 05500 - MISCELLANEOUS FABRICATIONS

1.03. REFERENCES

ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D522	Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings (Method A, Conical Mandrel)
ASTM D870	Standard Practice for Testing Water Resistance of Coatings Using Water Immersion
ASTM D1014	Standard Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates
ASTM D1653	Moisture Vapor Transmission
ASTM D2794	Impact
ASTM D3363	Hardness
ASTM D4541	Adhesion (Type II Fixed Alignment Adhesion Tester)
ASTM D4541	Adhesion (Type V Self-Aligning Adhesion Tester)
ASTM D4585	Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation
ASTM D16	Standard Terminology for Paint-Related Coatings, Materials, and Applications
ASTM D4060	Abrasion Resistance (CS-17 Wheel, 1000 Grams Load)
ASTM D3359	Adhesion by Tape Test
ASTM G53	QUV Exposure (UVA-340 Bulbs, 4 Hours Light, 4 Hours Dark)
ASTM G85	Prohesion
NACE	NACE International (formerly "National Association of Corrosion Engineers") – certification program
NSF International	ANSI/NSF Standard 61
SSPC-Volumes 1 and II	Steel Structures Painting Council - Steel Structures Painting Manual
SSPC-SP1	Solvent Cleaning
SSPC-SP2	Hand Tool Cleaning
SSPC-SP3	Power Tool Cleaning
SSPC-SP5	White Metal Blast Cleaning
SSPC-SP6	Commercial Blast Cleaning
SSPC-SP7	Brush-Off Blast Cleaning
SSPC-SP10	Near-White Metal Blast Cleaning
SSPC-SP11	Power Tool Cleaning to Bare Metal
SSPC-SP13 / NACE No. 6	Surface Preparation of Concrete
NSF (National Sanitation Foundation)	

1.04. DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.05. SUBMITTALS

- A. Submit, for approval, painting experience record of proposed subcontractor/Contractor for approval. The subcontractor/Contractor shall have a minimum five years' experience and list projects of three projects similar size and type that have been successfully completed within the past five years.
- B. Submit a complete schedule of paint systems and surface preparations proposed.
 - 1. List all interior and exterior surfaces and all major equipment to be painted.
 - 2. The schedule is to reflect the approved manufacturer's recommendations. Schedule shall include certification that a qualified manufacturer's representative has reviewed and approved the schedule. The qualified manufacturer's representative shall hold current NACE certification as a Coating Inspector, Protective Coatings Specialist, or Materials Selection/Design Specialist.
 - 3. As a minimum, schedule shall itemize each painted item or surface and shall contain the following information in the tabular format provided at the end of this section:
 - a. Type of surface preparation (note whether shop or field preparation).
 - b. Paint system (generic name).
 - c. Prime coat (product, number of coats, dry mil thickness per coat, square feet coverage per gallon).
 - d. Intermediate coat, if required (product, number of coats, dry mil thickness per coat, square feet coverage per gallon).
 - e. Finish coat (product, number of coats, color, dry mil thickness per coat, square feet coverage per gallon).
 - f. Painting status at time of installation.
 - g. Remarks (any special treatment or application requirements, etc.)
 - 4. The schedule shall contain the name of the paint manufacturer and name, address, and telephone number of the manufacturer's representative who will inspect the work. The schedule shall be in conformance with the criteria of Table A-1 and the schedules contained in the architectural drawings. Manufacturer's recommended dry mil thickness shall be incorporated into the schedule. Schedule shall be submitted to the Engineer as soon as possible following the award of Contract so that the approved schedule may be used to identify colors and to specify shop paint systems for fabricated equipment.
- C. Submit color chips for selection. Color names and/or numbers shall be identified according to the appropriate color chart published by the manufacturer.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Paint and paint products shall be as designated for the following uses and as manufactured by the following manufacturers or approved equal:
 - 1. Industrial/Commercial - Materials shall be products listed in this Section or equivalent as submitted per Section 01300, Submittals, and approved by Engineer.
 - 2. Wood Stains - Materials shall be as listed in this Section or equivalent as submitted per Section 01300, Submittals, and approved by Engineer.

- B. Equivalent materials of other manufacturers may be substituted only by approval of Engineer. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended dry film thicknesses.
 - 1. Requests for substitution shall also include a list of five projects where each product has been used and rendered satisfactory service; which list shall include the following information:
 - a. Name and location of the project.
 - b. A contact (name and telephone number) at the project who is in a position to be aware of the performance of the proposed coatings; typically the maintenance director or superintendent of buildings and grounds.
 - c. Information about which coatings were used on which surfaces at the referenced project.
 - 2. No request for substitution shall be considered that does not provide equal or better performance than the specified products. Provide manufacturer's certified test reports of characteristics relevant to the proposed product installation, showing that substitute product(s) equal or exceed performance of specified products as tested according to the standards listed below, or tests of equal relevance and severity:
 - a. ASTM D5894 – Corrosion Weathering (cycle testing)
 - b. ASTM D522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings (Method A, Conical Mandrel).
 - c. ASTM D870 - Standard Practice for Testing Water Resistance of Coatings Using Water Immersion.
 - d. ASTM D1014 - Standard Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates.
 - e. ASTM D4060 - Abrasion Resistance: CS17 wheel, 1000 cycles, 1 kg load.
 - f. ASTM D4541 - Abrasion Resistance.
 - g. ASTM D5894 – Adhesion.
 - h. ASTM D4585 – Humidity Resistance.

Products for each specified function and system shall be of a single manufacturer.

3. Where thinning is necessary, only the products of the particular manufacturer furnishing the paint shall be used and all such thinning shall be done in strict accordance with the manufacturer's instructions.

C. Products for each specified function and system shall be of a single manufacturer.

D. Where thinning is necessary, only the products of the particular manufacturer furnishing the paint shall be used, and all such thinning shall be done in strict accordance with the manufacturer's instructions.

2.02. MATERIAL

A. Paint - Refer to Table A-1, Coating System Schedule.

B. All materials which will be in contact with potable water shall be approved by the NSF and appropriate state and local health departments. Contractor shall submit evidence of approval for all applicable materials.

C. All materials used on this project, whether shop applied by equipment manufacturer or field applied by Contractor, shall comply with all current federal, state and local Clean Air Act-related regulations. It shall be the responsibility of equipment manufacturers to comply with laws in effect at their painting facilities. Where laws or regulations prohibit field applications of any scheduled paint product, Contractor shall submit for Engineer's approval, an alternate product of similar performance characteristics which complies with those laws. If approved, those products shall be provided at no additional cost to the Owner.

PART 3 EXECUTION

3.01. EXAMINATION

A. Ensure that substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Correct any condition that may potentially affect proper application.

3.02. SURFACE PREPARATION

A. All surfaces to be painted shall be prepared with the objective of obtaining a clean and dry surface free from dust, rust, scale and all foreign matter. No painting shall be done before surfaces meet requirements of paint manufacturer.

B. Hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place prior to cleaning and painting, and not intended to be painted, shall be protected or removed during painting operations and repositioned upon completion of painting operations.

C. All surface preparations shall be in strict accordance with the recommendations of the paint manufacturer.

- D. Ferrous Metals
1. All ferrous metal to be primed shall have all rust, dust, and scale removed by abrasive blast cleaning in accordance with The Society for Protective Coating procedures designated in the specifications or on Contract Drawings. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent rusting. If rusting beyond ASTM Rust Grade 8 occurs in the field, rusted portions of shop-primed ferrous metals shall be field-cleaned in accordance with SSPC blast cleaning specification appropriate for service and immediately field primed.
 2. All ferrous metals not primed in shop shall be abrasive blast cleaned to SSPC-SP10 Near White Blast or an SSPC-SP6 Commercial Blast, depending on exposure, prior to application of any primer, pretreatment, or paint. Any coating in immersion service requires at minimum SSPC-SP10 Near White Blast.
- E. Nonferrous Metals - All nonferrous metals, whether shop or field primed, shall be solvent cleaned (SSPC-SP1) prior to application of primer. Galvanized steel surfaces scheduled for painting shall be uniformly abraded to create a surface profile of between 1.0 to 1.5 mils prior to the application of either the shop or field prime coat.
- F. Concrete - All concrete surfaces shall be cleaned of all dust, form oil, curing compounds, and other foreign matter before paints or coating are applied. Poured concrete and submerged surfaces to be painted shall be prepared using the following method:
1. Blasting - Abrasive blast-cleaning of concrete shall be performed in accordance with SSPC-SP13 Standard and sufficiently profiled in accordance with ICRI Concrete Surface Profile Standards as required by the coatings manufacturer. Care shall be taken during blasting that concrete is not eroded unnecessarily.
 - a. Dry abrasive blasting equipment with a compressed air blast nozzle shall be used for blasting concrete. After blast cleaning is completed, abrasive dust and loose particles shall be removed from surface by vacuuming and blowing off with high pressure air. Voids and cracks that will cause discontinuities in coatings or unsightly appearance shall be patched in accordance with related concrete sections.
 - b. All drains subject to abrasive spray, shall be plugged prior to blasting. After blasting is completed, all abrasive shall be removed from area prior to opening drains. Under no circumstances shall abrasive be allowed to enter drains.
- G. Wood - Wood surfaces shall be thoroughly cleaned and free of all foreign matter, with cracks, nail holes and other defects properly filled and smoothed. Wood trim shall be sandpapered lightly when dry, before a second coat of paint or stain is applied. All wood trim shall be primed and back primed before being set in place; all end grain and cut wood shall be thoroughly saturated with sealer before priming. After the prime coat on woodwork has dried, all nail holes, cracks, open joints, and other small holes shall be filled neatly with approved spackling putty. Exposed nails and other ferrous metals on surfaces to be painted with water-thinned paints shall be spot primed with aluminum paint.
- H. Prior Coating - Old paint surfaces on concrete, ferrous metal, and nonferrous metal shall be prepared by abrasive blast cleaning in accordance with proper SSPC method for the service.
- I. Touchup - Any abraded areas of shop or field applied coatings shall be touched up with the same type of shop or field applied coating, even to the extent of applying an entire coating, if

necessary. Touchup coatings and surface preparations shall be in addition to and not considered as the first field coat.

- J. Castings (cast ferrous and nonferrous metals) - Surfaces of castings shall be prepared for painting by using a brush-applied filler and/or knife-applied filler, as required. These fillers are not to be used to conceal cracks, gas holes, or excessive porosity. Casting shall receive one coat of primer with a minimum thickness of 2 mils. Sufficient drying time must be allowed before further handling.
- K. Masonry - All masonry to be painted shall be prepared as listed in Table A-1.
- L. Gypsum Board - All gypsum board surfaces shall be finished to the ASTM C840 level specified in Section _____. Before painting, such surfaces shall be dry, clean and free from grit, loose materials, and surface irregularities. Cracks and holes shall be repaired with approved patching materials, properly keyed to existing surfaces and sandpapered smooth.

3.03. APPLICATION

- A. Contractor shall be responsible for cleanliness of all painting operations and use covers and masking tape to protect work. Contractor shall protect not only his own work, but also all adjacent work and materials by adequate covering with drop cloths.
- B. Contractor shall maintain a daily epoxy coatings induction record (log) showing each epoxy paint mixing event in the format demonstrated at the end of this section. A signed copy of this log shall be turned over to the Engineer's field representative before the end of each working day during which epoxy coatings are mixed or applied.
- C. Any unwanted paint shall be carefully removed without damage to finished paint or surface. If damage does occur, the entire surface adjacent to and including damaged area shall be repainted without visible lap marks.
- D. Do not use plumbing fixtures or waste piping for mixing of paint or disposal of any refuse material. All waste shall be disposed of properly into a suitable receptacle located outside of building.
- E. All paint shall be applied without runs, sags, thin spots, or unacceptable marks. Paint shall be applied at the rate specified to achieve minimum dry mil thickness required. Additional coats of paint shall be applied, if necessary, to obtain dry film thickness specified.
- F. Dry film thickness requirements shall be determined in accordance with SSPC-PA2 Procedure for Determining Conformance of Dry Coating Thickness.
- G. Application shall be by spraying where recommended by manufacturer. If material has thickened or must be diluted for application by spray gun, each coat shall be built up to the same film thickness achieved with undiluted brushed-on material. Where thinning is necessary, such thinning shall be done in strict accordance with manufacturer's instructions.
- H. A minimum of 24 hours drying time shall elapse between application of any two coats of paint on a particular surface, unless otherwise recommended by coating manufacturer. Longer drying times may be required for abnormal conditions in concert with manufacturer's recommendations.
- I. No painting whatsoever shall be accomplished in rainy or excessively damp weather when the relative humidity exceeds 85 percent, or when the general air temperature cannot be maintained at 50 degrees F (10 degrees C) or above throughout entire drying period.

- J. Apply color coding to all new piping, in accordance with Piping Color and Label Schedule and/or Engineer's instructions. Piping shall be painted solid colors unless otherwise specified.
- K. Apply identification labels to all types and sections of piping, as outlined herein. Such labels shall be in form of plain block lettering giving name of pipe content in full and showing direction of flow by arrows. All lettering shall have an overall height in inches, in accordance with the following table:

DIAMETER OF PIPE OR PIPE COVERING	HEIGHT OF LETTERING
3/4 to 1-3/8 inches	1/2 inch
1-1/2 to 2-3/8 inches	3/4 inch
2-1/2 to 7-7/8 inches	1-1/4 inches
8 to 10 inches	2-1/2 inches
Over 10 inches	3-1/2 inches

- L. Piping labels shall be located as follows:
 - 1. Adjacent to each valve and fitting (except at pump suction and discharge connections where labels are required on headers only).
 - 2. At each branch and riser take-off.
 - 3. Piping containing corrosive or hazardous chemicals shall be identified with labels every 10 feet, with at least two labels in each room, closet, or pipe chase.
 - a. Chemical piping labels shall include chemical name or common name. Chemical pipes under 6 CRR-NY shall adhere to the provisions therein.

3.04. FINISHING SHOP PRIMED EQUIPMENT

- A. All fabricated steel work and equipment scheduled to be delivered to job site shop primed, and scheduled for field finish painting, shall receive at factory at least one shop coat of approved prime paint compatible to be applied in concert with paint system required by these specifications. Surface preparation prior to shop painting shall be as scheduled in Table A-1. All shop primed items shall be properly packaged and stored until they are incorporated in work. Any primed surfaces that are damaged during handling, transportation, storage, or installation shall be cleaned, scraped, and patched before field painting begins so that work shall be equal to original painting at shop. Equipment or steel work that is to be assembled on the site shall likewise receive a minimum of one shop coat of paint at factory. Paint and surface preparation used for shop coating shall be identified on equipment shop drawings submitted to Engineer.
- B. Where exact identity of shop primer cannot be determined, or where primer differs from that specified, Contractor shall perform blast cleaning appropriate for service, followed by specified paint system. In lieu of above, Contractor has the option of shipping bare metal to job site and performing appropriate blast cleaning, followed by field prime coat of specified material immediately thereafter.

3.05. FIELD QUALITY CONTROL

- A. Prior to receiving a Certificate of Substantial Completion, Contractor shall arrange for manufacturer to inspect the application of his product and shall submit his report to Engineer identifying products used and verifying that said products were properly applied and that paint

systems were proper for the exposure and service. The manufacturer's representative shall also certify that all coats in each system are compatible with one another.

- B. Each field coat of priming and finishing paint shall be inspected by the Engineer or his authorized representative before the succeeding coat is applied. The Contractor shall follow a system of tinting successive paint coats so that no two coats for a given surface are exactly the same color. Areas to receive black protective coatings shall be tick-marked with white or actually gaged as to thickness when finished.

3.06. LEAD PAINT

- A. The Contractor is notified that lead paint has been found in painting systems at the subject work site. See the reports referenced in the Supplementary Conditions (SC-4.06).

3.07. SHOP PAINTING

- A. Shop painting of manufactured items (such as lockers, furnishings, and electrical and mechanical equipment) is not included in the scope of this work, unless specifically scheduled; as in the case of fabricated steel items (steel stairs, structural and miscellaneous steel, and steel doors and frames). Manufactured items shall be finished as noted in the specification section related to that item.

(continued)

TABLE A-1

COATING SYSTEM SCHEDULE

Non-Submerged Concrete Walls and Ceilings – Interior (paint only when scheduled in Table A-2 or on the architectural drawings)

SYSTEM C-1	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP 13 / NACE No.6			Allow concrete to cure 28 days prior to beginning coating operations
Prime coat	--	--	--	--
Intermediate coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69 Hi-Build Epoxoline II 3.5 - 5.0 mils	--
Finish coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69 Hi-Build Epoxoline II 3.5 - 5.0 mils	Total DFT – 8. mils, minimum

Concrete in Contact with Sewage (paint only when scheduled in Table A-2 or on the architectural drawings)

SYSTEM C-2	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP 13 / NACE No.6, Para. 4.3.1 Abrasive Sweep Blast ICRI 310.2 CSP 1 - 3			Allow concrete to cure 28 days prior to beginning coating operations
Prime coat	-	Amerlock 2/400 3.0 - 5.0 mils	Series N69 Hi-Build Epoxoline II 3.0 - 5.0 mils	--
Intermediate coat	--	--	--	--
Finish coat	Hi Mil Sher-Tar Coal Tar Epoxy 16.0 – 20.0 mils	Amercoat 78HB 16.0 - 20.0 mils	46H-413 Hi-Build Tneme-Tar 16.0 - 20.0 mils	Top of wall to 3 feet below water line. Total DFT-16 mils minimum

Concrete Block, Open Porous or Rough Masonry - Interior

SYSTEM C-3	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	Brush down with stiff bristle broom. Clean and dry.			Allow mortar joints to cure 28 days prior to beginning coating operations
Prime coat	Cement-Plex 875 Acrylic Block Filler 50 – 100 SF/gl.	Amerlock 400 BF	130-6602 Enviro-Fill 100-120 SF/gal	Fill all voids.
Intermediate coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400	Series N69 Hi-Build Epoxoline II 3.0-5.0 mils	--
Finish coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400	Series N69 Hi-Build Epoxoline II 3.0-5.0 mils	Total DFT – 16 mils minimum

TABLE A-1 (continued)

Concrete - Exterior (paint only when scheduled in Table A-2 or on the architectural drawings)

SYSTEM C-4	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP 13 / NACE No.6			Allow concrete to cure 28 days prior to beginning coating operations
Prime coat	ConFlex XL Textured High Build 98 – 131 SF/ gl	Perma-Crete Matte Flex 4-310 Series	Series 157-Color Enviro-crete 111-148 SF/gal	--
Intermediate coat	--	--	--	--
Finish coat	ConFlex XL Textured High Build 98 – 131 SF/gl.	Perma-Crete Matte –Flex 4-310 Series	Series 157-Color Enviro-crete 111-148 SF/gal	Total DFT – 12 mils minimum

Concrete in Contact with Raw or Potable Water (paint only when scheduled in Table A-2 or on the architectural drawings)

SYSTEM C-5	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP 13 / NACE No.6, Para. 4.3.1 Abrasive Sweep Blast, ICRI 310.2 CSP 1 - 3			Allow concrete to cure 28 days prior to beginning coating operations
Prime coat	Macropoxy 646 PW Epoxy, 231-385 SF/gl.	Amerlock 2	Series N149-15BL Pota-Pox Plus 214-357 SF/gal	Fill all voids.
Intermediate coat	Macropoxy 646 PW Epoxy, 231-385 SF/gl.	Amerlock 2	Series N140-1255 Pota-Pox Plus 178-268 SF/gal	--
Finish coat	Macropoxy 646 PW Epoxy, 192-289 SF/gl.	Amerlock 2	Series N140-1255 Pota-Pox Plus 178-268 SF/gal	Total DFT – 14 mils minimum

Non-Submerged Masonry Walls – Glazed Wall Finish - Interior

SYSTEM C-6	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	Brush down with stiff bristle broom. Clean and dry			Allow concrete to cure 28 days prior to beginning coating operations
Prime coat	Pro Industrial High Performance Epoxy 160 SF/gal	Amerlock 2/400	Series 104-color HS epoxy 110-125 SF/gal	--
Intermediate coat	--	--	--	--
Finish coat	Pro Industrial High Performance Epoxy 160 SF/gal	Amerlock 2/400	Series 104-color HS epoxy 125-150 SF/gal	Total DFT – 16 mils minimum

TABLE A-1 (continued)

Clay Brick, Exterior

SYSTEM B-1	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	Brush down with stiff bristle broom. Clean and dry (for existing brick: low-pressure application of biodegradable detergent followed by 4,000 psi pressure wash)			Allow mortar joints to cure 28 days prior to beginning coating operations
Prime coat	--	--	Series 633 – Prime-A-Pell H2O 125 - 200 SF/gal	--
Intermediate coat	Loxon Vertical Concrete Stain 150 – 250 SF/gal		Series 617 – Conformal Stain WB 150 - 200 SF/gal	--
Finish coat	Loxon Vertical Concrete Stain 150 – 250 SF/gal		Series 617 – Conformal Stain WB 150 - 200 SF/gal	--

Existing Clay Brick, Interior

SYSTEM B-2	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	Remove existing paint with 4,000 psi pressure wash			Allow brick to dry completely before application of new coatings
Prime coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils		Series N69 Hi-Build Epoxoline II 3.0 - 5.0 mils	--
Intermediate coat	--		--	--
Finish coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils		Series N69 Hi-Build Epoxoline II 3.0 - 5.0 mils	Total DFT – 6.0 mils minimum

Non-Submerged Ferrous Metal

SYSTEM M-1	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP6/NACE No.3 Commercial Blast Cleaning			Shop
Prime coat	Kem-Bond HS 2.0 – 3.0 mils	Amercoat 5105 Alkyd Primer 2.0 – 3.0 mils	Series V10 Tnemec Primer, 2.0-3.0 mils	Shop
Intermediate coat	Pro Industrial Acrylic 2.5 – 4.0 mils	Amercoat 220P 2.0 – 3.0 mils	Series 1029-Color Enduratone, 2.0-3.0 mils	--
Finish coat	Pro Industrial Acrylic 2.5 – 4.0 mils	Amercoat 220P 2.0 – 3.0 mils	Series 1029-Color Enduratone, 2.0-3.0 mils	Total DFT – 7.5 mils minimum

TABLE A-1 (continued)

General Ferrous Metal - Interior

SYSTEM M-2	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP6/NACE No.3 Commercial Blast Cleaning			Shop
Prime coat	Macropoxy 646 Fast Cure Epoxy 3.0 - 5.0 mils	Amerlock 2/400 3.0-5.0 mils	Series N69-1211 Hi-Build Epoxoline II 3.0-5.0 mils	Shop
Intermediate coat	Macropoxy 646 Fast Cure Epoxy 3.0 - 5.0 mils	Amerlock 2/400 3.0-5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	--
Finish coat	Macropoxy 646 Fast Cure Epoxy 3.0 - 5.0 mils	Amerlock 2/400 3.0-5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	Total DFT – 12 mils minimum

Submerged Ferrous Metal

SYSTEM M-3	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP10 /NACE No.2 Near white blast			Shop
Prime coat	Dura-Plate 235 Multi-Purpose Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-1211 Hi-Build Epoxoline II 3.0-5.0 mils	Shop
Intermediate coat	Dura-Plate 235 Multi-Purpose Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	--
Finish coat	Dura-Plate 235 Multi-Purpose Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	Total DFT – 12 mils minimum

General Ferrous Metal - Exterior

SYSTEM M-4	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP6/NACE No.3 Commercial Blast Cleaning			Shop
Prime coat	Macropoxy 646 Fast Cure Epoxy 3.0 - 5.0 mils	Amerlock 2/400 3.0 - 5.0 mils	Series N69-1211 Hi-Build Epoxoline II 3.0-5.0 mils	Shop
Intermediate coat	Macropoxy 646 Fast Cure Epoxy 3.0 - 5.0 mils	Amerlock 2/400 3.0 - 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	--
Finish coat	Hi-Solids Polyurethane 2.0 – 3.0 mils	Amercoat 450H 3.0 - 5.0 mils	Series N75-Color Endura-Shield II 2.0-3.0 mils	Total DFT – 10.5 mils minimum

TABLE A-1 (continued)

Ferrous Metal – Below Grade

SYSTEM M-5	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP6/NACE No.3 Commercial Blast Cleaning			--
Prime coat	--	--	--	--
Intermediate coat	--	--	--	--
Finish coat	Hi Mil Sher-Tar Coal Tar Epoxy 16.0 - 20.0 mils	Amercoat 78HB 16.0 - 20.0 mils	46H-413 Hi-Build Tneme-Tar 16.0 - 20.0 mils	Total DFT – 16.0 mils minimum

Ferrous Metal Moving Parts Submerged in Sewage

SYSTEM M-6	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP10 / NACE No.2 Near White Blast			Shop
Prime coat	Dura-Plate 235 Multi-Purpose Epoxy 3.0 – 5.0	Amercoat 240	Series N69-1211 (Red) Hi-Build Epoxoline II 3.0-5.0 mils	--
Intermediate coat	Dura-Plate 235 Multi-Purpose Epoxy 3.0 – 5.0 mils	--	--	--
Finish coat	Dura-Plate 235 Multi-Purpose Epoxy 3.0 – 5.0 mils	--	--	Total DFT – 12 mils, minimum

Ferrous Metal Submerged in Raw or Potable Water

SYSTEM M-7	SHERWIN-WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP10 / NACE No.2 Near White Blast			--
Prime coat	Macropoxy 646 PW Epoxy 3.0 – 5.0 mils	Amerlock 2 3.0 – 5.0 mils	Series N140-15BL Pota-Pox Plus 3.0-5.0 mils	--
Intermediate coat	Macropoxy 646 PW Epoxy 3.0 – 5.0 mils	Amerlock 2 3.0 – 5.0 mils	Series N140-1255 Pota-Pox Plus 4.0- 6.0 mils	--
Finish coat	Macropoxy 646 PW Epoxy 3.0 – 5.0 mils	Amerlock 2 3.0 – 5.0 mils	Series N140-15BL Pota-Pox Plus 4.0- 6.0 mils	Total DFT – 14.0 mils, minimum

TABLE A-1 (continued)

Uncertain Base Coat

SYSTEM M-8	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP1 Solvent cleaning & SSPC-2 Hand tool cleaning			Remove grease and oil. Scuff sand to dull gloss.
Prime coat	Macropoxy HS 3.0 – 4.0 mils	Amercoat 68MCZ 3.0 – 4.0 mils	Series 1 Omnithane 2.5-3.5 mils	Follow with appropriate system for exposure.
Intermediate coat	--	--	--	Delete normal specified primer
Finish coat	--	--	--	--

Aluminum Surfaces in Contact with Concrete

SYSTEM M-9	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP1 Solvent cleaning			--
Prime coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	--.
Intermediate coat	--	--	--	--
Finish coat	--	--	--	Total DFT – 5.0 mils minimum

Interior Insulated Piping

SYSTEM M-10	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	Clean and dry			--
Prime coat	Pro Industrial Acrylic 2.5 – 4.0 mils	Amercoat 220P 2.5 – 4.0 mils	Series 6-Color Tneme-Cryl 2.0 - 3.0 mils	--.
Intermediate coat	--	--	--	--
Finish coat	Pro Industrial Acrylic 2.5 – 4.0 mils	Amercoat 220P 2.5 – 4.0 mils	Series 6-Color Tneme-Cryl 2.0 - 3.0 mils	Total DFT – 5.0 mils minimum

TABLE A-1 (continued)

Non-Submerged Ferrous Metal – Extra Corrosion Protection - Exterior

SYSTEM M-11	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP6/NACE No.3 Commercial Blast Cleaning			Shop
Prime coat	Corothane 1 Galvapak Zinc 3.0 – 4.0 mils	Amercoat 68MCZ 3.0 – 4.0 mils	90-97 Tneme-Zinc 2.5 - 3.5 mils	Shop
Intermediate coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 4.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0 - 5.0 mils	--
Finish coat	Hi-Solids Polyurethane 2.0 – 3.0 mils	Amercoat 450H 3.0 – 4.0 mils	Series 1075-Color Endura-Shield II 2.0 - 3.0 mils	Total DFT – 9.5 mils minimum

Nonferrous Metal - Interior

SYSTEM M-12	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP1 Solvent Cleaning			--
Prime coat	Macropoxy 646 PW Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0 – 5.0 mils	--
Intermediate coat	--	--	--	--
Finish coat	Macropoxy 646 PW Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0 – 5.0 mils	Total DFT – 8.0 mils minimum

Nonferrous Metal - Exterior

SYSTEM M-13	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	SSPC-SP1 Solvent Cleaning			--
Prime coat	Macropoxy 646 PW Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	--
Intermediate coat	--	--	--	--
Finish coat	Hi-Solids Polyurethane 2.0 – 3.0 mils	Amercoat 450H 3.0 – 5.0 mils	Series 1075-Color Endura-Shield II 2.0-3.0 mils	Total DFT – 6.5 mils minimum

TABLE A-1 (continued)

Galvanized Steel - Exterior

SYSTEM M-14	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	ASTM D6386 Preparation of Zinc (Hot Dip Galvanized) Iron and Steel Product and Hardware Surfaces for Painting			--
Prime coat	Corothane I Galvapac Zinc 3.0 – 4.0	Amercoat 68MCZ 3.0 – 4.0	90-97 Tneme-Zinc 2.5 - 3.5 mils	Field Spot Repair Only
Intermediate coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 4.0	Series N69-Color Hi-Build Epoxoline II 3.0 - 5.0 mils	--
Finish coat	Hi-Solids Polyurethane 2.0 – 3.0 mils	Amercoat 450H 2.0 – 3.0	Series 1075-Color Endura-Shield II 2.0 - 3.0 mils	Total DFT – 8 mils minimum

Galvanized Steel - Interior

SYSTEM M-15	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	ASTM D6386 Preparation of Zinc (Hot Dip Galvanized) Iron and Steel Product and Hardware Surfaces for Painting			--
Prime coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	--
Intermediate coat	--	--	--	--
Finish coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0-5.0 mils	Total DFT – 8.0 mils minimum

Gypsum Board or Plaster Walls, Ceilings and Soffits – Interior/Exterior

SYSTEM G-1	SHERWIN WILLIAMS	PPG	TNEMEC	REMARKS
Surface preparation	Clean and dry			--
Prime coat	Pro Industrial Acrylic, 2.5 – 4.0	Amercoat 220P 2.0 - 3.0 mils	Series 6 Tneme-Cryl 2.0 - 3.0 mils	--
Intermediate coat	--	--	--	--
Finish coat	Pro Industrial Acrylic, 2.5 – 4.0	Amercoat 220P 2.0 - 3.0 mils	Series 6 Tneme-Cryl 2.0 - 3.0 mils	Total DFT – 5.0 mils minimum

TABLE A-1 (continued)

Gypsum Board Walls, Ceilings, and Soffits. High Performance - Interior

SYSTEM G-2	SHERWIN WILLIAMS	PPG		REMARKS
Surface preparation	Clean and dry			--
Prime coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0 – 5.0 mils	--
Intermediate coat	--	--	--	--
Finish coat	Macropoxy 646 Fast Cure Epoxy 3.0 – 5.0 mils	Amerlock 2/400 3.0 – 5.0 mils	Series N69-Color Hi-Build Epoxoline II 3.0 – 5.0 mils	Total DFT – 6.5 mils minimum

Natural Wood - Interior

SYSTEM W-1	SHERWIN WILLIAMS	PPG		REMARKS
Surface preparation	Clean and dry			--
Prime coat	Wood Classics Polyurethane Varnish	--	Varmor CF	--
Intermediate coat	-	Olympic Polyurethane Satin 43886	Varmor CF Satin	--
Finish coat	Wood Classics Polyurethane Varnish	Olympic Polyurethane Satin 43886	Varmor CF Satin	Total DFT – 6.5 mils minimum

Wood – Oil Base Stain – Exterior Semi-Transparent

SYSTEM W2	SHERWIN WILLIAMS	PPG	P&L	REMARKS
Surface preparation	Clean and Dry			--
Prime coat	WoodScapes Exterior Polyurethane Semi-Transparent Stain	Sun Proof Exterior Semi-Transparent Stain 77-1660	P&L Rustic	--
Intermediate coat	--	--	--	--
Finish coat	WoodScapes Exterior Polyurethane Semi-Transparent Stain	Sun Proof Exterior Semi Transparent Stain 77-1660	P&L Rustic	Total DFT – 4.2 mils minimum

TABLE A-1 (continued)

Wood – Acrylic or Oil Base Stain – Exterior Solid Color

SYSTEM W3	SHERWIN WILLIAMS	PPG	P&L	REMARKS
Surface preparation	Clean and Dry			--
Prime coat	WoodScapes Exterior Acrylic Solid Color Stain	Sun Proof Exterior Solid Color Stain 77-1110	P&L Solid Hide	--
Intermediate coat	--	--	--	--
Finish coat	WoodScapes Exterior Acrylic Solid Color Stain	Sun Proof Exterior Solid Color Stain 77-1110	P&L Solid Hide	--

Wood – Painted – Exterior

SYSTEM W4	SHERWIN WILLIAMS	PPG		REMARKS
Surface preparation	Clean and Dry			--
Prime coat	Exterior Oil-based Wood Primer 1.2 – 2.0 mils	Seal Grip 17-941NF 1.2 – 2.0 mils	Series 151-1051 Elasto-Grip PC	--
Intermediate coat	Super Paint 1.5 – 2.0 mils	Amercoat 220P 1.5 – 2.0 mils	Series 6-Color Tneme-Cryl 2.0 - 3.0 mils	--
Finish coat	Super Paint 1.5 – 2.0 mils	Amercoat 220 P 1.5 – 2.0 mils	Series 6-Color Tneme-Cryl 2.0 - 3.0 mils	Total DFT – 7.5 mils, mininum

NOTE: Table A-1 and the Equipment Finish Schedule (Table A-2) are not intended to list every structure or equipment item to be painted. Where painting is indicated on the Drawings or in the Specifications for any structures, equipment, or appurtenances; including all items furnished under the contract shall be painted by the Contractor, in accordance with the most applicable category from Table A-1. New concrete tanks are not to be painted unless specifically identified in the following tables or on the architectural drawings.

TABLE A-2

EQUIPMENT FINISH SCHEDULE

Building Name	Item Name	Paint System No.⁽¹⁾	Color⁽²⁾
Walden Woods Pump Station	Submersible grinder pumps	M-3	Blue
	Ferrous metal interior piping	M-2	Black
	Wet well	C-2	--
Jefferson Valley Pump Station	Pumps	M-3	Blue
	Channel grinder	M-3	Blue
	Ferrous metal interior piping	M-2	Black
	Wet well	C-2	--

- (1) Manufacturer shall provide the prime (shop) coating unless otherwise noted. All touch-up or field painting shall be by Contract No. 1.
- (2) Final colors to be selected by the Owner during shop drawing review.

PAINT SCHEDULE

Reviewed by Paint Mfg. Rep. _____

Interior or Exterior Surfaces to Be Painted and Major Equipment	Surface Preparation		Paint System	Prime Coat Product, No. of Coats, Dry Film Thickness, and Coverage	Intermediate Coat	Finish Coat	Painting Status	Remarks (Any Special Treatment or Application Requirements)
	Shop	Field		Color	Color	Color		

DAILY EPOXY COATINGS INDUCTION RECORD

Date	Product	Location	Ambient Temperature (°F)	Mix Start Time	Induction End Time	Total Induction Time Before Use

END OF SECTION

SECTION 10441

PLASTIC AND FIBERGLASS SIGNS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Engraved plastic and fiberglass signs with 1/32-inch Braille dots for visually-impaired persons.

1.02. REGULATORY REQUIREMENTS

- A. Conform to Americans with Disabilities Act (ADA) requirements as they pertain to areas of access for visually-impaired persons.

1.03. DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600, Materials and Equipment.
- B. Store and protect products under provisions of Section 01600, Materials and Equipment.
- C. Package signs, labeled in name groups.

1.04. ENVIRONMENTAL REQUIREMENTS

- A. Do not install signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Best Manufacturing Company - Products: HC300E MP or fiberglass for room designations and Type MP for safety/equipment signs.
 - 1. Interior Room Designation Signs - Laminated colored plastic; in black face color. Size to be 10 inches x 3 inches of 1/8-inch thick material. Room names shall be 5/8-inch high standard bold condensed upper case raised white letters. Standard 3/8-inch border and 1/2-inch radius corners; mounted with vinyl foam tape. Include Braille dots.
 - 2. Exterior Room Designation Signs - Laminated colored fiberglass; in black face color. Size to be 10 inches x 3 inches of 1/8-inch thick material. Room names shall be 5/8-inch high standard bold condensed upper case raised white letters. Standard 3/8-inch border and 1/2-inch radius corners; mounted with silicone backing cement and stainless steel one-way screws and expansion shields.
 - 3. Safety/Equipment/Door Signs - Laminated colored plastic, in red face color. Size shall be proportional to message of 1/8-inch thick material. Danger and Safety/Equipment signs to 1-inch high and "FIRE DOOR" signs shall be 1/2-inch high standard bold condensed upper case raised white letters. No border or radius corners required; attach Danger and Safety/Equipment signs with stainless steel

mounting hardware. Mount "FIRE DOOR" signs with vinyl foam tape. Include Braille dots.

- a. Tape Adhesive - Double sided tape with permanent adhesive; 1/16-inch vinyl foam for wall or door mounting.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts existing surfaces.

3.02. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install signs after doors, and surfaces are finished, in locations as directed.
- C. Center sign on door, level.
- D. Clean and polish.

3.03. SCHEDULES

- A. Room Designation Signs - Black face color with room names per "Remarks" column entries on Door and Hardware Schedule.
- B. Provide red "NON-POTABLE WATER - DO NOT DRINK" safety signs at the following locations:
 1. Hose bibbs.
 2. Yard hydrants.
 3. All other locations providing non-potable or effluent water sources.

END OF SECTION

SECTION 11207

PARSHALL FLUME

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Furnish, install, and test one Parshall flume system, complete with staff gauge, all mounting brackets, hardware, and all other required accessories for a complete and operable installation in accordance with the Contract Documents.

1.02. RELATED SECTIONS

- A. The specification sections listed below are an integral part of this equipment specification and the Contractor shall be responsible for providing these sections to the equipment suppliers.
 - 1. Section 17300 – ULTRASONIC LEVEL SENSORS

1.03. REFERENCES

- A. ASTM D638 - Standard Test Method for Tensile Properties of Plastics
- B. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- C. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

1.04. PERFORMANCE REQUIREMENTS

- A. The Parshall flume system shall be furnished and installed in accordance with the following data:
 - 1. Throat Width - 1 foot.
 - 2. Channel Width - 2 feet.
 - 3. Capacity of Flume
 - a. Minimum Flow - 0.1 mgd.
 - b. Maximum Flow – 2.0 mgd.

1.05. SUBMITTALS

- A. Provide in accordance with Section 01300, Submittals; Section 01640, Equipment-General; and as supplemented herein. Submittals shall include, but not be limited to, the following:
 - 1. Shop drawings.
 - 2. Certified flow data at 0.1-foot intervals.
 - 3. Certificate of equipment compliance.

4. Manufacturer's installation certificate.
 5. Field testing results.
 6. In addition to submittal requirements specified in related sections, submittals shall include, but not be limited to, test results of fiberglass reinforced plastic laminate, critical dimensions, jointing and connections, fasteners and anchors, materials of construction, sizes, spacing, and location of structural members, connections, attachments, openings, and colors
- B. Provide operation and maintenance manuals and data where scheduled in Section 01640, Equipment-General.

1.06. EQUIPMENT WARRANTIES AND SPECIAL GUARANTEES

- A. The supplier shall provide the following warranties and special guarantees in accordance with Sections 01600, Materials and Equipment, and 01640, Equipment-General.
1. The manufacturer shall guarantee for a period of three years starting at the time of equipment delivery to the job site or one year starting at the time of Substantial Completion (whichever is shorter), that the equipment supplied is free from defects in materials or workmanship and will meet the specified performance requirements when operated in accordance with the manufacturer's recommendations. The manufacturer shall correct any breach in this warranty at their expense.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Plasti-Fab. Tualatin, OR.
- B. Warminster Fiberglass, Southampton, PA.
- C. Or equal

2.02. EXPERIENCE REQUIREMENTS

- A. In the case of an "or-equal" or a substitution, demonstrate in writing, to the satisfaction of Owner that the manufacturer has produced the specified type and size of equipment for sanitary wastewater service that has been in successful operation for a minimum period of five years prior to the Bid date.

2.03. EQUIPMENT DESIGN

- A. Materials
1. Flume shall be full length, one-piece construction, molded fiberglass reinforced polyester with isophthalic resin.
 2. Interior surface shall have a minimum 15 mil white gelcoat backed by a resin-rich layer of resin and chopped glass forming a water- and chemical-resistant surface, free of irregularities.

3. Remainder of laminate shall be fiberglass reinforced polyester containing not less than 30 percent glass content by weight.
4. Thickness of flume walls and floor shall be not less than 1/4-inch thickness with 1/4- inch thick at the structural flanges. The flume shall be reinforced with box section stiffeners down the sides and across the bottom. The stiffeners shall be joined together at the knee to form a rigid dimensionally stable flume. The bottom of the flume shall include 2-inch by 3-inch steel tube laminated to the bottom for additional stiffening of the floor. The reinforcing tubing shall be designed to provide structural support throughout the length and width of the flume. The steel tubing on the inlet and outlet end of the flume shall extend 3 inches beyond the flume to be used to tie-down and brace the flume during installation and leveling.
5. Flume shall have pultruded FRP bracing at top of flume (inlet, two at throat and outlet), T-304 stainless steel hardware, sufficient to resist stresses encountered during shipping and proper installation.
6. 2-inch (minimum) top and end flanges.
7. Molded-in stiffening ribs, maximum 12-inch center to center spacing, to make unit self-supporting and to eliminate the need for external bracing. Stiffeners shall be joined together at the knee to form a rigid dimensionally stable flume. Flume shall be strong enough to hold an 18-inch depth of water without visible distortion.
8. Anchor clips along the side of the flume drilled for 9/16-inch for anchorage into concrete.
9. Minimum Tensile Strength (ASTM D638) - 14,000 psi.
10. Minimum Flexural Strength (ASTM D790) - 23,000 psi.
11. Flexural Modulus (ASTM D790) - 0.8×10^6 psi.
12. Barcol Hardness (ASTM D2583) - 30.
13. Notched Izod Impact - 10 ft. lbs/inch.
14. Water Absorption - <0.2 percent (in 24 hours).
15. Maximum Throat Tolerance
 - a. 18 inches - 3/32 inch.
16. Maximum Tolerance (Other Than Throat)
 - a. 18 inches - 1/8 inch.

B. Supports

1. Stiffeners across the top shall be permanent FRP pultruded cross supports for the flume and may be either the fiberglass or temporary wood spreaders as required.
2. Shall provide sufficient strength and structural support to resist the stresses that occur during shipping and proper installation of the flume.

3. The flume shall be braced and supported during installation per manufacturer's suggestions.

2.04. ACCESSORIES

- A. The flume shall be equipped with a molded-in head gage calibrated in 100ths of a foot and centimeters. The scale shall have 3/4-inch high black numerals at each tenth.
- B. Radius-shaped fiberglass inlet wing walls to transition flow into the flume.
- C. Adjustable T-304 stainless steel mounting bracket for ultrasonic level transducer.

PART 3 EXECUTION

3.01. EQUIPMENT INSTALLATION

- A. Install in accordance with the Contract Documents and the manufacturer's written instructions.
- B. No modifications to equipment shall be made without the written consent of the manufacturer and approval of Engineer.
- C. Field verify all dimensions and elevations. Notify Engineer of specific differences.
- D. The flume shall be installed level in both directions.
- E. Concrete or grout poured in the annular space between the outside flume walls and channel walls shall consist of lifts not greater than 4 inches.
- F. The flume shall be free standing and require no additional external support in order to maintain its dimensional integrity during operation.

3.02. TESTING AND STARTUP

- A. Testing and startup shall be performed in accordance with Section 01660, Testing and Startup, and as specified herein unless otherwise noted.
- B. The level sensor specified in Section 17300, Ultrasonic Level Sensors, shall be tested and compared with the flow determined by the staff gauge reading on the flume.
- C. Flume supplier shall coordinate with the Control Systems Integrator to calibrate the flow meter.
- D. All testing shall be done in the presence of the Engineer and the equipment manufacturer or their approved representative.
- E. The Parshall flume shall be inspected to determine if it was installed level within the tolerances indicated by the manufacturer's installation instructions.

3.03. SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. Provide services of the equipment manufacturer or their approval representative in accordance with Section 01640, Equipment-General, and as specified herein.

- B. Manufacturer's representative shall be at the project site to verify the proper installation of the equipment specified and that the system meets the requirements of this specification.

END OF SECTION

SECTION 11300

PUMPING EQUIPMENT-GENERAL

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Gauges on suction and discharge sides of pump.
- B. Gauges for pump waterseal connections.
- C. Nameplate requirements.
- D. Pressure switches.
- E. Shop and field tests.
- F. Services of manufacturer's representative.

1.02. RELATED SECTIONS

- A. Section 09900 - PAINTING

1.03. SUBMITTALS

- A. Shop Drawings – Provide in accordance with Sections 01300, Submittals, and 01640, Equipment-General, and as supplemented herein.

PART 2 PRODUCTS

2.01. GAUGES

- A. Gauges shall be installed on the suction and discharge sides of pumps in accordance with the following specifications.
 - 1. Gauges shall be of the bourdon tube type with 4-1/2-inch diameter dial and with diaphragm seal.
 - 2. Case and ring shall be black epoxy coated aluminum, bourdon tube shall be phosphor bronze with a brass tip and window shall be glass.
 - 3. Gauges shall be stem mounted and shall be installed close to the suction and discharge flanges of the pump.
 - 4. Gauges shall be calibrated to read zero at atmospheric pressure.
 - 5. The suction gauges shall be of the compound type to indicate both pressure and vacuum; they shall be calibrated to read 25 feet of water above and below zero.
 - 6. The discharge gauges shall be calibrated to read from 0 feet to a minimum of 5 feet of water pressure above pump shutoff head.

7. Gauges shall be Ashcroft No. 1379A (discharge) and No. 1379AC (suction); U.S. Gauge; or equal.
 8. All gauges shall have continuous duty, clamped Teflon diaphragm seals as manufactured by Ashcroft, Type 300; U.S. Gauge; or equal.
 9. Each diaphragm seal shall have Type 316 stainless steel upper and lower housings.
 10. The lower housing shall be a threaded connection.
 11. Gauges and diaphragm seals shall be by same manufacturer and shall be shipped as complete units, factory filled with silicone fluid.
 12. Each gauge and diaphragm seal unit shall be connected with the necessary brass pipe fittings and a brass stopcock.
 13. The Contractor shall coordinate with the various pump manufacturers so that all gauges are of one manufacturer.
 14. No gauges shall be required on sump, polymer feed, or screw pumps.
- B. Gauges shall be installed on pump waterseal connections as shown on the Drawings and in accordance with the following specifications.
1. Gauges shall be of the bourdon tube type with 2-1/2-inch diameter dial.
 2. Case and ring shall be polished stainless steel, bourdon tube shall be phosphor bronze with a brass tip, and the window shall be glass.
 3. Gauges shall be stem mounted in an upright position.
 4. Gauges shall be calibrated to read zero at atmospheric pressure. Gauges shall be calibrated to read from 0 feet to a minimum of 5 feet of water pressure above pump shutoff head.
 5. The gauges shall be connected with brass pipe fittings and stopcocks.
 6. Gauges shall be Ashcroft No. 1009A; U.S. Gauge; or equal.

2.02. NAMEPLATES

- A. A brass or stainless steel nameplate shall be furnished for each pump with stamped characters readable under ordinary lighting conditions.
1. Pump nameplate shall give the rating in gallons per minute, rated head, speed and efficiency.
 2. Additional data may be in accordance with the manufacturer's regular practice.
 3. Nameplates shall be securely attached and NOT PAINTED OVER.

2.03. PRESSURE SWITCHES

- A. The Contractor shall coordinate to ensure that all pressure switches supplied for this project shall be by the same manufacturer.

1. Pressure switches supplied for pump discharges shall be located in the discharge line immediately following the pumps and prior to any valve or obstruction in the line, unless otherwise specified or shown on the Drawings.
 2. All other pressure switches shall be located as specified or as recommended by equipment manufacturers.
- B. Unless otherwise specified, pressure switches shall be snap action, automatic reset, 120 volt, heavy duty a-c switches and shall be adjustable over the normal operating range specified or as recommended by equipment manufacturers.
1. Pressure switches to be installed in hazardous areas shall be NEMA 7 and all others shall be NEMA 4.
 2. All pressure switches shall have normally open contacts which close when the switch is activated.
 3. High pressure switches and pressure switches on pump discharges shall activate on pressure increase and shall be wired by the Electrical Contractor to deactivate the corresponding pump or equipment when the preset pressure setting is exceeded.
 4. Low pressure switches and pressure switches on pump intakes shall activate on pressure decrease and shall be wired by the Electrical Contractor to deactivate the corresponding pump or equipment when the pressure drops below the preset pressure or vacuum setting.
 5. The pressure switches shall be manufactured by Ashcroft; Automatic Switch Company; or equal.
 6. The Contractor and equipment manufacturer shall coordinate the installation and operating range of pressure switches.
- C. Each pressure switch shall have a continuous duty, clamped Teflon diaphragm seal as manufactured by Ashcroft, Type 300; U.S. Gauge; or equal.
1. Each diaphragm seal shall have Type 316 stainless steel upper and lower housings.
 2. The lower housing shall have a threaded connection.
 3. Switches and diaphragm seals shall be by the same manufacturer and shall be shipped as a complete unit, factory filled with silicone fluid.
 4. Each switch and diaphragm seal unit shall be connected with the necessary brass pipe fittings and a stopcock.

2.04. SHOP TESTS

- A. Tests shall be performed on the pumps in accordance with Section 01640, Equipment-General.
1. Each pump unit shall be shop tested to determine compliance with the specifications, and the manufacturers shall submit to the Engineer and receive approval of five certified copies of test data before shipment of the pumps is made.

2. The Engineer reserves the right to witness the shop test on each pump before the pumps are assembled for shipment to the job site.
3. The pump manufacturer shall give the Engineer ample notice of these tests so that the Engineer can arrange to witness the tests.
4. Final acceptance, however, will be dependent upon the satisfactory operation and performance after installation.

PART 3 EXECUTION

3.01. PAINTING

- A. Painting, including surface preparation, shall be in full accordance with Section 09900, Painting.
 1. The pump manufacturer shall coordinate fully with the Contractor the system and application of paints used.

3.02. INSTALLATION OF EQUIPMENT

- A. Pumping equipment shall be installed by the Contractor in accordance with Section 01640, Equipment-General.

3.03. FIELD TESTS

- A. Field tests shall be made in conformance with Section 01640, Equipment-General.
- B. Preliminary field tests shall be made after installation of the pumps. Final field tests shall demonstrate the following:
 1. That the units have been properly installed and are in proper alignment.
 2. That the units operate without overheating or overloading of any parts and without objectionable vibration.
 3. That there are no mechanical defects in any of the parts.
 4. That the pumps can deliver the specified pressure and quantity at the rated speed. All field tests shall be conducted with clean water from the public water supply system. The Contractor shall provide all temporary flow measurement devices as necessary to achieve accurate measurement of the pumped flow during the field tests.
 5. That the pumps can pass the size of solids specified and the type of liquid for which the pumps are to be used.

3.04. SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. Unless stated otherwise in the individual equipment section, the Contractor shall arrange for the equipment manufacturer to furnish the services of a qualified representative in accordance with Section 01640, Equipment-General.

1. For each series of pumps of the same model and size, the representative shall supervise and check the installation for not less than two days and supervise its initial operation, instruct the operators in operation, proper maintenance and repairs for not less than one day or for a length of time defined in the individual equipment section.

END OF SECTION

SECTION 11310

SUBMERSIBLE GRINDER PUMP STATION

PART 1 GENERAL

1.01. SUMMARY

- A. Furnish and install one submersible grinder pump station and above-grade, wet well-mounted prefabricated buildings located at the Walden Woods and Jefferson Park Pump Station. The station shall include submersible grinder pumps, pump control panel, field instrumentation, pump guides and bars, valves, emergency generator, heater, ventilation, panelboard, lighting, receptacles, telemetry, and internal wiring, complete with all accessories and ready to operate in compliance with the specifications and as shown on the Contract Drawings. In addition, provide a spare pump assembly for the pump station, including motor and power cable, protective devices, and spare parts in accordance with the following specifications and as shown on the Contract Drawings:
- B. Provide all fittings required for connection of the pump to the piping shown on the Contract Drawings.
- C. All equipment, prefabricated buildings, enclosures, and accessories shall be provided by a single supplier as a system. The supplier shall bear all responsibility for performance of the station as a system and provide all warranties in accordance with the Contract Documents.

1.02. RELATED SECTIONS

- A. Division 7 Specifications.
- B. Division 8 Specifications.
- C. Section 09900 - PAINTING
- D. Section 11300 - PUMPING EQUIPMENT-GENERAL
- E. Section 14602 - HOISTS AND CRANES
- F. Division 15 Specifications.
- G. Division 16 Specifications
- H. Division 17 Specifications.

1.03. REFERENCES

- A. Standards of the Hydraulic Institute.
- B. ASTM A36 - Structural Steel, Carbon Steel.
- C. ASTM A48 - Specification for Gray Iron Castings.
- D. ASTM A479 - Specification for Stainless Steel and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.

- E. ICEA - Insulated Cable Engineers Association.
- F. NEC - National Electrical Code.
- G. NEMA - National Electrical Manufacturers Association.
- H. AISI - American Iron and Steel Institute.
- I. ANSI - American National Standards Institute.
- J. U.L. Listing

1.04. SCOPE OF SUPPLY

- A. The principal items of equipment shall include, but not be limited to, the following:
 - 1. Building enclosure including lights, HVAC equipment, panelboard, receptacles, telemetry, roof, and finishes.
 - 2. A fabricated steel base.
 - 3. Pumps.
 - 4. Pump control panel.
 - 5. Level sensing equipment
 - 6. Convenience accessories.
 - 7. Natural gas-fueled generator.
 - 8. Automatic transfer switch.
 - 9. Piping and valves.

1.05. PREFABRICATED BUILDING DESIGN REQUIREMENTS

- A. Prefabricated buildings shall be designed by a licensed professional engineer in the State of New York. All dead loads, live loads, wind, seismic, erection, temperature, and anchorage stresses shall be considered. Calculations shall be prepared in neat and legible manner, sealed by licensed professional engineer performing calculations.
- B. Structures and members to withstand dead load, live load, and design loads defined in the "Structural Design Criteria" on Contract Drawing S001. Combinations of loads shall be applied in accordance with ASCE 7 and the 2010 Building Code of New York State.
- C. Exterior Roof, Fascia and Soffit System to Withstand Imposed Loads With Maximum Allowable Deflection of Span - 1/180.
- D. Assembly to permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 100 degrees F.
- E. Size and fabricate roof, fascia and soffit systems free of distortion or defects detrimental to appearance or performance.

- F. Design of anchor bolts (including diameter and embedment lengths) to attach pump station base to the concrete slab foundation.

1.06. SUBMITTALS

A. Mechanical Shop Drawings

- 1. Submit shop drawings for equipment provided under this section. Format and content of the shop drawing submittal shall conform to requirements specified in Sections 01300, Submittals, and 01640, Equipment-General.
 - a. The shop drawing submittal shall include the following as a minimum:
 - 1) Manufacturer's published pump curves demonstrating compliance with specified performance requirements.
 - 2) Manufacturer's catalog information, descriptive literature, specifications, etc. for pumps, motors, and accessories, including pump seal assemblies and pressure gauges.
 - 3) Manufacturer's certified installation drawings containing all critical dimensions, piping connection sizes, weights, etc. required for installation of the equipment.
 - 4) Shop and field painting information.
 - 5) Motor information conforming to the requirements specified in Section 15170, Motors.
 - 6) Manufacturer's written installation instructions, including any special requirements for shipping, handling, and storage of equipment prior to installation.
 - 7) Performance affidavit in accordance with 01300, Submittals, and 01640, Equipment-General.

B. Control Panel Shop Drawings

- 1. Control panel assembly drawings detailing panel cut-out locations and sizes, back panel, and device layout and locations.
- 2. Using AutoCAD 2014 or higher, provide these drawings for each control cabinet in the following order. Label all components with manufacturer and complete model numbers on the drawings. Typical drawings are not acceptable.
- 3. Scaled enclosure layout drawings in 11-inch by 17-inch format, detailing locations of all components on the subpanel, door, and all other enclosure faces. Label each view as "Enclosure Door," "Enclosure Subpanel," "Enclosure Side," etc. Drawing shall display layout of completed assemblies, including, but not limited to, PLC backplane, PLC I/O modules, empty slots, radios, UPS, Ethernet switches, terminal blocks, installed spare equipment, power supplies, power line isolators, surge suppression, grounding lugs, wireway, disconnect switches, fuses, control relays, acceptable regions for conduit penetrations of both AC and DC wiring separately, and external power. Illustrate handles, hasps, hinges, and dimensions of exterior mounted devices. Identify equipment manufacturer and model numbers by placing a number

next to the piece of equipment on the drawing and cross-referencing with the Bill of Materials. In addition to the Bill of Materials cross-reference labeling, label PLC I/O modules on the drawing with the manufacturers complete model numbers.

4. Elementary diagram drawings in 11-inch by 17-inch format, detailing all enclosure electrical components including, but not limited to, power line isolators, surge suppression, UPS, power supplies, fuses, duplex receptacles, indicating lights, switches, and control relays. Diagrams shall include terminal point designations, line reference numbers, and wire numbers. All wires shall maintain the same wire number for the entire contiguous segment of wire. Diagrams shall illustrate all network cabling and DC and AC electrical distribution. Drawing shall illustrate all available instrument terminations, both used and unused, and be labeled with the manufacturer's terminal point label as will be found on the installed instrument. Provide a legend on this sheet for all symbols and general notes used on this sheet and on the PLC I/O module detail drawings.
5. Where PLCs are used, submit scaled PLC I/O module detail drawings, in 11-inch by 17-inch format, for each card installed in the PLC backplane. Detail the wiring of all terminations on the PLC I/O module including, wiring of all I/O points and power. Illustrate all termination points for each signal including termination points for terminal blocks, relays, etc. Identify each wires color and wire number. Utilize NFPA 79 standards to illustrate termination points: to an MCC, to a device terminal, to a control panel terminal, to fused blocks, to surge suppressor blocks, etc. Label the each point on PLC I/O modules with the PLCs physical address. Utilize NFPA 79 standards for illustration of wiring: internal to the PLC enclosure, outside the PLC panel, and integral to a device. Progression of I/O modules detail drawings shall be in the order of the orientation of the I/O modules in the PLC backplane (e.g. Slots 1 and 2 on sheet 7, Slots 3 and 4 on sheet 8, etc.). Not more than two card details shall be shown on any one drawing. Each I/O module shall be labeled with the installed rack and slot number. Illustrate installed spare I/O modules, but it is not necessary to detail slot filler cards. Include signals that shall be transmitted from the PLC-based station control panel to the RTU system.
6. Provide PLC submittals, where applicable, including:
 - a. PLC memory map of data registers used in transferring data to the SCADA system as specified herein.
 - b. Catalog cuts and user's manuals for all PLC system components.
 - c. Screen captures of all OIT displays.
 - d. Operating description.
 - e. Comment PLC source listing.
 - f. Other materials, as required, to fully describe the control panel operation.
 - g. Updated hard and soft copies of all uncompiled PLC and OIT program files shall be submitted to the buyer for inclusion with record document submittals.
 - h. Detailed Bill of Materials in Microsoft Word 2013 table format of Excel 2013, identifying component name, manufacturer, model number, and quantity supplied. Typical Bills of Materials are not acceptable.

- i. Manufacturer's catalog information for all components and accessories. All catalog cuts, Web site printouts, manufacturers' specifications, and drawings shall be clearly marked to allow identification of the specific products used. Cross out all options and function not supplied with the equipment.
- j. Manufacturer's standard wiring diagrams including all available terminal connections for each component.
- k. Descriptive lists of spare parts and extra materials provided shall be in the same format as the Bill of Materials. Lists shall be exclusive to the spare parts and extra materials requested by the specification section, hence separate from the Bill of Materials for installed equipment.
- l. Project-specific installation instructions and mounting details for each component. Materials of construction for supports, brackets, and mounting hardware shall be provided with details for each type of equipment mounting rack.
- m. Proposed nameplate wording. Scaled illustrations for each nameplate provided.
- n. Submit field testing schedule and field testing reports.
- o. Process Control System Coordination - Where PLCs are utilized, submit the following information within 45 days after receiving an approved shop drawing submittal for the equipment.
- p. PLC Memory Map - Submit a PLC memory map to coordinate the PLC memory registers that will be utilized to facilitate bidirectional read and write functionality between the OEM PLC and the plant-wide SCADA system (plant PLCs and supervisory software). The PLC memory map shall conform to the following requirements:
 - 1) Transmitted electronically to the Engineer in Microsoft Excel format.
 - 2) Identify PLC memory locations of key operating data. At a minimum, PLC memory address locations shall be provided for each data point in the OEM-supplied OIT to enable OIT functionality to be fully replicated over the specified protocol within the supervisory software.
 - 3) Communication shall be direct to the OEM PLC or protocol converter. Communication to an OEM supplied computer or OIT is not acceptable.
 - 4) Accurate text descriptions for all data points.
 - 5) Datatype of each data point (i.e. Boolean, Integer, Double Integer, Floating Point/Real, etc.).
 - 6) Scaling/range of values for all analog data points (i.e., 0 to 60 Hertz, 0 to 10.00 mg/L, etc.).
 - 7) Engineering units of all analog data points (i.e., gpm, mgd, mg/L, feet, inches, etc.).

- 8) Configuration details for any “packed” integers whereby the integer value of the data point signifies different equipment or process conditions. Examples are an integer whose value signifies the pump is Not Running (0), Running (1), Failed (2), Ready (3), etc.; Hand (0), Off (1), Auto (2) status; or Lead (0), Lag (1), Standby (2) configurations. Alarm conditions shall be contained in individual Boolean registers and are prohibited from existing solely in packed integers.
 - 9) Identify value of Boolean/Discrete values when they are “active”, i.e., alarm is active when Boolean register is True (1) or active when False (0).
 - 10) Alarms – Identify alarm conditions that are annunciated in the OEM OIT. Differentiate alarm conditions from events. Prioritize alarm conditions and identify alarm conditions that are worthy of notifying the operations staff via the plant’s alarm notification system (dialer).
 - 11) Key operating setpoints useful to the operating staff to view remotely. Access to all setpoints is required.
 - 12) Sequence of operations detailing how the system will function once programming has been performed.
- q. Submit OIT/operator interface graphic displays (screen shots) for each OIT graphic display for the completed program. Submit four sets of color screen shots.
 - r. PLC Program – Complete electronic form of PLC program for coordination with plant process control system.
- C. Shop Test Results - Submit shop test results, including certified pump curves for each pump provided, in accordance with requirements specified in Sections 01640, Equipment-General, and 11300, Pumping Equipment-General.
- D. Operation and Maintenance Manual
1. Submit manufacturer's written instructions for proper operation and maintenance of pumps, motors, and accessories provided under this section.
 2. Format and content of the manufacturer's operation and maintenance instructions shall conform to the requirements specified in Section 01640, Equipment-General.
 3. Owner Maintenance - All tools, information and equipment required to fully maintain or modify the provided OEM panels shall be provided. Tools and equipment shall include, but not be limited to:
 - a. Documented PLC/microprocessor /OIT source code and configuration files in electronic format.
 - b. Licensed PLC/microprocessor /OIT development software with installation media.

E. Manufacturer's Certification of Equipment Compliance

1. Submit written certification of proper equipment installation and satisfactory completion of preliminary field testing by authorized field service representative of the equipment manufacturer.
2. Manufacturer's certification shall conform to requirements specified in 01640, Equipment-General, and 11300, Pumping Equipment-General.

F. Prefabricated Building Shop Drawings

1. Shop drawings of building shall be fully to scale, 24-inch x 36-inch size design drawings, fully dimensioned, denoted and project specific, showing: (1) details of the building components;(2) the base skid plan and structural reinforcing members including exact size, location, and method of attaching, and (3) and the anchoring system. The design drawings shall include the total weight of the proposed pump stations.
2. The pump station supplier shall provide, at a minimum, original stamped drawings detailing the prefabricated building design as well as stamped calculations for the method used to anchor the station to the foundation. The drawings and calculations shall be stamped by a Professional Engineer licensed in the State of New York. This design shall be based upon the most current edition of the New York State Building Code and be specific to the site where the pump station will be placed.
 - a. Calculations shall include all design loading and code references utilized for the building design listed on a Design Summary Sheet. In part, calculations shall include, but not be limited to, the following:
 - 1) Foundation loads, dead weight, live loads, wind forces, seismic forces, shear, and axial loads.
 - 2) Design of anchor bolts with required size, material, and embedment depth. Maximum anchor bolt pullout force shall also be indicated.

1.07. COORDINATION

- A. Ethernet Addressing - Coordinate IP addressing of all Ethernet networked devices with the Engineer, utilizing IP addresses supplied by the Engineer. Engineer-supplied IP addresses shall be coordinated and configured in networked devices prior to shipment of equipment to the project site. IP address shall be entered into networked devices under this specification section.

PART 2 PRODUCTS

2.01. PREFABRICATED PUMP STATION

Furnish and install one prefabricated, above-grade, wet well-mounted pump station at the Walden Woods and Jefferson Park Pump Station. The complete unit shall be designed, fabricated, assembled and tested prior to shipment to the site.

A. Pump Station Base

1. The station's common base shall be fabricated from a minimum 3/8-inch structural grade steel plate, reinforced with adequate sized steel channels to prevent deflection due to equipment weight and stresses imposed from lifting and setting of equipment.
2. The base shall be provided with a prefabricated aluminum hatch rated 300 PSF with suitable lifting handles and locking hasp. When the cover is in the full open position, a hold open device shall be provided to prevent accidental closing.
3. Bolt on lifting eyes shall be placed about the perimeter of the equipment base to facilitate lifting and handling of the station. The lifting eyes shall be easily removable after the station has been set in place.
4. Steel plate in the base shall meet or exceed the requirement of ASTM A36.
5. Anchoring of the pump station base to the cast-in-place concrete slab-on-grade indicated on the Contract Drawings shall be designed by the pump station supplier.
6. Provide clamps/lugs to connect the pump station base to the grounding grid.

B. Pump Station Prefabricated Building

1. General

- a. The prefabricated building shall be complete with a factory assembled modular building affixed to a steel equipment base as shown on the plans.
- b. The unit shall be one piece when delivered and require only off loading, installation on the prescribed foundation slab, pipe line hook up and electrical service to complete the installation. Field-erected buildings will not be acceptable.

2. Wall and Ceiling Panels

- a. All sidewall and ceiling panels shall consist of interior and exterior metal skins formed with steel dies and roll-forming equipment and checked with gauges for uniformity and accuracy.
- b. Polyurethane shall be foamed-in-place and shall bond to the metal skins to form a rigid 4-inch thick insulated panel. Overall coefficient of heat transfer shall be a minimum of .033 (R-30) for 4-inch thick walls.
- c. Panels shall contain 100 percent polyurethane insulation and have no internal wood between the skins. Panel edges shall have foamed-in-place tongues and grooves with a flexible vinyl gasket also foamed-in-place on the interior and exterior of all tongue edges.
- d. Polyurethane foam core shall be classified by Underwriters Laboratories as having flame spread of 25 or lower and smoke generation of less than 450 when tested in accordance with UL Standard 723 (ASTM Standard E-84).
- e. Panels shall be equipped with cam lock joining devices and the distance between locks shall not exceed 46 inches.

- f. Each locking device shall consist of a cam-action, hooked locking arm placed in one panel, and a steel rod positioned in the adjoining panel.
- g. Locking arms and steel rods shall be housed in individual steel pockets set into the panel.
- h. Pockets on one side of the panel shall be connected to pockets on the other side, in width, by the use of steel straps set into the insulation and press fit caps shall be provided to close lock wrench holes. A cam lock wrench shall be supplied with the building.
- i. Wood reinforcement shall be placed inside the wall and ceiling panels where required to support the station equipment loads. Any wood reinforcement in a wall and ceiling panel shall be totally enclosed within the panel and clad with the exterior and or interior metal skins.
- j. Exterior of building shall be a minimum of .026-inch (24 gauge) thick galvanized steel panel protected by a spray and baked tan-colored polyester protective coating.
- k. Interior of building shall be a minimum of .026-inch (24 gauge) thick galvanized steel panel, protected by a spray and baked white color polyester protective coating.

3. Doors

- a. Hinged entrance doors shall be insulated with full 2-inch thick foam polyurethane insulation core. Matching metal jambs shall be furnished to fit prefabricated panels without the use of any interior framing.
- b. Jamb members shall attach to panels with sheet metal screws and doors shall be supplied with weatherstripping and wiper gasket.
- c. One door shall be provided. The normal entrance shall be a double entry door with a minimum 72-inch x 78-inch clear opening size.
- d. Hardware for doors shall be cylindrical lockset with satin stainless steel finish.
- e. Each door shall have three tamper-proof pinned butt hinges.
- f. All doors for outdoor structures shall be supplied with a metal shield above the door to divert rain and snow from the door opening. An extruded aluminum sill plate shall be provided on outdoor buildings.

4. Vinyl Siding

- a. The exposed portion of the exterior of the station as shown on the plans shall be covered with low gloss, color clear through construction vinyl siding. The siding shall be .042-inch nominal thickness double 4.5-inch dutchlap finish with coordinating trim colors.
- b. A color chart shall be supplied with the submittals for color selection by the Owner

c. Siding shall have a lifetime limited fade protection warranty.

d. Vinyl siding shall be Restoration Classic or equal.

5. Roof

a. The ceiling panels shall be covered by a pitched truss roof having a 4:12 minimum pitch with 12-inch overhang on all sides.

b. Roof peak shall run parallel to the station's longest dimension.

c. Mounting strips to be installed in modular building for mounting of the roof trusses. Trusses to be spaced on a maximum of 24-inch centers covered with exterior grade plywood, 30# underlayment and covered with standing seam steel sheets. The color will be selected by the Consulting Engineer or Owner.

d. The building shall include aluminum soffit and fascia

C. Heat and Ventilation

1. The ventilation system shall be provided to maintain a fresh air supply in the equipment chamber. The exhaust blower shall be sized and rated to change the equipment chambers air 30 times per hour.

2. The blower shall be of the centrifugal squirrel cage design with statically balanced wheel to assure quiet performance and maximum air delivery. The blower shall be located a minimum of 18 inches above the floor and exhaust through sufficient sized duct for efficient air circulation. The exterior ports shall be above ground elevation and be protected against weather and foreign matter.

3. An automatic cover operated switch shall operate the blower when the access door for the enclosure is opened. A manual control switch shall also be provided near the access door to operate the blower when the door is in the closed position.

4. The equipment chamber shall be provided with two wall mounted 1,500-watt electric heaters suitable for 120-volt, single phase service.

5. The heater shall be of the fan-forced type complete with an integral automatic dial-type thermostat, copper anodized aluminum reflector, and safety grill.

6. A thermostat will be provided to alarm personnel that the temperature inside the PumpMate fiberglass enclosure has dropped to a temperature that could freeze piping and damage equipment. The thermostat shall have a SPDT contact rated for 10 amperes at 120 VAC. This shall be pre-wired to the pump station control panel.

7. Heating and ventilation equipment shall be powered via the pump station building panelboard. Provide all starters, switches, and thermostats as required. Provide all conduit and wiring.

D. Lighting - The Control Building shall include four 4-foot energy efficient fluorescent light fixtures. An automatic cover-operated switch shall operate the lights when the access door for the enclosure is opened. A manual control switch shall also be provided near the access door to operate the lights when the door is in the closed position. An exterior light with photo cell will be mounted near the entry door. The other three sides of the building shall have lights

controlled by a manual switch mounted inside the entry door. Lighting shall be powered via the pump station panelboard. Provide all conduit and wiring.

- E. Receptacles - Provide a minimum of two standard 120V, 20A, duplex GFIC receptacles on the interior of the pump station building and two on the exterior. Receptacles shall be provided with "waterproof while in use" covers. In addition, provide an exterior receptacle dedicated for use with the electronic hoist specified in Section 14602, Hoists and Cranes. All receptacles to be mounted a minimum of 18 inches above the finished slab.
- F. Emergency Generator and Automatic Transfer Switch
 1. The emergency generator and automatic transfer switch shall be supplied in accordance with Division 16 specifications.
 2. The manufacturer of the generator set shall also provide the automatic transfer switch for single source responsibility.
 3. The generator shall be mounted on the common building base. It shall have a weatherproof and sound attenuated enclosure. The transfer switch will be mounted in the common pump station building.
 4. The engine generator for the pump station shall be sized by the pump station manufacturer to start and run both pumps while running other station accessories.
 5. Pump station shall operate on 208/120 volt, 3 phase, 4 wire, 60 Hertz power. Walden Woods and Jefferson Park service size 200 amps.
- G. Panelboard - Provide a panelboard for the pump station, to be rated for 208/120 volt, 3 phase, 4 wire, 60 Hertz. Amperage as required for pump station loads. Provide individual circuit breakers for lighting, receptacles, HVAC, telemetry, process loads, and ancillary generator loads. Size breakers in accordance with the NEC. Provide a main circuit breaker. Size mainline lugs to accommodate service entrance cables. Provide a schedule identifying circuit numbers and loads powered. Provide all conduit and wiring from panelboard to all equipment installed in and on the pump station building. The Electrical Contractor shall provide service entrance conduit and wire, conduits and wire to the generator, and conduits from the wet well to the control panel. All other conduit and wire shall be by the General Contract/pump station supplier.

2.02. PUMPS

- A. Walden Woods - The pumps provided under this section shall be Model Piranha PE 100/2 by ABS; or equal.
- B. Jefferson Park - The pumps provided under this section shall be Model Piranha PE 28/2 by ABS; or equal.
- C. Dimensions and locations shown on the Contract Drawings are based on the equipment manufacturers and models listed above. Any change in the dimensions or location of equipment, including accessories, required to accommodate alternate manufacturers and models shall be at the Contractor's expense.
- D. In the case of equipment submitted for approval as an "or equal" to the manufacturers and models listed above, the Contractor shall demonstrate, in writing, at the time of shop drawing submittal, that the manufacturer has produced the specified type and size of equipment for

sanitary wastewater service that has been in successful operation for a minimum period of 10 years prior to the bid date.

E. Performance Requirements

1. The pumps shall be equipped with a cast iron mating flange for connection to the discharge piping shown on the Contract Drawings. There shall be no need for personnel to enter the wet well for the purpose of connecting the pumps to the discharge piping. The pumps shall be automatically and firmly connected to the discharge piping guided by a single guide bar extending from the top of the wet well to the discharge piping connection. The working load of the lifting system for the pumps shall be at least 50 percent greater than the weight of the pumps. No portion of the pump shall bear directly on the floor of the wet well.
2. The pumps shall be designed for intermittent pumping of municipal raw sewage containing solids and fibrous materials without clogging and without cavitation or excessive vibration or noise under the following operating conditions:

Walden Woods Pump Station	
Design Point:	
Pumping rate (gpm), each	111
Pumping head (feet)	124
Rated motor HP	20
Pump speed, maximum (RPM)	1,800
Jefferson Park Pump Station	
Design Point:	
Pumping rate (gpm), each	50
Pumping head (feet)	21
Rated motor HP	5
Pump speed, maximum (RPM)	1,800

3. The pump motor and cable shall be capable of continuous submergence without loss of watertight integrity to a depth of 65 feet or greater.
4. The pumps shall be provided with submersible motors connected for operation on 208 volt, 3 phase, 60 Hertz power supply with submersible cable suitable for submersible grinder pump applications.
5. The pump, motor and power cable shall be rated for use in NEC Class I, Division 1, Groups C and D hazardous locations.

F. Spare Parts

1. One spare submersible non-clog pump identical in make and model to the other furnished and installed pumps at each pump station.
2. The manufacturer shall furnish the following spare parts in clearly identified containers. Provide one set of spare parts for each pump.
 - a. Two sets of upper and lower mechanical seals.
 - b. Two sets of bearings.
 - c. Two sets of O-rings.
 - d. Two sets of circlips

- e. Two sets of cable seals.
 - f. Two spare pump complete with motor and ancillary accessories for the pump station.
- 3. One spare Computer Processing Unit (CPU) for each CPU type.
 - 4. One spare memory battery for each PLC.
 - 5. One spare PLC power supply for each type used.
 - 6. One of each type discrete input module.
 - 7. One of each type discrete output module.
 - 8. One of each type analog input module.
 - 9. One of each type analog output module.
 - 10. One of each type communication module.
- G. Pump Design
- 1. General
 - a. Major pump components shall be manufactured of ASTM A48 Class 35B or 40 gray cast iron with smooth surfaces devoid of blow holes or other irregularities.
 - b. All exposed nuts and bolts shall be AISI Type 316 stainless steel.
 - c. All metal surfaces coming into contact with the pumpage other than stainless steel or brass shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
 - d. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact on four sides without a specific torque limit requirement.
 - 2. Grinder Mechanism
 - a. The grinder mechanism shall consist of two circular, hardened cutter elements, one rotating and one stationary.
 - b. Cutter elements shall be constructed on AISI 40C stainless steel with the addition of cobalt, vanadium, and molybdenum for abrasion resistance and a hardness of Rockwell C 58-62.
 - c. Rotating elements shall be secured to the end of the pump shaft directly below the impeller by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. It shall be keyed to the impeller so that it rotates with the motor. The head of the securing bolt

shall be effectively recessed within the cutter element bore to prevent disruption of the flow stream and catching of solid material in the wastewater.

- d. The stationary element shall be secured to the self-cleaning wear plate and positioned so that it is concentric to and aligned with the rotating element. Both elements shall incorporate a sinusoidal wave pattern at the grinding interface to create a shearing and cutting action between the elements as the rotating cutter spins.
- e. The rotating cutter shall incorporate an integrated solids deflector to prevent items such as plastic bags from covering the grinder assembly and starving the pump.
- f. All wastewater being pumped by the impeller shall be drawn through the grinder mechanism by the natural suction of the pump impeller and reduced to a particle size approximately 1/8 inch.
- g. The grinder mechanism shall not require routine adjustments throughout the life of the grinder assembly.

3. Self-Cleaning Wear Plate

- a. Each pump shall be equipped with a self-cleaning wear plate constructed of ASTM A48 Class 35B or 40 gray cast iron.
- b. The wear plate shall be designed to hold and secure the stationary cutter firmly in place, concentric to the rotating cutter.
- c. The impeller side of the wear plate shall incorporate an outwardly spiraling V-shaped groove to shred and force stringy solids outward from the impeller and through the pump discharge.
- d. The wear plate shall be mounted to the volute with four stainless steel securing screws and four stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller.
- e. Adjustment to allow for wear and to restore peak pumping performance shall be easily accomplished in the field utilizing standard tools, and without requiring disassembly of the pump.
- f. The use of fixed or non-adjustable wear plates or rings, or systems that require disassembly of the pump or shimming of the impeller to facilitate adjustment shall not be acceptable.

4. Impeller

- a. The impeller shall be semi-open, multi vane design and manufactured of ASTM A48 Class 35B or 40 gray cast iron and shall be dynamically balanced, semi-open, non-clog design.
- b. Impellers shall be slip fit into the motor shaft and drive key securely fastened to the shaft by a stainless steel bolt which holds the cutter mechanism.

5. Volute Bottom

- a. The pump volute shall be single-piece construction made of ASTM A48 Class 35B or 40 gray cast iron.
 - b. The discharge flange design shall permit attachment to standard ANSI or DIN flanges/appurtenances.
 - c. The minimum working pressure of the voute shall be 145 psi.
6. Pump Shaft
- a. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable.
 - b. The shaft shall be made of AISI 420 stainless steel.
7. Bearings
- a. The pump shaft shall rotate on two bearings.
 - b. Motor bearings shall be permanently grease lubricated.
 - c. The upper bearing shall be a single, deep groove ball bearing and the lower bearing shall be a two-row, angular contact bearing to compensate for axial thrust and radial forces.
 - d. L-10 bearing life shall be a minimum of 50,000 hours.
8. Mechanical Seal
- a. Each pump shall be provided with a tandem mechanical seal consisting of two independent seal assemblies.
 - b. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate.
 - c. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven, rotating, corrosion-resistant tungsten or silicon carbide ring.
 - d. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion-resistant tungsten or silicon carbide seal ring.
 - e. Each seal interface shall be held in contact by its own spring system.
 - f. The seals shall not require maintenance or adjustment and shall not depend on direction of rotation for sealing.
 - g. Each pump shall be provided with a lubricant chamber, designed to prevent overfilling and to provide lubricant expansion capacity, for the shaft sealing system. The drain and inspection plug, with positive anti-leak seal, shall be easily accessible from the outside.
 - h. Seal lubricant shall be FDA approved and non-toxic.

9. Mechanical Seal Protection and Seal Failure Warning System

- a. The primary mechanical seal shall be protected from interference by an active seal protection system integrated into the impeller and volute.
- b. The back side of the impeller shall be equipped with pump out vanes to eject any fibrous material that attempts to lodge behind the impeller.
- c. The seal protection system shall operate whenever the pump operates and shall not require adjustment or maintenance in order to function.
- d. The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time by a seal failure warning system.
- e. An electrical probe shall be provided in the sensing chamber positioned between the primary and secondary mechanical seals to detect the presence of water contamination within the chamber. The sensing chamber shall be filled with environmentally safe non-toxic oil. A solid-state relay shall be mounted in the pump control panel and shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber.
- f. When sufficient water enters the sensing chamber through the primary mechanical seal, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel to energize a seal failure indication light in the control panel.

10. Cable Entry Seal

- a. The cable entry seal design shall preclude specific torque requirements for a watertight and submersible seal.
- b. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter, and compressed by the body containing a strain relief function, separate from the function of sealing the cable.
- c. The assembly shall provide ease of changing the cable when necessary using the same entry seal.
- d. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the top of the pump.

11. Motor and Power Cable

- a. The pump motor shall be a NEMA B design, induction type, with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber.
- b. The stator windings shall be insulated with moisture-resistant Class H insulation rated for 180 degrees C (356 degrees F).

- c. The stator shall be heat shrink fitted into the cast iron stator housing. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing is not acceptable.
 - d. The motor shall be designed for continuous duty handling pumped media up to 40 degrees C (104 degrees F) and capable of up to 15 evenly spaced starts per hour.
 - e. The rotor bars and short circuit rings shall be made of cast aluminum.
 - f. Thermal switches set to open at 125 or 140 degrees C shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches (MWTPs) shall be used in conjunction with, and supplemental to, external motor overload protection and shall be connected to the pump control panel.
 - g. The junction box containing the terminal board shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to the terminal board.
 - h. The combined service factor shall be a minimum of 1.15.
 - i. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need for any splices. The cable shall also connect the MWTPs and leak sensor to the control panel.
 - j. The outer jacket of the cable shall be oil resistant and UV stable material.
12. Protection Devices and Monitoring Unit
- a. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125 or 140 degrees C stopping the motor and activating an alarm.
 - b. A leakage sensor shall be provided to detect the presence of water in the stator chamber. When activated the sensor shall activate local and remote alarms.
 - c. The thermal switches and leakage sensor shall be connected to the control panel.
 - d. Provide for all motors, 1200, 1800, and 3600 rpm (nominal), 60 Hertz, constant single speed (not VFD controlled), squirrel cage induction type, which do not have a minimum power factor of 85 percent. Motors which cannot meet this criteria shall have power factor correction capacitors, switched integrally with the motors (unless otherwise required by either the motor or starter manufacturer), which will bring the power factor up to a minimum of 90 percent.

13. Guide Rail/Bracket

- a. One AISI Type 316 stainless steel rail shall be provided to guide each pump when being raised or lowered in the sump and mounted on the discharge base/elbow.
- b. The rail shall align the pump with the discharge connection as it is lowered into place.
- c. A ductile iron upper rail guide bracket shall be furnished to support and align the rail at the top of the sump.
- d. Provide Type 316 stainless steel chain for installing and removing each pump.

14. Pump Control Panel

- a. Pump controls shall be furnished and installed in accordance with this specification, Division 16 and 17 specification sections, and as shown on the Drawings.
- b. The control panel shall be constructed in compliance with UL's Industrial Control Panels listing and follow-up service; utilizing UL listed recognized components where applicable.
- c. All major components and sub-assemblies shall be identified with laminated, engraved Bakelite nameplates or similar approved means.
- d. The control panel shall operate two submersible grinder pumps as specified above.
- e. The incoming service shall be 120 volts, 3 phase, 4 wire, 60 cycle. All metering shall be done ahead of the main disconnect and control panel.
- f. A 3-pole molded case main circuit breaker sized as required for the controls serviced shall be provided as the main power disconnecting device for the control panel. The circuit breaker must have a minimum ampere interrupting capacity of (25,000-240 volt - 18,000-480 volt) symmetrical RMS amps.
- g. The circuit breaker shall be properly sized to protect the control circuit conductors against over current due to short circuit or grounds.
- h. A NEMA rated full voltage non-reversing motor starter with manual reset, ambient compensated, 3 phase thermal overload relay shall be provided for each of the pumps.
- i. A lightning arrestor shall be supplied in the control and connected to each line of the incoming side of the power input terminals. The arrestor shall protect the control against damage due to lightning strikes on the incoming power line.
- j. A solid-state, phase sequence/failure and under voltage release relay shall be provided when a three phase service is supplied, to ensure additional running protection for the pump motors. The relay shall be complete with an LED to indicate proper phase sequence, all phases in operation and voltage

within limits. The relay shall also include an adjustable voltage monitor, be UL and CSA certified and be complete with automatic reset feature.

- k. The panel shall include a 120V control circuit. A properly sized circuit breaker shall be provided.

H. Enclosure Construction

1. General

- a. Dimensions of enclosures shown on the Contract Drawings are minimum required dimensions. Enclosure shall be sized as required to house the electrical equipment shown or specified.
- b. Reserve a 12-inch x 12-inch run of DIN-rail for future installation of a cellular-based radio.
- c. Control panels shall include an equipment support system for mounting internal wiring and control components, and for the proper support of long case instruments. This system shall ensure that equipment is adequately supported by the main structural frame members. Fixed support members shall not be attached to front panels or removable access panels.
- d. Steel enclosures shall be constructed of a minimum of 14 gauge steel and shall be constructed in accordance with NEMA requirements. Seams shall be continuously welded and ground smooth, with no holes or knockouts. Exterior hardware, including mounting hardware shall be stainless steel unless otherwise noted.
- e. Panel cutouts shall be provided for mounting components as arranged on the Contract Drawings and shall include cutouts and cover plates, and shall be capable of being removed for the addition of future components. Components shall either be door mounted unless otherwise noted. Control panels requiring rear access shall have the components mounted on side opposite the door.

2. NEMA 12 Steel Enclosures

- a. NEMA 12 enclosures shall be dust-tight, drip-tight suitable for protecting enclosed equipment and components from fibers, flyings, lint, dust and dirt. NEMA 12 enclosures shall provide a degree of protection against light splashing, seepage, dripping and external condensation of non-corrosive liquids.
- b. Manufacturers
 - 1) Hoffman
 - 2) Saginaw Control & Engineering
 - 3) Equal

I. Enclosure Doors

1. Enclosures shall be provided with front access single or double overlapping doors as required for the enclosure size. Door(s) shall be provided with heavy duty three point spring-roller latches operated by a key locking handle. Latch rods shall have rollers to facilitate door closing. Provide a minimum of two keys for each lock. Locks shall be keyed the same.
 2. Door(s) shall be mounted with continuous piano hinges. Contractor shall coordinate door swing (right hand or left hand) for each control panel to avoid interference with other equipment mounted adjacent to the control panels.
 3. A rolled lip around minimum three sides of door shall be provided to prevent dirt and liquid from dropping into the panel when door is open.
 4. Door(s) shall be fitted with a neoprene gasket applied with oil resistant adhesive and held in place with stainless steel retaining strips.
 5. Enclosures mounted outdoors shall be provided with stainless steel door stops to hold the door(s) in the open position. The open position shall be field adjustable.
- J. Interior Subpanels - Interior subpanels for component mounting shall be provided and assembled for each enclosure. Interior subpanels shall be constructed of 14 gauge steel finished in white enamel paint. Subpanels shall be provided with intermediate stiffeners where required to maintain surface flatness and panel rigidity. Fasteners, screws, and equipment mounting racks shall be stainless steel.
- K. Enclosure Finish
1. NEMA 12 Enclosures - Sheet metal components shall be thoroughly cleaned, bonderized and finished with a prime coat and two topcoats of a two-component, catalyzed, polyurethane enamel. Texture semi-gloss finish shall be applied to provide a non-glare and abrasion resistant surface. Enclosures shall be provided with gray finish inside with a white enamel interior unless otherwise specified.
- L. Enclosure Accessories
1. A large print pocket shall be provided on interior face of the enclosure door(s). Where this cannot be accommodated due to windows and other control devices mounted on the door, the print pockets shall be mounted on the interior side of the control panels.
 2. Circuit Breaker Operators
 - a. The circuit breaker shall be properly sized to protect the control circuit conductors against over current due to short circuit or grounds.
 - b. Main circuit breaker disconnect handle operators shall be provided. Handle operator shall be flange mounted type, accessible from the front flange of the panel, and shall be capable of being locked in either the On or Off position with a padlock.
 - c. Handle operators shall prevent opening of the control panel doors with the handle in the On position. Operators shall be provided with a defeater mechanism to allow authorized personnel to open the door with the handle in the On position.

3. Service Lights and Receptacles

- a. Provide a fluorescent light package in each enclosure. Fluorescent light shall utilize a manual light switch, terminal block, and non-yellowing PVC lens. Light shall not energize automatically when door is opened. Light shall be Hoffman, Model A-LF16M24, or equal.
- b. Provide a Ground Fault Circuit Interruptor (GFCI), 15-amp duplex receptacle, in accordance with Section 16055, Basic Electrical Requirements, in the PLC/microprocessor enclosure. To be used as a service outlet with both outlets available..
- c. Fluorescent service lights shall be provided with a plastic cover to protect the bulb (bulb sleeves are not acceptable). Lights shall be controlled by a door activated light switch. Service lights shall be as manufactured by Hoffman or equal.

2.03. ELECTRICAL SYSTEMS

- A. Pump control panel including internal components shall be designed to operate on standard utility grade power systems ± 10 percent nominal voltage. Equipment and systems shall be capable of sustaining temporary voltage dips of up to 15 percent as required to accommodate step starting and loading of emergency generator systems. Equipment shall be design to automatically restart after a power outage without latching into an alarm condition. Each system shall be provided with one shot times, relays, configuration programming and accessories to allow automatic restart after a power outage.
- B. Power Distribution
 1. Power Supplies – Unless otherwise noted, power is provided to the OEM control panels from a single source as listed in the specifications or shown on the Drawings.
 2. Power and distribution devices including, control power transformers, power supplies, fuses, circuit breakers, power distribution blocks, terminations and other required components shall be provided to generate all required voltages used by the control panel.
 3. Control panels shall include provisions for distributing power to all three phase and single phase equipment shown on the Contract Drawings. Control panels shall include a main circuit breaker which shall disconnect power to the entire system. Incoming terminals shall be oversized to accommodate wiring and cable sizes as shown on the Contract Drawings.
 4. Branch circuit breakers shall be provided on control power circuits and each individual circuit distributed from the panel. Circuit breakers shall be grouped on a DIN-rail. Use branch circuit breakers rated at no more than twice the load.
 5. Provide control power transformers and power supplies as required to obtain an operable system. Control power transformers shall be provided with suitable fusing on the primary and secondary side of the transformers. Control power transformers shall be sized as required to power equipment as shown on the Contract Drawings.
 6. Place no more than 20 devices on any single circuit. Do not exceed 12 amperes on the branch circuit.

7. Where multiple units provide parallel operations, do not group devices on the same branch circuit.
- C. Circuit Protective Devices
1. Circuit Breakers
 - a. Circuit breakers shall be of the thermal magnetic air type. Circuit breakers shall be appropriately sized to protect the equipment served per the requirements of the National Electrical Code.
 - b. Thermal magnetic air circuit breakers shall be provided for branch circuit disconnect service and short circuit protection of motor control and auxiliary circuits.
 - c. Main circuit breakers for motor control panels which include motor controllers, motor starters, variable frequency drives, solid state reduced voltage starters, etc., shall be rated a minimum of 35kAIC.
 2. Fuses
 - a. Provide fuses as required and specified for protecting individual control circuits and systems. Fuse ratings shall be sized to protect the equipment served per the requirements of the National Electrical Code.
 - b. Each PLCI/O module shall be individually fused.
 3. Surge Protection - Each control panel shall be provided with transient voltage surge arresters on the incoming power supply as required to protect the equipment from voltage surges. Control and Instrument circuits which enter/exit the building or structure shall be furnished with surge protective devices.
- D. Terminal Blocks
1. General
 - a. Terminal blocks shall be feed through, single level, and suitable for DIN rail mounting. Terminal blocks shall be fabricated complete with marking strip, covers, end plates, partitions, and screw type pressure connectors. Terminal blocks shall be screw connector type, tin-plated copper.
 - b. Terminal blocks shall be UL listed, rated for 600 VAC, 35 amperes unless otherwise noted.
 - c. Not less than 25 percent spare terminals shall be provided.
 - d. Terminal blocks for external connections shall be suitable for No. 12 AWG wire.
 2. Terminal blocks for low voltage instrumentation circuits shall be rated for 300 VAC, 10 amperes.
 3. Separate terminals shall be used for AC and DC voltages. These terminals shall be labeled AC and DC and shall be provided with two distinct colors. Separate wireways

shall be installed for AC and DC voltages. AC and DC wiring shall be kept separate at all times.

4. Fuse terminal blocks shall be provided with LED blown fuse indicators and shall be capable of being disconnected without the use of any special tools.
 5. Ground terminals shall be green.
 6. Terminal blocks shall be located in the bottom of the panel, except where otherwise shown or noted. Terminal blocks shall be located near the doors or access panels of the enclosures to facilitate field wiring connections. Minimum spacing between terminal blocks shall be 5 inches and a minimum of 4 inches all around. Duplicate terminals shall be used to limit the number of wires at one terminal to two.
 7. Terminals shall be labeled to agree with identification shown on supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable.
 - a. Wires shall be numbered using wire markers. Wire numbers shall agree with terminal numbers, submittals, and remote equipment wiring designations.
 - b. Terminal blocks shall be numbered with a high resolution, wipe resistant label. Phoenix Zack strip or equal.
 8. Provide a screwdriver with blade suitable for operating each type of terminal screw provided.
 9. Terminal blocks shall be as manufactured by:
 - a. Phoenix Contact.
 - b. Equal.
- E. Internal Wiring
1. Internal instrument and component device wiring shall be as normally furnished by the manufacturer.
 2. With the exception of low voltage instrumentation circuits (less than 30 V), interconnecting wiring and wiring to terminals for external connection shall be not less than No. 14 AWG copper, insulated for not less than 600 volts, with a moisture and heat resistant material and flame-retardant nonmetallic covering.
 3. Wiring, except where noted, shall terminate on panel terminal blocks. Wiring shall be from terminal to terminal with no splices. Wiring from external devices shall terminate at the panel's field termination terminal blocks.
 4. Instrumentation circuits shall be shielded.
 5. Wiring shall be grouped or cabled and firmly supported to the panel. Not less than eight inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Plastic wireway, Panduit or equal, shall be used to route wire within the panel. Wireways shall be provided with removable covers. Wireway shall be run in continuous length with snap on covers. AC and DC wiring shall be run in separate plastic wireways.

6. Tie-wraps used for bundling wire shall be cinched carefully to eliminate grooving the insulation.
 7. Each control loop or system shall be individually fused, and fuses and circuit breakers shall be clearly labeled and located for easy maintenance.
 8. Color code wiring as follows:
 - a. Line and Load Circuits (ac or dc power) - Black.
 - b. Neutral - White.
 - c. AC Control Circuits - Red.
 - d. DC Control Circuits - Blue.
 - e. Interlock Control Circuits on the Panel Energized From External Source - Yellow.
 - f. Equipment Grounding Conductors - Green.
- F. Circuit Identification - Devices mounted on or within the enclosures shall be permanently identified. The device and terminal identifications shall agree with those shown on the Contract Drawings.
- G. Controls and Instruments - Panel-mounted control relays, pushbuttons, indicating lights, selector switches, and instruments and components shall be as specified herein. Device, junction, pullboxes and other conduit system accessories shall be as specified in the Section 16055, Electrical Work.
- H. Grounding
1. Enclosures shall be provided with two grounding lugs located on opposite sides of the enclosure for connection to external grounding system.
 2. Provide a ground bus in each cabinet or panel for the shield and signal grounding circuits.
 3. Door panels shall be grounded and provided with flexible grounding braids that allow the door panels to be opened.

2.04. CONTROL PANEL IDENTIFICATION

- A. Control panels and enclosures shall be provided with nameplates on the exterior of each enclosure identifying the application function of the equipment enclosed such as "Gas Conditioning System Control Panel". Nameplates shall be mounted directly above equipment.
- B. In addition, for selector switches and/or pushbuttons, a factory installed legend plate shall be provided to indicate the function each station performs, such as "On" or "Off."
- C. Nameplates shall be engraved 1/4-inch high (1/2-inch high for enclosure titles) black capital letters on a 1/8-inch thick plastic black tag with white letters mechanically attached to enclosure. Lettering shall be in capitals except as shown. Nameplate text shall be as shown or scheduled on the Contract Drawings.

- D. Legend plates shall be metal with black lettering mechanically attached to control panel.
- E. Interior mounted components and equipment shall be provided with nameplates. Nameplates shall be located adjacent to, but not on, the given device and visibility shall not be obstructed by wire bundles or other equipment. Nameplates shall include device identification number as well as descriptive name.
- F. Instrumentation equipment shall be provided with identification tags. Identification tags shall have 5/16-inch high capital, white letters on black background machine engraved. Hang nameplates from process-mounted instruments via metallic chains. Nameplates shall be hung within 12 inches of the equipment.
- G. Enclosures shall be provided with instruction plaques indicating any warnings or special instructions required by the component manufacturers. Warning plaques shall be red with white lettering.
- H. Nameplates shall be permanently secured to enclosures and backpanels.
- I. Each panel shall be provided with short circuit current rating information included on the nameplate.

2.05. MISCELLANEOUS ITEMS

- A. Wiring Diagrams - A set of elementary wiring diagrams shall be provided, in the enclosure print pocket, on the inside door of each control panel. The wiring diagram shall include all shop drawing and field changes and revisions performed during construction.
- B. Surge Suppressors - Surge suppressors shall be provided on all DC operated relay coils to minimize the high transient voltages generated when the circuit to the operating coil is opened.

2.06. CONTROL COMPONENTS

A. Relays

1. General Purpose Control Relay

- a. 24 VDC units shall be blade plug-in type. 120 VAC units shall be pin plug-in type. All relays shall have LED indicators and mechanical test button.
- b. Use - Shall be used in motor control centers where all relays are in separate sections and only for such things as indicating lights, alarm output, and motor starting coil seal in contact.
- c. Number of poles and arrangement as shown or specified.
- d. Contacts.
- e. AC units shall be rated 10 amps at 240 volts AC.
- f. DC units shall be rated 5 amps at 40 volts DC.
- g. Material shall be silver cadmium oxide.
- h. Coils shall be rated continuous duty.

- i. Sockets.
 - j. Supply with relay retainer clip.
 - k. Terminal connections with captive screw to accept locking fork solderless connectors.
 - l. Single tier design.
 - m. Manufacturers - Square D Company Class 8501 Type K relay and Type NR socket; Potter-Brumfield; or equal.
2. Industrial Control Relay
- a. Industrial machine tool type.
 - b. Use - Shall be used to control equipment with power requirements, such as solenoid valves.
 - c. Shall be used in MCC for all control relay applications.
 - d. Contacts (with LED indicators)
 - 1) Double break field convertible.
 - 2) Rated 10 amps at 600 volts AC.
 - 3) Rated 5 amps at 250 volts DC.
 - e. Coil shall be encapsulated, continuously rated of the voltage rating indicated on the plans.
 - f. Number of poles as indicated on Contract Drawings, but not less than four.
 - g. Holding and Operating Mechanism
 - 1) Electrically held, electrically operated, Square D Company Class 8501, Type X; or equal.
 - 2) Mechanically held/electrically held relay with mechanically-held attachment.
 - 3) Time Delay - Pneumatic timer attachment for electrically-held delay; 'on delay' or 'off delay' as indicated on plans.
3. Time Delay Relays
- a. Solid-state type with calibrated dial head or dip switch adjustment, encapsulated coil, snap-action switch assembly of number of poles indicated.
 - b. "On-Delay," "Off-Delay," or "On-Off Delay" dual head type as indicated; timing range intervals as shown or specified.
 - c. Bases shall have captive screws for locking fork solderless connectors, single tier design, with relay retainer clips.

- d. Dust-tight construction.
- e. Provide auxiliary contacts where indicated.
- f. Contacts rated 10 amps resistive at 120 VAC.
- g. Manufacturer - Diversified Electronics Series "TD;" Square D, Type JCK; Timemark 300 Series.

B. Wireway

- 1. Provide covers for all wireway.
- 2. For all stand-alone enclosures provide 3-inch width wireway, minimum.
- 3. Size width and depth based on 50 percent of area fill. Check the applicable codes to verify fill.
- 4. Manufacturer
 - a. Panduit.
 - b. Or equal.

C. 24 VDC Power Supply

- 1. Provide a sufficient quantity of 24 VDC power supplies as necessary to power PLC equipment and instrumentation.
- 2. Power supplies shall be sized with capacity to accommodate the load of the provided PLC controls in addition to a future cellular-based Radio to be installed within the control panel.
- 3. Power supplies shall be manufactured by Acme Electric Corporation, Model DR Series, LAMBDA Electronic, Acopian, or equal. Power supplies shall meet, or exceed, the following requirements.
 - a. UL 508 listed, CE approved.
 - b. DIN-rail mounted.
 - c. Removable, pluggable connections for input and output power.
 - d. Local output status indication light.
 - e. Overload Protection - Current limited to a preset value.
 - f. 86 percent efficient.
 - g. Output Voltage - 24 VDC +5 percent adjustable.
 - h. Temperature Range - -20 to 50 degrees C.
 - i. Mean lifetime of 500,000 hours.

- j. Two-year warranty.
 - k. Ripple and Noise - 24 mV RMS, 200-mV peak to peak.
 - l. Accept input voltages of both 120 VAC and 240 VAC. Fully enclosed, touch-safe.
- D. Ethernet Switches Without Fiber Ports (DIN-Rail Mounted)
- 1. General
 - a. Provide DIN-rail-mounted fast Ethernet switch for mounting in control panel in accordance with the Contract Drawings.
 - b. Provide quantities of Ethernet ports to accommodate connections to each required networked device.
 - 2. Specifications
 - a. Software Layer 3 Enhanced with Internet Group Multicast Protocol (IGMP) snooping enabled.
 - b. DIN-rail-mounted, fanless design.
 - c. Manufacturer-rated for industrial use, including temperatures of 0 to 60 degrees C, humidity 10 to 95 percent non-condensing, and an Mean Time Between Failures manufacturer rating greater than 40 years.
 - d. IEC 60068-2-27 conformity for shock. Capable of withstanding 18 shocks at 15 g of 11 ms in duration.
 - e. IEC 60068-2-6 conformity for vibration.
 - f. EN 61000-4 conformity for immunity to electro-magnetic interference (EMI).
 - g. Support 256 virtual Local Area Networks (VLANs).
 - h. Removable terminal blocks with screw compression.
 - i. Capable of being powered from redundant/dual DC power supply sources.
 - j. LEDs for Link and Activity per port. Failure LED for switch.
 - k. Device configuration and monitoring shall be achieved through a web-browser interface via the Ethernet TCP/IP protocol. The device shall include an embedded web server to access configuration and status pages. Ethernet switches that utilize separate configuration software packages are not acceptable.
 - 3. Manufacturers shall be:
 - a. Hirschmann, MACH100 Series.
 - b. Allen-Bradley, Stratix 5410 Series.

- c. N-Tron equipment is not acceptable.

2.07. PILOT DEVICES

A. General

1. Pilot devices shall include indicating light, pushbuttons, and selector switches.
2. Heavy-duty, industrial type, construction.
3. Area Classification
 - a. Non-Classified Area Device Rating - NEMA 13 oil-tight.
 - b. Wet Area or Exterior Device Rating - NEMA 4 and NEMA 13 oil-tight and watertight.
4. Provide extra large nameplates in accordance with Section 17000 Instrumentation for all door or enclosure front-mounted devices.
5. Controls and relays shall be by one manufacturer wherever possible.
6. 30-millimeter diameter.
7. Retaining ring and boot type.
8. Terminal blocks shall have a safety cover or be finger safe to protect personnel.

2.08. POWER LINE SURGE PROTECTORS

- A. General - Power line surge protectors shall be provided to protect equipment from transients on the AC power line. Surge protectors shall meet the requirements of ANSI/IEEE C62.41. They shall be of the type required to protect equipment installed in an industrial environment.
- B. Hardwired Type - Hardwired power line surge protectors shall be wired to the input terminals of the respective panel or equipment. Power line surge protectors shall be by Topaz, Best, Tycor, Control Concepts, or equal.

2.09. UNINTERRUPTIBLE POWER SUPPLIES (UPS)

- A. Where PLC-based control panels are required, provide a DIN-rail-mounted UPS, Phoenix Contact Model QUINT or equal that provides a minimum of 15 minutes' backup power. The intent of this requirement is reliable backup power using an industrial grade, compact design (for minimal space requirements), easily replaceable, modular batteries, and reduced heat generation-type UPS.

2.10. STATION CONTROL PANEL

- A. The provided Station Control Panel shall utilize a PLC-based solution named PLC-JPPS that is located in a panel comprised solely of control components. Motor starters and back-up float electronics shall not be installed within the station control panel.
- B. Where PLC control panels are provided:

1. Provide a Station Control Panel PLC. Manufacturer and model shall be Allen-Bradley, CompactLogix or equal.
 - a. Refer to I/O list (Table 11310-1 at the end of this section) for I/O points for the PLC enclosure.
 - b. All I/O shall be wired to terminal strips. Where relays, intrinsically safe barriers and/or surge protection for I/O are required, wiring shall be from the I/O module to the relay, barrier, or surge protector to the terminal strip.
 - c. Provide intrinsically safe barriers for I/O originating in hazardous areas as indicated on the Contract Drawings. Installation and separation of wiring shall be in full accordance with the latest revision of the NEC.
 - d. Provide surge protection in accordance with Section 17000, Instrumentation. Surge protection shall be located on a separate DIN rail from the terminal strips.
 - e. Provide loop and external power supplies for all field devices that require such power.
 - f. Provide at a minimum three additional spare Discrete Input points.
 - g. Provide 120 VAC power for all 120 VAC discrete outputs.
 - h. Provide 24 VDC power for all discrete inputs.
2. The PLC controls for the system shall be based on an open programming environment which allows the Owner to make changes after the warranty period ends. The manufacturer shall provide complete and unprotected electronic copies of the PLC logic and OIT programs to the Owner following the operational testing period.
3. Local monitoring and control of the system shall be through an OIT panel mounted to the system control panel.
 - a. The station control panel OIT manufacturer and model shall be Allen-Bradley, Model Panelview Plus 7 or equal.
 - b. Communications between the OIT and PLC shall be via Ethernet through an Ethernet switch in the system control panel.
 - c. Furnish one licensed copy of the associated OIT configuration software.
 - d. The OIT shall be programmed by the system manufacturer utilizing the following screens:
 - 1) Pumping Station Overview Graphic
 - a) Shall be a schematic representation of the PS.
 - b) As a minimum, display the operational status of Jefferson Valley centrifugal pumps (P-1010, P-1020, P-1030) and channel grinder (G-1040). Show each pump as a small circle that changes color according to the pump run status.

Graphic detail and equipment designations of the equipment are necessary on this screen.

- c) All important analog values, including, but not limited to, wet well level (LT-1001) and influent screenings Parshall flume flow (FIT-1101) and as directed by Owner and Engineer shall be indicated on this main screen.
 - 2) Pump Control Graphic – Provide a pop-up window that is accessed from the pumping station overview graphic. This window shall display and allow a user to enter control setpoints for each user-adjustable setpoint. These setpoints include, but are not limited to: Lead Pump Start Level, Lead Pump Start Delay, Lag Pump Start Level, Lag Pump Start Delay, Lag Pump Off Level, Lag Pump Off Delay, Lead Pump Off Level, and Lead Pump Off Delay. Additionally, provide the ability to enable/disable pump alternation through the OIT. Pumps shall be configured to alternate by default.
 - 3) Alarm Setpoint Graphic – Provide a pop-up window that is accessed from the pumping station overview graphic. This window shall allow a user to enter critical elevation levels for alarming of High-High, High, Low, and Low-Low Level.
 - 4) Alarm Summary Graphic - Provide one full screen, less title bar, alarm summary window that details each active alarm along with timestamp in which the alarm was received.
4. System manufacturer shall program the Station Control Panel PLC and OIT in accordance with requirements specified herein.
5. Future SCADA System Integration
 - a. All status, monitoring, and alarm functions shall be accessible through the SCADA system. PLC/microprocessor
 - b. All calculations and derived conditions shall be accessible in registers within the PLC/microprocessor. All scaling shall be performed within the PLC/microprocessor to ensure that scaled values are accessible to SCADA directly from registers within the PLC/microprocessor.
 - c. Coordinate data to be shared with the SCADA system through the PLC/microprocessor memory maps and static OIT graphic prints specified to be provided by the manufacturer herein.
 - d. All physical inputs and outputs shall be mapped to memory registers. The OIT software shall not be required to reference physical I/O directly.
 - e. All alarm conditions shall be False/0/Low when the alarm condition is Not Active and True/1/High when the alarm condition is Active. All alarm conditions shall be in Boolean-datatype memory registers.
 - f. Constant speed drive equipment shall be programmed to respond to variations in the wet well in a manner wherein the hydraulic requirement will be accommodated in the pumping program using simple menu-related operator interface routines.

- g. The pumps in a First-on/First-off (FOFO) sequence and can be configured to sequence the pumps every start, every 24 hours, on the lowest run time or manually.
- h. Upon pump failure, the alternate pump shall be called to run.
- i. The FOFO sequencing shall operate such that the next load turned on is always the one that has had the longest opportunity to rest since its last operation.
- j. It is the specific intention of this functional requirement that a standard programmable logic controller will be employed with features as herein described and be a fully integrated assembly. That is, the furnishing of similar functions using a proprietary controller with custom software, a multiplicity of setpoints, modules or extensive relay-timer logic to accomplish control sequences, etc., is specifically precluded by this specification and will not be acceptable.
- k. The programmable logic controller and operator interface shall provide all of the above controls and operations. A redundant back up float system shall be wired to the station control panel and shall accommodate an automatic operation.
- l. The intent of the specification is that a standard controller be provided, with standard documentation. A custom-written description of operation is not acceptable.
- m. The pump controller operates on a 4-20 mA input via a submersible transducer and shall be capable of being configured at the factory or jobsite to perform operating functions as described below. All configurations are password protected and shall be provided as a minimum as follows:
 - 1) Simplex/duplex pump operation.
 - 2) Wet well transducer rating (1.0-15.0 psi).
 - 3) Wet well cross sectional area for flow monitor (up to 32,767 square inches).
 - 4) Lag pump disable for non-additive systems.
 - 5) Selectable pump fault for low oil, bearing overtemp or check valve limit switch.
- n. The pump controller will include the following user-adjustable setpoints. All setpoints are password protected and shall be provided as follows:
 - 1) Pump 1 start fail delay (0-99 seconds).
 - 2) Pump 2-start fail delay (0-99 seconds).
 - 3) Lead pump start delay (0-99 seconds).
 - 4) Lag pump start delay (0-99 seconds).

- 5) Lead pump stop delay (0-99 seconds).
 - 6) Lag pump stop delay (0-99 seconds).
 - 7) Delay between calls (0.1-9.9 minutes).
 - 8) Back-up float pump down timer (1-5 minutes).
 - 9) Back-up float lag call timer (0-99 seconds).
- o. The PLC will include the field adjustable setpoints. Setpoints are password protected and provided as follows:
- 1) Lead pump start.
 - 2) Lead pump stop.
 - 3) Lag pump start.
 - 4) Lag pump stop.
 - 5) High level alarm.
 - 6) Low level alarm.
 - 7) Back-up high float.
- p. Provide the following derived alarms/data:
- 1) LAHH – High-High Level Alarm. When the level in the wet well rises to this setpoint, a High-High Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
 - 2) LAH– High Level Alarm. When the level in the wet well rises to this setpoint, a High Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
 - 3) LAL - Low Level Alarm. When the level in the wet well lowers to this setpoint, a Low Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
 - 4) LALL– Low-Low Level Alarm. When the level in the wet well lowers to this setpoint, a Low-Low Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
6. Run Time Totalization – Provide individual runtimes in registers for all pumps, mixers, drives, and other motors that have run indication wired to a PLC. Run times shall be configured in hours, resettable only by plant personnel through the supervisory software.

7. Flow totalization – Calculate running and daily totals of all flows monitored at one-minute intervals and write each to a register. Calculate daily minimum, maximum, and average flow values and write each to a register.
8. Under Range Alarming - Provide under range alarm monitoring for all analog signals. Alarms shall have enable/disable functionality (_EN modifier) and utilize the alarm active structure (_AL modifier). Alarms will be utilized for analog signal troubleshooting.
9. PLC Clock Synchronization - Provide a PLC clock synchronization tag as an Integer in a writable register from SCADA. At 3:00 a.m., the SCADA computer shall be able to write a 1 into the PLC clock synchronization register which then triggers logic to set the PLC clock to 3:00 a.m.. The PLC shall then set the PLC clock synchronization register back to 0.
10. Redundant Back-up Float Controller – The back-up float controller shall be a separate panel whose electronics shall be in accordance with drawing 86-18742-1001.
 - a. A redundant backup float controller will be installed to operate the pumps and alarm on up to five back up floats (Low Alarm, Pumps Off, Lead Start, Lag Start, High Alarm) in the unlikely situation that the primary controller or transducer would fail. T. A dry telemetry contact is provided to indicate the backup controller is on. The controller shall be capable of being configured to operate the pumps and alarm on the backup floats as follows:
 - b. Four Float Operation (High Level, Lead Start, Lag Start and Pumps Off) - When the high float is activated, the controller will call the lead pump and signal the alarm. If the float does not deactivate in a predetermined adjustable time the lag pump will also start. When the pumps off float is deactivated, the pump(s) will be turned off. Each subsequent activation of the lead start float will turn the lead pump on and subsequent activation of the lag start float will turn the lag pump on. Each subsequent activation of the high float will turn the high alarm output contact on. The backup controller on output contact will remain on until manually reset. Provide intrinsically safe barriers for each float in an isolated section of the control panel.
 - c. A flow monitoring algorithm is included in the controller to measure influent flow. This algorithm will calculate the incoming flow rate during periods of pump inactivity, detecting the change in level and using the configured wet well area. Pumping rates are calculated during periods of pump activity, detecting the change in level and using the configured wet well area and average incoming flow rate. The controller displays incoming flow and totalized flow in gallons per minute. It also displays each pump's rate in gallons per minute.
11. Submersible Wet Well Level Sensing Transducer - A submersible level transducer shall sense the liquid level of the wet well. The transducer shall be a two-wire type to operate from a supply voltage of 10.5 to 24 VDC instrumentation signal in direct proportion to the measured level excursion over a factory-calibrated range of zero to 11.5 feet of water. It shall be of the head pressure sensing type, suitable for continuous submergence and operation and shall be installed in accordance with manufacturer's instructions. The bottom diaphragm face (2-1/2-inch diameter minimum) of the sensor shall be installed 6 inches above the floor.

The transducer shall incorporate a diffused silicon semiconductor transducer element to convert the sensed pressure to a corresponding electrical value. The sensed media shall exert its pressure against the diaphragm, which flexes minutely so as to vary the proximity between an internal ceramic diaphragm created between the two surfaces. A stable, hybrid, operational amplifier assembly shall be incorporated in the transducer to excite and demodulate the sensing mechanism. The transducer shall incorporate laser trimmed, temperature compensation and high quality components and construction to provide a precise, reliable, stable output signal directly proportional to the sensed pressure over a factory-calibrated range.

The submersible pressure transducer shall be wired to the station control panel through an intrinsically safe barrier. The intrinsic safety barrier shall be UL listed.

12. Wet Well Level Sensing Float Switches - Provide four back-up float(s) for redundant control and alarm. The float(s) shall be non-mercury and have a molded polypropylene body, internal redundant polyurethane foam floatation, potted switch/cable connections and fine stranded AWG #18 cable with heavy-duty synthetic rubber jacket in lengths as required to run unspliced to the control panel.

The float switches shall be individually suspended in the wet well with weight kits. The float switch cables shall be suspended from a cable rack mounted to the top of the wet well.

The float switches shall be wired to the backup float control panel and utilize intrinsically safe barriers. The intrinsic safety barrier shall be UL listed.

13. Auxiliary Outputs From Station Control Panel - Provide Form C dry contact relay outputs for each of the following conditions:

- a. Low level alarm.
- b. High level alarm.
- c. Generator Running.
- d. Generator Failure.
- e. Generator Low Fuel Level
- f. In addition to the conditions listed above, provide Form C dry contact relay outputs for the following conditions:
 - 1) Pump 1 Run Indication - To RTU system.
 - 2) Pump 1 Failure Indication - To RTU system.
 - 3) Pump 2 Run Indication - To RTU system.
 - 4) Pump 2 Failure Indication - To RTU system.
 - 5) High Level Float - To RTU system.
 - 6) High Level Float - To Marshall alarm panel.
 - 7) Low Level Float - To RTU system.

- 8) ATS on Utility Power - To RTU system.
 - 9) ATS on Generator Power - To RTU system.
 - 10) ATS Failure – To RTU system.
 - 11) Generator Running - To RTU system
 - 12) Generator Failure – To RTU system
 - 13) Back-up float control panel on – To RTU system
 - 14) Generator Low Fuel Level – To RTU System
- g. The pump station controller shall have a 4-20 mA output for the following condition:
- 1) Wet Well Level - Output to RTU system.

2.11. MOTOR STARTER PANEL

- A. Motor starters shall be furnished and installed in accordance with this specification, Division 16 and 17 specification sections, and as shown on the Drawings.
- B. Motor starter panel shall be separate from the station control panel.
- C. The motor starter panel shall be constructed in compliance with UL's Industrial Control Panels listing and follow-up service; utilizing UL listed recognized components where applicable.
- D. The described equipment shall be housed in a NEMA 12 painted steel enclosure. The enclosure shall be approximately 36 inches high and 10 inches deep. The enclosure shall be constructed of not less than 14 gauge steel.
- E. All major components and sub-assemblies shall be identified with laminated, engraved Bakelite nameplates or similar approved means.
- F. The incoming service shall be 208 volts, 3 phase, 4 wire, 60 cycle. All metering shall be done ahead of the main disconnect and control panel.
- G. A 3-pole molded case main circuit breaker sized as required for the pumps and controls serviced shall be provided as the main power disconnecting device for the control panel. The circuit breaker must have a minimum ampere interrupting capacity of (25,000-240 volt - 18,000-480 volt) symmetrical RMS amps.
- H. A thermal magnetic circuit breaker shall be supplied as branch circuit protection for each pump motor. The circuit breaker must have a minimum ampere interrupting capacity of (10,000-240 volt - 14,000-480 volt) symmetrical RMS amps. The circuit breaker shall be operable through the operator's door of the enclosure.
- I. The circuit breaker shall be properly sized to protect the motor starter, and the motor against over current due to short circuit or grounds.

1. A NEMA rated full voltage non-reversing motor starter with manual reset, ambient compensated, 3 phase thermal overload relay shall be provided for each of the pumps.
2. A solid-state, phase sequence/failure and under voltage release relay shall be provided when a three phase service is supplied, to ensure additional running protection for the pump motors. The relay shall be complete with an LED to indicate proper phase sequence, all phases in operation and voltage within limits. The relay shall also include an adjustable voltage monitor, be UL and CSA certified, and be complete with automatic reset feature.
3. A heavy-duty, three-position, hand-off-automatic selector switch shall be flush-mounted on the door of the control center for the operation of each motor magnetic starter. This selector switch shall operate the starter when it is in either the Hand position or the Automatic position and the automatic control system is calling for the operation of the equipment in the manner as herein described. In addition, a door mounted heavy-duty green pilot light operated from a respective starter auxiliary contact, shall be provided to indicate a "pump running" condition, and a door mounted heavy-amber pilot light operated from a respective starter auxiliary contact shall be provided to indicate pump alarm conditions. Provide auxiliary contacts to be wired to the station control panel for "In Auto" indications. The pilot light shall have a replaceable bulb.
4. Motor control panels which include motor controllers, motor starters, variable frequency drives, solid state reduced voltage starters, etc., shall have flange-mounted disconnects mounted on the enclosure. Through-door-type disconnecting handles are not acceptable.
5. An overload reset pushbutton, mounted through the control panel door, shall permit resetting the overload relays without opening the control panel door.
6. Overload relays may also be solid-state block-type having visual trip indication with trip free operation. Electrically resetting the overload will cause a snap action one normal open and one normal closed isolated alarm/control contact to reset, thus re-establishing a control circuit. Trip settings shall be governed by solid state circuitry and adjustable current setting. Trip classes shall be 10, 15 and 20. Additional features to include phase loss protection, selectable jam/stall protection and selectable ground fault protection
7. Current transformers shall be provided for each motor starter and housed within the motor start control panel. Current transformer output shall be wired to the station control panel for real-time continuous monitoring of motor current.

PART 3 EXECUTION

3.01. SHOP TESTING

- A. Each pump shall be shop tested by the equipment manufacturer prior to shipment to the job site.
- B. Shop testing shall demonstrate that each pump meets the performance requirements specified in this section.

- C. In addition to the requirements specified in this section, shop testing shall conform to requirements specified in Sections 01640, Equipment-General, and 11300, Pumping Equipment-General.

3.02. EQUIPMENT INSTALLATION

- A. Install equipment in accordance with the manufacturer's instructions at the locations shown on the Contract Drawings.
- B. Verify all dimensions and elevations shown on the Contract Drawings and required for equipment installation. Notify Engineer of specific differences and conflicts.
- C. Furnish and install all materials (including oil, grease, lubricants, chemicals, etc.) and all temporary equipment (including measuring devices, etc.) required for equipment startup, field testing and initial operation.

3.03. FIELD TESTING AND INITIAL OPERATION

- A. Perform startup, field testing, and initial operation of equipment in accordance with requirements specified in Section 01640, Equipment-General.
- B. Field testing of equipment shall be conducted in the presence of the Engineer and the equipment manufacturer, or their approved representative.
- C. Final acceptance shall be based on successful demonstration that each pump meets the specified performance requirements, and that each motor is not overloaded, in all normal operating modes.
- D. Adjust, repair, modify, or replace any equipment components that fail to meet specified performance requirements.

3.04. MANUFACTURER'S SERVICES

- A. Equipment Installation, Startup, and Field Testing
 - 1. The equipment manufacturer shall provide the services of a qualified field service representative to inspect the installation and supervise the startup, field testing, and initial operation of the equipment provided.
 - 2. The services provided shall conform to the minimum durations and other requirements specified in Section 01640, Equipment-General.
 - 3. The manufacturer's field service representative shall submit written certification to the Contractor and Engineer that the equipment has been installed and tested to the manufacturer's satisfaction, that all final adjustments have been made, and that the equipment is ready for startup and initial operation.
- B. Training Services
 - 1. The equipment manufacturer shall provide the services of a qualified representative to train the Owner's personnel in proper procedures for operation and maintenance of the equipment provided.
 - 2. The training services provided shall conform to the minimum durations and other requirements specified in Section 01640, Equipment-General.

3.05. EQUIPMENT WARRANTY

- A. The manufacturer shall warranty that the equipment provided under this section shall be free of defects in materials and workmanship and shall meet the specific performance requirements when operated in accordance with the manufacturer's written operation and maintenance instructions.
- B. The equipment warranty shall be for a period of either three years starting on the date of equipment delivery to the site, or one year starting on the date of Substantial Completion of construction, whichever is shorter.

END OF SECTION

Item No.	Equipment Item	Equipment Designation	Description	Function Designation	Input or Output	I/O Type	Electrical Characteristic	In/Out Building?	Remarks
1000	Dry Pit								
1001	Wet Well Level	LT - 1001	Level Indication	LI, LAHH, LAH, LAL, LALL, LR	Input	Analog	4-20 mA	In	Submersible Pressure Transducer. Signal from Signal Isolator.
	Wet Well Backup Float Control Panel	BUFCP-1002	High-High Level Float	LSHH	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Low-Low Level Float	LSLL	Input	Discrete	24 VDC	In	
			BUFCP System On	YI	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
1005	Pump 1	P - 1010	In Remote Run Indication	HSI YI, KQ, YQ	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Start/Stop Control	OC/CC	Output	Discrete	24 VDC	In	
			Motor Current	II	Input	Analog	4-20 mA	In	
			Speed Control	SC	Output	Analog	4-20 mA	In	
			Speed Indication	SI, SR	Input	Analog	4-20 mA	In	
1006	Pump 2	P - 1020	In Remote Run Indication	HSI YI, KQ, YQ	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Start/Stop Control	OC/CC	Output	Discrete	24 VDC	In	
			Motor Current	II	Input	Analog	4-20 mA	In	
			Speed Control	SC	Output	Analog	4-20 mA	In	
			Speed Indication	SI, SR	Input	Analog	4-20 mA	In	
1090	Generator	GEN-1090	Run Indication	YI, KQ, YQ	Input	Discrete	24 VDC	Out	
			Failure Indication	YA	Input	Discrete	24 VDC	Out	
			Fuel Level Low	LAL	Input	Discrete	24 VDC	Out	
1095	Automatic Transfer Switch	ATS-1095	On Utility Power	JI_Utility	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			On Generator Power	JI_Gen	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	

Item No.	Equipment Item	Equipment Designation	Description	Function Designation	Input or Output	I/O Type	Electrical Characteristic	In/Out Building?	Remarks
PLC Status									
PLC-JPPS			PLC Memory Battery	MEM_BATT	Internal Value	Internal Value		In	
PLC-JPPS			AC Power Loss	AC_LOSS	Input	Discrete	24 VDC	In	N.O. contacts energized closed while power is On.
PLC-JPPS	Primary DC Power Supply Failure		Failure Indication	DCPS_PRI_FAIL	Input	Discrete	24 VDC	In	
PLC-JPPS	Uninterruptible Power Supply (UPS)		On Battery Indication	UPS_ON_BATT	Input	Discrete	24 VDC	In	
PLC-JPPS	Station Control Panel Open	DS-1	Door Open	ZSH	Input	Discrete	24 VDC	In	NC, Open when hatch open. Magnetic contact
PLC-JPPS	PLC Cabinet Internal Temperature	TT-1	Temperature Indication	TI, TAH, TAL, TR	Input	Analog	4-20 mA	In	

Item No.	Equipment Item	Equipment Designation	Description	Function Designation	Input or Output	I/O Type	Electrical Characteristic	In/Out Building?	Remarks
1000	Dry Pit								
1001	Wet Well Level	LT - 1001	Level Indication	LI, LAHH, LAH, LAL, LALL, LR	Input	Analog	4-20 mA	In	Submersible Pressure Transducer. Signal from Signal Isolator.
	Wet Well Backup Float Control Panel	BUFCP-1002	High-High Level Float	LSHH	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Low-Low Level Float	LSLL	Input	Discrete	24 VDC	In	
			BUFCP System On	YI	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
1005	Pump 1	P - 1010	In Remote Run Indication	HSI YI, KQ, YQ	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Start/Stop Control	OC/CC	Output	Discrete	24 VDC	In	
			Motor Current	II	Input	Analog	4-20 mA	In	
			Speed Control	SC	Output	Analog	4-20 mA	In	
			Speed Indication	SI, SR	Input	Analog	4-20 mA	In	
1006	Pump 2	P - 1020	In Remote Run Indication	HSI YI, KQ, YQ	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Start/Stop Control	OC/CC	Output	Discrete	24 VDC	In	
			Motor Current	II	Input	Analog	4-20 mA	In	
			Speed Control	SC	Output	Analog	4-20 mA	In	
			Speed Indication	SI, SR	Input	Analog	4-20 mA	In	
1090	Generator	GEN-1090	Run Indication	YI, KQ, YQ	Input	Discrete	24 VDC	Out	
			Failure Indication	YA	Input	Discrete	24 VDC	Out	
			Fuel Level Low	LAL	Input	Discrete	24 VDC	Out	
1095	Automatic Transfer Switch	ATS-1095	On Utility Power	JI_Utility	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			On Generator Power	JI_Gen	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	

Item No.	Equipment Item	Equipment Designation	Description	Function Designation	Input or Output	I/O Type	Electrical Characteristic	In/Out Building?	Remarks
PLC Status									
PLC-WWPS			PLC Memory Battery	MEM_BATT	Internal Value	Internal Value		In	
PLC-WWPS			AC Power Loss	AC_LOSS	Input	Discrete	24 VDC	In	N.O. contacts energized closed while power is On.
PLC-WWPS	Primary DC Power Supply Failure		Failure Indication	DCPS_PRI_FAIL	Input	Discrete	24 VDC	In	
PLC-WWPS	Uninterruptible Power Supply (UPS)		On Battery Indication	UPS_ON_BATT	Input	Discrete	24 VDC	In	
PLC-WWPS	Station Control Panel Open	DS-1	Door Open	ZSH	Input	Discrete	24 VDC	In	NC, Open when hatch open. Magnetic contact
PLC-WWPS	PLC Cabinet Internal Temperature	TT-1	Temperature Indication	TI, TAH, TAL, TR	Input	Analog	4-20 mA	In	

SECTION 11320

DRY PIT SUBMERSIBLE HORIZONTAL CENTRIFUGAL PUMPS

PART 1 GENERAL

1.01. SUMMARY

- A. Furnish and install three dry pit submersible non-clog sewage pumps, complete and ready to operate; and also provide one additional spare submersible non-clog sewage pump, including motor and power cable, protective devices and monitoring unit, guide rails and lifting assembly, spare parts, PLC, PLC accessories, PLC programming and manufacturer's services in accordance with the following specifications and as shown on the Contract Drawings:
- B. Provide all fittings required for connection of the pump to the piping shown on the Contract Drawings.

1.02. RELATED SECTIONS

- A. Section 09900 - PAINTING
- B. Section 11300 - PUMPING EQUIPMENT-GENERAL
- C. Section 15170 - MOTORS
- D. Division 16 Specifications
- E. Division 17 Specifications

All electrical equipment and wiring shall be in full compliance with Division 16, Electrical Specifications.

1.03. REFERENCES

- A. Standards of the Hydraulic Institute.
- B. ASTM A48 - Specification for Gray Iron Castings.
- C. ASTM A479 - Specification for Stainless Steel and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
- D. ICEA - Insulated Cable Engineers Association.
- E. NEC - National Electrical Code.
- F. NEMA - National Electrical Manufacturers Association.
- G. AISI - American Iron and Steel Institute.
- H. ANSI - American National Standards Institute.

1.04. DESIGN AND PERFORMANCE REQUIREMENTS

- A. The pumps shall be equipped with a cast iron mating flange for connection to the discharge piping shown on the Contract Drawings. There shall be no need for personnel to enter the wet well for the purpose of connecting the pumps to the discharge piping. The pumps shall be automatically and firmly connected to the discharge piping guided by a single guide bar extending from the top of the wet well to the discharge piping connection. The working load of the lifting system for the pumps shall be at least 50 percent greater than the weight of the pumps. No portion of the pump shall bear directly on the floor of the wet well.
- B. The pumps shall be designed for intermittent pumping of municipal raw sewage containing solids and fibrous materials without clogging and without cavitation or excessive vibration or noise under the following operating conditions:

	Design Point 1 (VFD Operation Condition)	Design Point 2
Pumping rate (gpm), each	450	690
Pumping head (feet)	95	105
Rated motor HP	47	47
Pump speed, maximum (RPM)	1,200	1,200
Break HP	20	20

- C. Solids passing capability of the pump shall be a minimum of a 3-inch solid.
- D. The pump motor and cable shall be capable of continuous submergence without loss of watertight integrity to a depth of 65 feet or greater.
- E. The pumps shall be provided with submersible motors connected for operation on 460 volt, 3 phase, 60 Hertz power supply with submersible cable suitable for submersible pump applications.
- F. The pump, motor and power cable shall be rated for use in NEC Class I, Division 1, Groups C and D hazardous locations.

1.05. SUBMITTALS

- A. Shop Drawings
 - 1. Submit shop drawings for equipment provided under this section. Format and content of the shop drawing submittal shall conform to requirements specified in Sections 01300, Submittals, and 01640, Equipment-General.
 - 2. The shop drawing submittal shall include the following as a minimum:
 - a. Manufacturer's published pump curves demonstrating compliance with specified performance requirements.
 - b. Manufacturer's catalog information, descriptive literature, specifications, etc. for pumps, motors, and accessories, including pump seal assemblies and pressure gauges.

- c. Manufacturer's certified installation drawings containing all critical dimensions, piping connection sizes, weights, etc. required for installation of the equipment.
- d. Shop and field painting information.
- e. Motor information conforming to the requirements specified in Section 15170, Motors.
- f. Manufacturer's written installation instructions, including any special requirements for shipping, handling, and storage of equipment prior to installation.
- g. Performance affidavit in accordance with Sections 01300, Submittals, and 01640, Equipment-General.
- h. Control panel assembly drawings detailing panel cut-out locations and sizes, back panel and device layout and locations.
- i. Using AutoCAD 2014, or higher, provide these drawings for each control cabinet in the following order. Label all components with manufacturer and complete model numbers on the drawings. Typical drawings are not acceptable.
 - 1) Scaled enclosure layout drawings in 11-inch by 17-inch format, detailing locations of all components on the subpanel, door, and all other enclosure faces. Label each view as "Enclosure Door", "Enclosure Subpanel", "Enclosure Side", etc. Drawing shall display layout of completed assemblies, including, but not limited to, PLC backplane, PLC I/O modules, empty slots, radios, UPS, Ethernet switches, terminal blocks, installed spare equipment, power supplies, power line isolators, surge suppression, grounding lugs, wireway, disconnect switches, fuses, control relays, acceptable regions for conduit penetrations of both AC and DC wiring separately, and external power. Illustrate handles, hasps, hinges, and dimensions of exterior mounted devices. Identify equipment manufacturer and model numbers by placing a number next to the piece of equipment on the drawing and cross-referencing with the Bill of Materials. In addition to the Bill of Materials cross-reference labeling, label PLC I/O modules on the drawing with the manufacturers complete model numbers.
 - 2) Elementary diagram drawings in 11-inch by 17-inch format, detailing all enclosure electrical components including, but not limited to, power line isolators, surge suppression, UPS, power supplies, fuses, duplex receptacles, indicating lights, switches, and control relays. Diagrams shall include terminal point designations, line reference numbers, and wire numbers. All wires shall maintain the same wire number for the entire contiguous segment of wire. Diagrams shall illustrate all network cabling and DC and AC electrical distribution. Drawing shall illustrate all available instrument terminations, both used and unused, and be labeled with the manufacturer's terminal point label as will be found on the installed instrument. Provide a legend on this sheet for all symbols and general notes used on this sheet and on the PLC I/O module detail drawings.

- 3) Where PLCs are used, submit scaled PLC I/O module detail drawings, in 11-inch by 17-inch format, for each card installed in the PLC backplane. Detail the wiring of all terminations on the PLC I/O module including, wiring of all I/O points and power. Illustrate all terminations points for each signal including termination points for terminal blocks, relays, etc. Identify each wires color and wire number. Utilize NFPA 79 standards to illustrate termination points: to an MCC, to a device terminal, to a control panel terminal, to fused blocks, to surge suppressor blocks, etc. Label the each point on PLC I/O modules with the PLCs physical address. Utilize NFPA 79 standards for illustration of wiring: internal to the PLC enclosure, outside the PLC panel, and integral to a device. Progression of I/O modules detail drawings shall be in the order of the orientation of the I/O modules in the PLC backplane (e.g. Slots 1 and 2 on sheet 7, Slots 3 and 4 on sheet 8, etc.). Not more than two card details shall be shown on any one drawing. Each I/O module shall be labeled with the installed rack and slot number. Illustrate installed spare I/O modules, but it is not necessary to detail slot filler cards. Include signals that shall be transmitted from the PLC-based station control panel to the RTU system.
- j. Provide PLC submittals, where applicable, including:
 - 1) PLC memory map of data registers used in transferring data to the SCADA system as specified herein.
 - 2) Catalog cuts and user's manuals for all PLC system components.
 - 3) Screen captures of all OIT displays.
 - 4) Operating description.
 - 5) Comment PLC source listing.
 - 6) Other materials, as required, to fully describe the control panel operation.
 - 7) Updated hard and soft copies of all uncompiled PLC and OIT program files shall be submitted to the buyer for inclusion with record document submittals.
 - k. Detailed Bill of Materials in Microsoft Word 2013 table format of Excel 2013, identifying component name, manufacturer, model number, and quantity supplied. Typical Bills of Materials are not acceptable.
 - l. Manufacturer's catalog information for all components and accessories. All catalog cuts, Web site printouts, manufacturers' specifications, and drawings shall be clearly marked to allow identification of the specific products used. Cross out all options and function not supplied with the equipment.
 - m. Manufacturer's standard wiring diagrams including all available terminal connections for each component.
 - n. Descriptive lists of spare parts and extra materials provided shall be in the same format as the Bill of Materials. Lists shall be exclusive to the spare

parts and extra materials requested by the specification section, hence separate from the Bill of Materials for installed equipment.

- o. Project specific installation instructions and mounting details for each component. Materials of construction for supports, brackets, and mounting hardware shall be provided with details for each type of equipment mounting rack.
- p. Proposed nameplate wording. Scaled illustrations for each nameplate provided.
- q. Submit field testing schedule and field testing reports.
- r. Process Control System Coordination - Where PLCs are utilized, submit the following information within 45 days after receiving an approved shop drawing submittal for the equipment.
 - 1) PLC Memory Map - Submit a PLC memory map to coordinate the PLC memory registers that will be utilized to facilitate bidirectional read and write functionality between the OEM PLC and the plant-wide SCADA system (plant PLCs and supervisory software). The PLC memory map shall conform to the following requirements:
 - a) Transmitted electronically to the Engineer in Microsoft Excel format.
 - b) Identify PLC memory locations of key operating data. At a minimum, PLC memory address locations shall be provided for each data point in the OEM-supplied OIT to enable OIT functionality to be fully replicated over the specified protocol within the supervisory software.
 - c) Communication shall be direct to the OEM PLC or protocol converter. Communication to an OEM supplied computer or OIT is not acceptable.
 - d) Accurate text descriptions for all data points.
 - e) Datatype of each data point (i.e. Boolean, Integer, Double Integer, Floating Point/Real, etc.).
 - f) Scaling/range of values for all analog data points (i.e., 0 to 60 Hertz, 0 to 10.00 mg/L, etc.).
 - g) Engineering units of all analog data points (i.e., gpm, mgd, mg/L, feet, inches, etc.).
 - h) Configuration details for any "packed" integers whereby the integer value of the data point signifies different equipment or process conditions. Examples are an integer whose value signifies the pump is Not Running (0), Running (1), Failed (2), Ready (3), etc.; Hand (0), Off (1), Auto (2) status; or Lead (0), Lag (1), Standby (2) configurations. Alarm conditions shall be contained in individual Boolean registers and are prohibited from existing solely in packed integers.

- i) Identify value of Boolean/Discrete values when they are “active”, i.e., alarm is active when Boolean register is True (1) or active when False (0).
 - j) Alarms – Identify alarm conditions that are annunciated in the OEM OIT. Differentiate alarm conditions from events. Prioritize alarm conditions and identify alarm conditions that are worthy of notifying the operations staff via the plant’s alarm notification system (dialer).
 - k) Key operating setpoints useful to the operating staff to view remotely. Access to all setpoints is required.
 - l) Sequence of operations detailing how the system will function as programmed.
 - s. Submit OIT/operator interface graphic displays (screen shots) for each OIT graphic display for the completed program. Submit four sets of color screen shots.
 - t. PLC Program – Complete electronic form of PLC program for coordination with plant process control system.
- B. Shop Test Results - Submit shop test results, including certified pump curves for each pump provided, in accordance with requirements specified in Sections 01640, Equipment-General, and 11300, Pumping Equipment-General..
- C. Operation and Maintenance Manual
 - 1. Submit manufacturer's written instructions for proper operation and maintenance of pumps, motors, and accessories provided under this section.
 - 2. Format and content of the manufacturer's operation and maintenance instructions shall conform to the requirements specified in Section 01640, Equipment-General.
- D. Owner Maintenance - All tools, information and equipment required to fully maintain or modify the provided OEM panels shall be provided. Tools and equipment shall include, but not be limited to:
 - 1. Documented PLC/microprocessor/OIT source code and configuration files in electronic format.
 - 2. Licensed PLC/microprocessor/OIT development software with installation media.
- E. Manufacturer's Certification of Equipment Compliance
 - 1. Submit written certification of proper equipment installation and satisfactory completion of preliminary field testing by authorized field service representative of the equipment manufacturer.
 - 2. Manufacturer's certification shall conform to requirements specified in Sections 01640, Equipment-General, and 11300, Pumping Equipment-General.

1.06. SPARE PARTS

- A. One spare dry-pit submersible non-clog pump identical in make and model to the others furnished and installed pumps at each pump station.
- B. The manufacturer shall furnish the following spare parts in clearly identified containers. Provide one set of spare parts for each pump.
 - 1. One set of O-rings of each type.
 - 2. One set of lower bearings.
 - 3. One set of upper bearings.
 - 4. One set of upper and lower mechanical seals or one seal of each type.
 - 5. One set of wear rings (when applicable).
- C. One spare Computer Processing Unit (CPU) for each CPU type.
- D. One spare memory battery for each PLC.
- E. One spare PLC power supply for each type used.
- F. One of each type discrete input module.
- G. One of each type discrete output module.
- H. One of each type analog input module.
- I. One of each type analog output module.
- J. One of each type communication module.

1.07. COORDINATION

- A. The General Contractor will coordinate with the Electrical Contractor to determine the space required to install the subpanel into the enclosure provided by the Electrical Contractor.
- B. Coordinate subpanel dimensions with the Electrical Contractor prior to the submission of the shop drawings for this section.
- C. Ethernet Addressing - Coordinate IP addressing of all Ethernet networked devices with the Engineer, utilizing IP addresses supplied by the Engineer. Engineer-supplied IP addresses shall be coordinated and configured in networked devices prior to shipment of equipment to the project site. IP address shall be entered into networked devices under this specification section.

PART 2 PRODUCTS

2.01. GENERAL

- A. Pumps - The pumps provided under this section shall be Model 6NNT18-3300 by Cornell; Model XFP 1505J-CB2 by ABS; or equal.

- B. Dimensions and locations shown on the Contract Drawings are based on the equipment manufacturers and models listed above. Any change in the dimensions or location of equipment, including accessories, required to accommodate alternate manufacturers and models shall be at the Contractor's expense.
- C. In the case of equipment submitted for approval as an "or equal" to the manufacturers and models listed above, the Contractor shall demonstrate, in writing, at the time of shop drawing submittal, that the manufacturer has produced the specified type and size of equipment for sanitary wastewater service that has been in successful operation for a minimum period of 10 years prior to the bid date.

2.02. PUMP DESIGN

A. General

- 1. Major pump components shall be manufactured of ASTM A48 Class 35B or 40 gray cast iron with smooth surfaces devoid of blow holes or other irregularities.
- 2. All exposed nuts and bolts shall be AISI Type 316 stainless steel.
- 3. All metal surfaces coming into contact with the pumpage other than stainless steel or brass shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- 4. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact on four sides without a specific torque limit requirement.
- 5. The pump shall be secured to a steel support stand of suitable strength to support the weight of the pump and resist any expected torsion, bending, or vibration forces. The pump shall be suitable for either vertical or horizontal dry pit installation without requiring any internal modifications.

B. Impeller

- 1. The impeller shall be manufactured of ASTM A48 Class 35B or 40 gray cast iron and shall be dynamically balanced, semi-open, non-clog design.
- 2. Impellers shall be locked to the shaft, held by a stainless steel impeller bolt.

C. Volute Bottom

- 1. The pump volute shall be made of ASTM A48 Class 35B or 40 gray cast iron.
- 2. The discharge flange design shall permit attachment to standard ANSI or DIN flanges/appurtenances.

D. Pump Shaft

- 1. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable.
- 2. The shaft shall be made of 420 stainless steel.

3. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation.

E. Bearings

1. The pump shaft shall rotate on three bearings. The upper bearing shall be a cylindrical roller bearing and the lower bearings shall be a matched set of at least three heavy duty bearings, two angular contact ball bearings, and one cylindrical roller bearing. All three lower bearings shall have identical outer race diameters to provide maximum bearing load capacity.
2. Motor bearings shall be permanently grease lubricated.
3. L-10 bearing life shall be a minimum of 100,000 hours.

F. Mechanical Seal

1. Each pump shall be equipped with a triple seal system consisting of tandem mechanical shaft seals, plus a radial lip seal, providing three complete levels of sealing between the pump wet end and the motor.
2. The mechanical seal system shall consist of two totally independent seal assemblies operating in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate.
3. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring and one rotating industrial duty solid silicon-carbide seal ring.
4. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron ASTM A48, Class 35B. The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate.
5. The upper, secondary seal unit, located between the lubricant chamber and the sensing chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring, and one rotating one rotating industrial duty solid silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system.
6. A radial lip seal shall be positioned above the sensing chamber, preventing any liquid which accumulates in the sensing chamber from entering the lower bearing and motor.
7. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing.
8. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling.
9. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump.

10. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe non toxic material.

G. Cable Entry/Junction Chamber

1. The cable entry seal design shall preclude specific torque requirements for a watertight and submersible seal.
2. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter, and compressed by the body containing a strain relief function, separate from the function of sealing the cable.
3. The assembly shall provide ease of changing the cable when necessary using the same entry seal.
4. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the top of the pump.

H. Mechanical Seal Protection and Seal Failure Warning System

1. The primary mechanical seal shall be protected from interference by an active seal protection system integrated into the impeller and volute.
2. The back side of the impeller shall be equipped with pump out vanes to eject any fibrous material that attempts to lodge behind the impeller.
3. The seal protection system shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function.
4. The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time by a seal failure warning system.
5. An electrical probe shall be provided in the sensing chamber positioned between the primary and secondary mechanical seals to detect the presence of water contamination within the chamber. The sensing chamber shall be filled with environmentally safe non-toxic oil. A solid-state relay shall be mounted in the pump control panel or in a separate enclosure and shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber.
6. When sufficient water enters the sensing chamber through the primary mechanical seal, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel to energize a seal failure indication light in the control panel.

I. Cooling System

1. Pumps shall be equipped with a closed loop cooling system adequately designed to allow the motor to run continuously under full load while in an unsubmerged or minimally submerged condition.

2. A cooling jacket shall surround the stator housing, and an environmentally safe non-toxic propylene glycol solution shall be circulated through the jacket by an axial flow circulating impeller attached to the main motor shaft.
3. The coolant shall be pumped through an integrated heat exchanger in the base of the motor whenever the motor is running, allowing excess heat to be transferred to the process liquid.
4. Cooling systems that circulate the pumped medium through the cooling jacket, or those that use a toxic cooling liquid shall not be acceptable.
5. The use of external heat exchangers, fans, or the supply of supplemental cooling liquid shall not be acceptable.

J. Motor and Power Cable

1. The pump motor shall be a NEMA B design, induction type, with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The motor shall be suitable for operation on VFDs.
2. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180 degrees C (356 degrees F).
3. The stator shall be heat shrink fitted into the cast iron stator housing. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing is not acceptable.
4. The motor shall be designed for continuous duty handling pumped media up to 40 degrees C (104 degrees F) and capable of up to 15 evenly spaced starts per hour.
5. The rotor bars and short circuit rings shall be made of cast aluminum.
6. Thermal switches set to open at 125 or 140 degrees C shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with, and supplemental to, external motor overload protection and shall be connected to the pump control panel.
7. The junction box containing the terminal board shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to the terminal board.
8. The combined service factor shall be a minimum of 1.00.
9. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need for any splices.
10. The outer jacket of the cable shall be oil resistant and UV stable material.

K. Protection Devices and Monitoring Unit

1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125 or 140 degrees C stopping the motor and activating an alarm.

2. A leakage sensor shall be provided to detect the presence of water in the stator chamber. When activated the sensor shall activate local and remote alarms.
3. The thermal switches and leakage sensor shall be connected to the control panel.
4. Pump manufacturer/supplier shall provide a single cable for each pump containing conductors suitably rated for pump power, seal leak sensors, and motor winding temperature sensors. Cable length as required from pump to motor starter. Coordinate with Electrical Contractor.

2.03. GUIDE RAIL/BRACKET

- A. One AISI Type 316 stainless steel rail shall be provided to guide each pump when being raised or lowered in the sump and mounted on the discharge base/elbow.
- B. The rail shall align the pump with the discharge connection as it is lowered into place.
- C. A ductile iron upper rail guide bracket shall be furnished to support and align the rail at the top of the sump.
- D. Provide Type 316 stainless steel chain for installing and removing each pump.

2.04. CONTROLS

1. Station Control Panel

A. Enclosure Construction

1. General

- a. Dimensions of enclosures shown on the Contract Drawings are minimum required dimensions. Enclosure shall be sized as required to house the electrical equipment shown or specified.
- b. Reserve a 12-inch x 12-inch run of DIN-rail for future installation of a cellular-based radio.
- c. Control panels shall include an equipment support system for mounting internal wiring and control components, and for the proper support of long case instruments. This system shall ensure that equipment is adequately supported by the main structural frame members. Fixed support members shall not be attached to front panels or removable access panels.
- d. Steel enclosures shall be constructed of a minimum of 14 gauge steel and shall be constructed in accordance with NEMA requirements. Seams shall be continuously welded and ground smooth, with no holes or knockouts. Exterior hardware, including mounting hardware shall be stainless steel unless otherwise noted.
- e. Panel cutouts shall be provided for mounting components as arranged on the Contract Drawings and shall include cutouts and cover plates, and shall be capable of being removed for the addition of future components. Components shall either be door mounted unless otherwise noted. Control panels requiring rear access shall have the components mounted on side opposite the door.

2. NEMA 12 Steel Enclosures

- a. NEMA 12 enclosures shall be dust-tight, drip-tight suitable for protecting enclosed equipment and components from fibers, flyings, lint, dust and dirt. NEMA 12 enclosures shall provide a degree of protection against light splashing, seepage, dripping and external condensation of non-corrosive liquids.
- b. Manufacturers
 - 1) Hoffman
 - 2) Saginaw Control & Engineering
 - 3) Equal

B. Enclosure Doors

- 1. Enclosures shall be provided with front access single or double overlapping doors as required for the enclosure size. Door(s) shall be provided with heavy duty three point spring-roller latches operated by a key locking handle. Latch rods shall have rollers to facilitate door closing. Provide a minimum of two keys for each lock. Locks shall be keyed the same.
- 2. Door(s) shall be mounted with continuous piano hinges. Contractor shall coordinate door swing (right hand or left hand) for each control panel to avoid interference with other equipment mounted adjacent to the control panels.
- 3. A rolled lip around minimum three sides of door shall be provided to prevent dirt and liquid from dropping into the panel when door is open.
- 4. Door(s) shall be fitted with a neoprene gasket applied with oil resistant adhesive and held in place with stainless steel retaining strips.
- 5. Enclosures mounted outdoors shall be provided with stainless steel door stops to hold the door(s) in the open position. The open position shall be field adjustable.

C. Interior Subpanels - Interior subpanels for component mounting shall be provided and assembled for each enclosure. Interior subpanels shall be constructed of 14 gauge steel finished in white enamel paint. Subpanels shall be provided with intermediate stiffeners where required to maintain surface flatness and panel rigidity. Fasteners, screws, and equipment mounting racks shall be stainless steel.

D. Enclosure Finish

- 1. NEMA 12 Enclosures - Sheet metal components shall be thoroughly cleaned, bonderized and finished with a prime coat and two topcoats of a two-component, catalyzed, polyurethane enamel. Texture semi-gloss finish shall be applied to provide a non-glare and abrasion resistant surface. Enclosures shall be provided with gray finish inside with a white enamel interior unless otherwise specified.

E. Enclosure Accessories

- 1. A large print pocket shall be provided on interior face of the enclosure door(s). Where this cannot be accommodated due to windows and other control devices

mounted on the door, the print pockets shall be mounted on the interior side of the control panels.

2. Circuit Breaker Operators

- a. The circuit breaker shall be properly sized to protect the control circuit conductors against over current due to short circuit or grounds.
- b. Main circuit breaker disconnect handle operators shall be provided. Handle operator shall be flange mounted type, accessible from the front flange of the panel, and shall be capable of being locked in either the On or Off position with a padlock.
- c. Handle operators shall prevent opening of the control panel doors with the handle in the On position. Operators shall be provided with a defeater mechanism to allow authorized personnel to open the door with the handle in the On position.

3. Service Lights and Receptacles

- a. Provide a fluorescent light package in each enclosure. Fluorescent light shall utilize a manual light switch, terminal block, and non-yellowing PVC lens. Light shall not energize automatically when door is opened. Light shall be Hoffman, Model A-LF16M24, or equal.
- b. Provide a Ground Fault Circuit Interruptor (GFCI), 15-amp duplex receptacle, in accordance with Section 16055, Electrical Work, in the PLC/microprocessor enclosure. To be used as a service outlet with both outlets available..
- c. Fluorescent service lights shall be provided with a plastic cover to protect the bulb (bulb sleeves are not acceptable). Lights shall be controlled by a door activated light switch. Service lights shall be as manufactured by Hoffman or equal.

2.05. ELECTRICAL SYSTEMS

- A. Pump control panel including internal components shall be designed to operate on standard utility grade power systems ± 10 percent nominal voltage. Equipment and systems shall be capable of sustaining temporary voltage dips of up to 15 percent as required to accommodate step starting and loading of emergency generator systems. Equipment shall be design to automatically restart after a power outage without latching into an alarm condition. Each system shall be provided with one shot times, relays, configuration programming and accessories to allow automatic restart after a power outage.
- B. Power Distribution
 1. Power Supplies – Unless otherwise noted, power is provided to the OEM control panels from a single source as listed in the specifications or shown on the Drawings.
 2. Power and distribution devices including, control power transformers, power supplies, fuses, circuit breakers, power distribution blocks, terminations and other required components shall be provided to generate all required voltages used by the control panel.

3. Control panels shall include provisions for distributing power to all three phase and single phase equipment shown on the Contract Drawings. Control panels shall include a main circuit breaker which shall disconnect power to the entire system. Incoming terminals shall be oversized to accommodate wiring and cable sizes as shown on the Contract Drawings.
4. Branch circuit breakers shall be provided on control power circuits and each individual circuit distributed from the panel. Circuit breakers shall be grouped on a DIN-rail. Use branch circuit breakers rated at no more than twice the load.
5. Provide control power transformers and power supplies as required to obtain an operable system. Control power transformers shall be provided with suitable fusing on the primary and secondary side of the transformers. Control power transformers shall be sized as required to power equipment as shown on the Contract Drawings.
6. Place no more than 20 devices on any single circuit. Do not exceed 12 amperes on the branch circuit.
7. Where multiple units provide parallel operations, do not group devices on the same branch circuit.

C. Circuit Protective Devices

1. Circuit Breakers

- a. Circuit breakers shall be of the thermal magnetic air type. Circuit breakers shall be appropriately sized to protect the equipment served per the requirements of the National Electrical Code.
- b. Thermal magnetic air circuit breakers shall be provided for branch circuit disconnect service and short circuit protection of motor control and auxiliary circuits.
- c. Main circuit breakers for motor control panels which include motor controllers, motor starters, variable frequency drives, solid state reduced voltage starters, etc., shall be rated a minimum of 35kAIC.

2. Fuses

- a. Provide fuses as required and specified for protecting individual control circuits and systems. Fuse ratings shall be sized to protect the equipment served per the requirements of the National Electrical Code.
- b. Each PLCI/O module shall be individually fused.

3. Surge Protection - Each control panel shall be provided with transient voltage surge arresters on the incoming power supply as required to protect the equipment from voltage surges. Control and Instrument circuits which enter/exit the building or structure shall be furnished with surge protective devices.

D. Terminal Blocks

1. General

- a. Terminal blocks shall be feed through, single level, and suitable for DIN rail mounting. Terminal blocks shall be fabricated complete with marking strip, covers, end plates, partitions, and screw type pressure connectors. Terminal blocks shall be screw connector type, tin-plated copper.
 - b. Terminal blocks shall be UL listed, rated for 600 VAC, 35 amperes unless otherwise noted.
 - c. Not less than 25 percent spare terminals shall be provided.
 - d. Terminal blocks for external connections shall be suitable for No. 12 AWG wire.
2. Terminal blocks for low voltage instrumentation circuits shall be rated for 300 VAC, 10 amperes.
 3. Separate terminals shall be used for AC and DC voltages. These terminals shall be labeled AC and DC and shall be provided with two distinct colors. Separate wireways shall be installed for AC and DC voltages. AC and DC wiring shall be kept separate at all times.
 4. Fuse terminal blocks shall be provided with LED blown fuse indicators and shall be capable of being disconnected without the use of any special tools.
 5. Ground terminals shall be green.
 6. Terminal blocks shall be located in the bottom of the panel, except where otherwise shown or noted. Terminal blocks shall be located near the doors or access panels of the enclosures to facilitate field wiring connections. Minimum spacing between terminal blocks shall be 5 inches and a minimum of 4 inches all around. Duplicate terminals shall be used to limit the number of wires at one terminal to two.
 7. Terminals shall be labeled to agree with identification shown on supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable.
 - a. Wires shall be numbered using wire markers. Wire numbers shall agree with terminal numbers, submittals, and remote equipment wiring designations.
 - b. Terminal blocks shall be numbered with a high resolution, wipe resistant label. Phoenix Zack strip or equal.
 8. Provide a screwdriver with blade suitable for operating each type of terminal screw provided.
 9. Terminal blocks shall be as manufactured by:
 - a. Phoenix Contact.
 - b. Equal.

E. Internal Wiring

1. Internal instrument and component device wiring shall be as normally furnished by the manufacturer.
 2. With the exception of low voltage instrumentation circuits (less than 30 V), interconnecting wiring and wiring to terminals for external connection shall be not less than No. 14 AWG copper, insulated for not less than 600 volts, with a moisture and heat resistant material and flame-retardant nonmetallic covering.
 3. Wiring, except where noted, shall terminate on panel terminal blocks. Wiring shall be from terminal to terminal with no splices. Wiring from external devices shall terminate at the panel's field termination terminal blocks.
 4. Instrumentation circuits shall be shielded.
 5. Wiring shall be grouped or cabled and firmly supported to the panel. Not less than eight inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Plastic wireway, Panduit or equal, shall be used to route wire within the panel. Wireways shall be provided with removable covers. Wireway shall be run in continuous length with snap on covers. AC and DC wiring shall be run in separate plastic wireways.
 6. Tie-wraps used for bundling wire shall be cinched carefully to eliminate grooving the insulation.
 7. Each control loop or system shall be individually fused, and fuses and circuit breakers shall be clearly labeled and located for easy maintenance.
 8. Color code wiring as follows:
 - a. Line and Load Circuits (ac or dc power) - Black.
 - b. Neutral - White.
 - c. AC Control Circuits - Red.
 - d. DC Control Circuits - Blue.
 - e. Interlock Control Circuits on the Panel Energized From External Source - Yellow.
 - f. Equipment Grounding Conductors - Green.
- F. Circuit Identification - Devices mounted on or within the enclosures shall be permanently identified. The device and terminal identifications shall agree with those shown on the Contract Drawings.
- G. Controls and Instruments - Panel-mounted control relays, pushbuttons, indicating lights, selector switches, and instruments and components shall be as specified herein. Device, junction, pullboxes and other conduit system accessories shall be as specified in the Section 16055, Electrical Work.

H. Grounding

1. Enclosures shall be provided with two grounding lugs located on opposite sides of the enclosure for connection to external grounding system.
2. Provide a ground bus in each cabinet or panel for the shield and signal grounding circuits.
3. Door panels shall be grounded and provided with flexible grounding braids that allow the door panels to be opened.

2.06. CONTROL PANEL IDENTIFICATION

- A. Control panels and enclosures shall be provided with nameplates on the exterior of each enclosure identifying the application function of the equipment enclosed such as "Gas Conditioning System Control Panel." Nameplates shall be mounted directly above equipment.
- B. In addition, for selector switches and/or pushbuttons, a factory installed legend plate shall be provided to indicate the function each station performs, such as "On" or "Off."
- C. Nameplates shall be engraved 1/4-inch high (1/2-inch high for enclosure titles) black capital letters on a 1/8-inch thick plastic black tag with white letters mechanically attached to enclosure. Lettering shall be in capitals except as shown. Nameplate text shall be as shown or scheduled on the Contract Drawings.
- D. Legend plates shall be metal with black lettering mechanically attached to control panel.
- E. Interior mounted components and equipment shall be provided with nameplates. Nameplates shall be located adjacent to, but not on, the given device and visibility shall not be obstructed by wire bundles or other equipment. Nameplates shall include device identification number as well as descriptive name.
- F. Instrumentation equipment shall be provided with identification tags. Identification tags shall have 5/16-inch high capital, white letters on black background machine engraved. Hang nameplates from process-mounted instruments via metallic chains. Nameplates shall be hung within 12 inches of the equipment.
- G. Enclosures shall be provided with instruction plaques indicating any warnings or special instructions required by the component manufacturers. Warning plaques shall be red with white lettering.
- H. Nameplates shall be permanently secured to enclosures and backpanels.
- I. Each panel shall be provided with short circuit current rating information included on the nameplate.

2.07. MISCELLANEOUS ITEMS

- A. Wiring Diagrams - A set of elementary wiring diagrams shall be provided, in the enclosure print pocket, on the inside door of each control panel. The wiring diagram shall include all shop drawing and field changes and revisions performed during construction.
- B. Surge Suppressors - Surge suppressors shall be provided on all DC operated relay coils to minimize the high transient voltages generated when the circuit to the operating coil is opened.

2.08. CONTROL COMPONENTS

A. Relays

1. General Purpose Control Relay

- a. 24 VDC units shall be blade plug-in type. 120 VAC units shall be pin plug-in type. All relays shall have LED indicators and mechanical test button.
- b. Use - Shall be used in motor control centers where all relays are in separate sections and only for such things as indicating lights, alarm output, and motor starting coil seal in contact.
- c. Number of poles and arrangement as shown or specified.
- d. Contacts.
- e. AC units shall be rated 10 amps at 240 volts AC.
- f. DC units shall be rated 5 amps at 40 volts DC.
- g. Material shall be silver cadmium oxide.
- h. Coils shall be rated continuous duty.
- i. Sockets.
- j. Supply with relay retainer clip.
- k. Terminal connections with captive screw to accept locking fork solderless connectors.
- l. Single tier design.
- m. Manufacturers - Square D Company Class 8501 Type K relay and Type NR socket; Potter-Brumfield; or equal.

2. Industrial Control Relay

- a. Industrial machine tool type.
- b. Use - Shall be used to control equipment with power requirements, such as solenoid valves.
- c. Shall be used in MCC for all control relay applications.
- d. Contacts (with LED indicators)
 - 1) Double break field convertible.
 - 2) Rated 10 amps at 600 volts AC.
 - 3) Rated 5 amps at 250 volts DC.

- e. Coil shall be encapsulated, continuously rated of the voltage rating indicated on the plans.
- f. Number of poles as indicated on Contract Drawings, but not less than four.
- g. Holding and Operating Mechanism
 - 1) Electrically held, electrically operated, Square D Company Class 8501, Type X; or equal.
 - 2) Mechanically held/electrically held relay with mechanically-held attachment.
 - 3) Time Delay - Pneumatic timer attachment for electrically-held delay; 'on delay' or 'off delay' as indicated on plans.

3. Time Delay Relays

- a. Solid-state type with calibrated dial head or dip switch adjustment, encapsulated coil, snap-action switch assembly of number of poles indicated.
- b. "On-Delay," "Off-Delay," or "On-Off Delay" dual head type as indicated; timing range intervals as shown or specified.
- c. Bases shall have captive screws for locking fork solderless connectors, single tier design, with relay retainer clips.
- d. Dust-tight construction.
- e. Provide auxiliary contacts where indicated.
- f. Contacts rated 10 amps resistive at 120 VAC.
- g. Manufacturer - Diversified Electronics Series "TD;" Square D, Type JCK; Timemark 300 Series.

B. Wireway

- 1. Provide covers for all wireway.
- 2. For all stand-alone enclosures provide 3-inch width wireway, minimum.
- 3. Size width and depth based on 50 percent of area fill. Check the applicable codes to verify fill.
- 4. Manufacturer
 - a. Panduit.
 - b. Or equal.

C. 24 VDC Power Supply

- 1. Provide a sufficient quantity of 24 VDC power supplies as necessary to power PLC equipment and instrumentation.

2. Power supplies shall be sized with capacity to accommodate the load of the provided PLC controls in addition to a future cellular-based Radio to be installed within the control panel.
 3. Power supplies shall be manufactured by Acme Electric Corporation, Model DR Series, LAMBDA Electronic, Acopian, or equal. Power supplies shall meet, or exceed, the following requirements.
 - a. UL 508 listed, CE approved.
 - b. DIN-rail mounted.
 - c. Removable, plugable connections for input and output power.
 - d. Local output status indication light.
 - e. Overload Protection - Current limited to a preset value.
 - f. 86 percent efficient.
 - g. Output Voltage - 24 VDC +5 percent adjustable.
 - h. Temperature Range - -20 to 50 degrees C.
 - i. Mean lifetime of 500,000 hours.
 - j. Two-year warranty.
 - k. Ripple and Noise - 24 mV RMS, 200-mV peak to peak.
 - l. Accept input voltages of both 120 VAC and 240 VAC. Fully enclosed, touch-safe.
- D. Ethernet Switches Without Fiber Ports (DIN-Rail Mounted)
1. General
 - a. Provide DIN-rail-mounted fast Ethernet switch for mounting in control panel in accordance with the Contract Drawings.
 - b. Provide quantities of Ethernet ports to accommodate connections to each required networked device.
 2. Specifications
 - a. Software Layer 3 Enhanced with Internet Group Multicast Protocol (IGMP) snooping enabled.
 - b. DIN-rail-mounted, fanless design.
 - c. Manufacturer-rated for industrial use, including temperatures of 0 to 60 degrees C, humidity 10 to 95 percent non-condensing, and an Mean Time Between Failures manufacturer rating greater than 40 years.

- d. IEC 60068-2-27 conformity for shock. Capable of withstanding 18 shocks at 15 g of 11 ms in duration.
 - e. IEC 60068-2-6 conformity for vibration.
 - f. EN 61000-4 conformity for immunity to electro-magnetic interference (EMI).
 - g. Support 256 virtual Local Area Networks (VLANs).
 - h. Removable terminal blocks with screw compression.
 - i. Capable of being powered from redundant/dual DC power supply sources.
 - j. LEDs for Link and Activity per port. Failure LED for switch.
 - k. Device configuration and monitoring shall be achieved through a web-browser interface via the Ethernet TCP/IP protocol. The device shall include an embedded web server to access configuration and status pages. Ethernet switches that utilize separate configuration software packages are not acceptable.
3. Manufacturers shall be:
- a. Hirschmann, MACH100 Series.
 - b. Allen-Bradley, Stratix 5410 Series.
 - c. N-Tron equipment is not acceptable.

2.09. PILOT DEVICES

A. General

- 1. Pilot devices shall include indicating light, pushbuttons, and selector switches.
- 2. Heavy-duty, industrial type, construction.
- 3. Area Classification
 - a. Non-Classified Area Device Rating - NEMA 13 oil-tight.
 - b. Wet Area or Exterior Device Rating - NEMA 4 and NEMA 13 oil-tight and watertight.
- 4. Provide extra large nameplates in accordance with Section 17000, Instrumentation , for all door or enclosure front-mounted devices.
- 5. Controls and relays shall be by one manufacturer wherever possible.
- 6. 30-millimeter diameter.
- 7. Retaining ring and boot type.
- 8. Terminal blocks shall have a safety cover or be finger safe to protect personnel.

2.10. POWER LINE SURGE PROTECTORS

- A. General - Power line surge protectors shall be provided to protect equipment from transients on the AC power line. Surge protectors shall meet the requirements of ANSI/IEEE C62.41. They shall be of the type required to protect equipment installed in an industrial environment.
- B. Hardwired Type - Hardwired power line surge protectors shall be wired to the input terminals of the respective panel or equipment. Power line surge protectors shall be by Topaz, Best, Tycor, Control Concepts, or equal.

2.11. UNINTERRUPTIBLE POWER SUPPLIES (UPS)

- A. Where PLC-based control panels are required, provide a DIN-rail-mounted UPS, Phoenix Contact Model QUINT or equal that provides a minimum of 15 minutes' backup power. The intent of this requirement is reliable backup power using an industrial grade, compact design (for minimal space requirements), easily replaceable, modular batteries, and reduced heat generation-type UPS.

2.12. PLC

- A. Provide a PLC named PLC-JVPS. The pump control panel shall utilize one of the following type PLCs:
 - 1. Allen-Bradley, Model CompactLogix or equal.
- B. Local monitoring and control of the system shall be through an OIT panel mounted to the system control panel.
 - 1. The station control panel OIT manufacturer and model shall be Allen-Bradley, Model Panelview Plus 7 or equal.
 - 2. Communications between the OIT and PLC shall be via Ethernet through an Ethernet switch in the system control panel.
 - 3. Furnish one licensed copy of the associated OIT configuration software.
 - 4. OIT shall be installed centerline between 4 feet 9 inches and 5 feet 0 inches from the finished floor.
- C. The OIT shall be programmed by the system manufacturer utilizing the following screens:
 - 1. Pumping Station Overview Graphic
 - a. Shall be a schematic representation of the pumps tation.
 - b. As a minimum display the operational status of Jefferson Valley centrifugal pumps (P-1010, 1020, 1030) and channel grinder (G-1040). Show each pump as a small circle that changes color according to the pump run status. Graphic detail and equipment designations of the equipment are necessary on this screen.
 - c. All important analog values, including, but not limited to, wet well level (LT-1001) and influent screenings Parshall flume flow (FIT-1101) and as directed by Owner and Engineer shall be indicated on this main screen.

2. Pump Control Graphic – Provide a pop-up window that is accessed from the Pumping Station Overview Graphic. This window shall display and allow a user to enter control setpoints for each user adjustable setpoint as described in Article 2.13. These setpoints include, but are not limited to: Lead Pump Start Level, Lead Pump Start Delay, Lag Pump Start Level, Lag Pump Start Delay, Lag Pump Off Level, Lag Pump Off Delay, Lead Pump Off Level, and Lead Pump Off Delay. Additionally, provide the ability to enable/disable pump alternation through the OIT. Pumps shall be configured to alternate by default.
 3. Alarm Setpoint Graphic – Provide a pop-up window that is accessed from the Pumping Station Overview Graphic. This window shall allow a user to enter critical elevation levels for alarming of High-High, High, Low, and Low-Low Level Alarms as described in Article 2.13.
- D. Alarm Summary Graphic - Provide one full screen, less title bar, alarm summary window that details each active alarm along with timestamp in which the alarm was received. Future SCADA System Integration
1. All status, monitoring, and alarm functions shall be accessible through the SCADA system. PLC/microprocessor
 2. All calculations and derived conditions shall be accessible in registers within the PLC/microprocessor. All scaling shall be performed within the PLC/microprocessor to ensure that scaled values are accessible to SCADA directly from registers within the PLC/microprocessor.
 3. Coordinate data to be shared with the SCADA system through the PLC/microprocessor memory maps and static OIT graphic prints specified to be provided by the manufacturer herein.
 4. All physical inputs and outputs shall be mapped to memory registers. The OIT software shall not be required to reference physical I/O directly.
 5. All alarm conditions shall be False/0/Low when the alarm condition is Not Active and True/1/High when the alarm condition is Active. All alarm conditions shall be in Boolean-datatype memory registers.
- E. Refer to Article 2.13 for the Process Control Narrative.
- F. Auxiliary Discrete Outputs Located in Pump Control Panel - Provide Form C dry contact relay outputs for the following conditions and noted in Table 11320-1:
1. Pump 1 Run Indication – To RTU System
 2. Pump 1 Failure Indication – To RTU System
 3. Pump 2 Run Indication – To RTU System
 4. Pump 2 Failure Indication – To RTU System
 5. Pump 3 Run Indication – To RTU System
 6. Pump 3 Failure Indication – To RTU System
 7. High-High Level Float – To RTU System

8. High-High Level Float – To Marshall Alarm Panel
 9. BUFCP System On – To RTU System
 10. Parshall Flume Transmitter Failure Indication – To RTU System
 11. ATS on Utility Power – To RTU System
 12. ATS on Generator Power – To RTU System
 13. Generator Running – To RTU System
 14. Grinder Running – To RTU System
 15. Grinder Failure – To RTU System
- G. Auxiliary analog outputs located in pump control panel- Provide signal isolators for conditions as follows and noted in Table 11320-1.
1. Wet Well Level – To PLC-JVPS
 2. Parshall Flume Flow – To PLC-JVPS
 3. Wet Well Level – To RTU System
 4. Parshall Flume Flow – To RTU System
- H. Refer to I/O list (Table 11320-1 at the end of this section) for I/O points for the PLC enclosure.
1. All I/O shall be wired to terminal strips. Where relays, intrinsically safe barriers and/or surge protection for I/O are required, wiring shall be from the I/O module to the relay, barrier, or surge protector to the terminal strip.
 2. Provide intrinsically safe barriers for I/O originating in hazardous areas as indicated on the Contract Drawings. Installation and separation of wiring shall be in full accordance with the latest revision of the NEC.
 3. Provide surge protection in accordance with Section 17000, Instrumentation. Surge protection shall be located on a separate DIN rail from the terminal strips.
 4. Provide loop and external power supplies for all field devices that require such power.
 5. Provide at a minimum three additional spare discrete input points.
 6. Provide 120 VAC power for all 120 VAC discrete outputs.
 7. Provide 24 VDC power for all discrete inputs.

2.13. JEFFERSON VALLEY PUMP STATION WET WELL

- A. PLC programming shall be performed by the system supplier as specified herein.
- B. In the event the PLC becomes unavailable, non-responsive, faults, or the signal from the level transducer is lost to the PLC, the backup float control panel shall activate and take control of the pumps. Once the Backup Float Control Panel (BUFCP) takes control of the pumps, PLC control will be locked out until an operator physically resets the operation at the BUFCP via a pushbutton. Refer to detail on drawing 86-18742-JP-I002 for required electronics.
- C. Coordinate with the supplier of the submersible level transducer (LT-1001) to ensure the device is configured to drive its signal below 4.0 mA in the event of a failure. Configure the analog input modules to also drive the level signal low in the event of a module or wiring failure.
 1. Provide the following derived alarm:
 - a. LAHH – High-High Level Alarm. When the level in the wet well rises to this setpoint, a High-High Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
 - b. LAH– High Level Alarm. When the level in the wet well rises to this setpoint, a High Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
 - c. LAL - Low Level Alarm. When the level in the wet well lowers to this setpoint, a Low Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
 - d. LALL– Low-Low Level Alarm. When the level in the wet well lowers to this setpoint, a Low-Low Level alarm shall be generated by the PLC and displayed in the OIT. This shall be an Alarm Setpoint adjustable in units of fact and displayed to the tenths.
- D. The wet well pumps (P-1010, 1020, 1030) shall be monitored and controlled remotely via the PLC described below. The pumps are in a triplex configuration. The pumps shall be driven by a VFD. The pumps shall have a Local/Off/Auto switch on the main control panel.
 1. In Hand, the respective pump shall run at a speed manually set by an operator at the VFD. PLC control of this equipment shall be prohibited. The pump shall stop running if seal failure, thermal overload and/or VFD failure occur via hardwired interconnections. Interlocks shall not be dependent upon operation of the PLC.
 2. In Off, the respective pump shall stop. PLC control of this equipment shall be prohibited.
 3. In Auto, the respective pump shall modulate its speed based on the level from LT-1001. The pumps will start, run and modulate their speed based on the setpoints listed below.

- a. As level in the wet well increases to a user-adjustable Lead Pump Start Level Setpoint (units: feet) and remains at, or above, this level for a user-adjustable Lead Pump Start Delay Setpoint (units: seconds), the lead pump shall start and run.
- b. When level reaches the user-adjustable Lag Pump Start Setpoint (units: feet) and remains at, or above, this level for a user-adjustable Lag Pump Start Delay Setpoint (units: seconds), the lag pump shall start and run.
- c. When level drops to the user-adjustable Lag Pump Stop Level Setpoint (units: feet) and remains at, or below, this level for the user-adjustable Lag Pump Stop Delay Setpoint (units: seconds), the lag pump shall stop running.
- d. When level drops to the user-adjustable Lead Pump Off Level Setpoint (units: feet) and remains at, or below, this level for a user-adjustable Lead Pump Stop Delay Setpoint (units: seconds), the lead pump shall stop running.
- e. Staging - The three pumps serving the wet well shall operate in a lead/lag/standby configuration, such that only one pump operates at any given instant, unless a level is reached that requires the use of another pump. In the event the lead pump fails to start, the lag pump shall start in its place, the standby pump shall take the place of the lag pump and a Fail-to-Start alarm will be annunciated via the OIT. In the event that lag pump fails, the standby pump will take the place of the lag pump and a Fail-to-Start alarm will be annunciated via the OIT.
- f. Pump Alternation – Provide the ability to enable/disable pump alternation through the OIT. By default, pumps shall be configured to alternate. Alternation shall occur in response to either of two conditions, whichever occurs first. The first, and normal, condition shall when the lead pump shuts down due to reaching the Lead Pump Stop Level Setpoint. The second condition shall be when the lead pump has been running continuously for a user-adjustable Excessive Runtime Setpoint (units: minutes). When one of the conditions has been met, the Lead pump will become the Standby pump, the Lag pump will become the Lead pump, and the Standby pump will become the Lag pump.

E. Provide the following derived data pertinent to the operation of the PS:

- 1. Run Time Totalization – Provide individual runtimes in registers for all pumps, mixers, drives, and other motors that have run indication wired to a PLC. Run times shall be configured in hours, resettable only by plant personnel through the supervisory software.
- 2. Flow totalization – Calculate running and daily totals of all flows monitored at one-minute intervals and write each to a register. Calculate daily minimum, maximum, and average flow values and write each to a register.
- 3. Under Range Alarming - Provide under range alarm monitoring for all analog signals. Alarms shall be have enable/disable functionality (_EN modifier) and utilize the alarm active structure (_AL modifier). Alarms will be utilized for analog signal troubleshooting.

4. PLC Clock Synchronization - Provide a PLC clock synchronization tag as an Integer in a writable register from SCADA. At 3am the SCADA computer shall be able to write a 1 into the PLC clock synchronization register which then triggers logic to set the PLC clock to 3am. The PLC shall then set the PLC clock synchronization register back to 0.
- F. Pump controls shall be furnished and installed by the Contractor as stated in Sections 16055, 16480, 16484, and 16486, and as shown on the Drawings.
 1. All controls and PLC hardware shall be completely fabricated and fully tested on a subpanel that will be installed in an enclosure provided by the Electrical Contractor.
 2. A 12-inch x 12-inch run of unoccupied DIN rail shall be reserved in the upper right-hand corner of the subpanel for future use.
- G. All output meters shall be calibrated to indicate pump capacity (gpm) over the entire range of available motor speeds.

PART 3 EXECUTION

3.01. SHOP TESTING

- A. Each pump shall be shop tested by the equipment manufacturer prior to shipment to the job site.
- B. Shop testing shall demonstrate that each pump meets the performance requirements specified in this section.
- C. In addition to the requirements specified in this section, shop testing shall conform to requirements specified in Sections 01640 and 11300.

3.02. EQUIPMENT INSTALLATION

- A. Install equipment in accordance with the manufacturer's instructions at the locations shown on the Contract Drawings.
- B. Verify all dimensions and elevations shown on the Contract Drawings and required for equipment installation. Notify Engineer of specific differences and conflicts.
- C. Furnish and install all materials (including oil, grease, lubricants, chemicals, etc.) and all temporary equipment (including measuring devices, etc.) required for equipment startup, field testing and initial operation.

3.03. FIELD TESTING AND INITIAL OPERATION

- A. Perform startup, field testing, and initial operation of equipment in accordance with requirements specified in Section 01640.
- B. Field testing of equipment shall be conducted in the presence of the Engineer and the equipment manufacturer, or their approved representative.
- C. Final acceptance shall be based on successful demonstration that each pump meets the specified performance requirements, and that each motor is not overloaded, in all normal operating modes.

- D. Adjust, repair, modify, or replace any equipment components that fail to meet specified performance requirements.

3.04. MANUFACTURER'S SERVICES

A. Equipment Installation, Startup, and Field Testing

1. The equipment manufacturer shall provide the services of a qualified field service representative to inspect the installation and supervise the startup, field testing and initial operation of the equipment provided.
2. The services provided shall conform to the minimum durations and other requirements specified in Section 01640.
3. The manufacturer's field service representative shall submit written certification to the Contractor and Engineer that the equipment has been installed and tested to the manufacturer's satisfaction, that all final adjustments have been made, and that the equipment is ready for startup and initial operation.

B. Training Services

1. The equipment manufacturer shall provide the services of a qualified representative to train the Owner's personnel in proper procedures for operation and maintenance of the equipment provided.
2. The training services provided shall conform to the minimum durations and other requirements specified in Section 01640.

3.05. EQUIPMENT WARRANTY

- A. The manufacturer shall warranty that the equipment provided under this section shall be free of defects in materials and workmanship and shall meet the specific performance requirements when operated in accordance with the manufacturer's written operation and maintenance instructions.
- B. The equipment warranty shall be for a period of either three years starting on the date of equipment delivery to the site, or one year starting on the date of Substantial Completion of construction, whichever is shorter.

END OF SECTION

Item No.	Equipment Item	Equipment Designation	Description	Function Designation	Input or Output	I/O Type	Electrical Characteristic	In/Out Building?	Remarks
1000	Dry Pit								
1001	Wet Well Level	LT - 1001	Level Indication	LI, LAHH, LAH, LAL, LALL, LR	Input	Analog	4-20 mA	In	Submersible Pressure Transducer. Signal from Signal Isolator.
	Wet Well Backup Float Control Panel	BUFCP-1002	High-High Level Float	LSHH	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Low-Low Level Float	LSSL	Input	Discrete	24 VDC	In	
			BUFCP System On	YI	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
1005	Pump 1	P - 1010	In Remote Run Indication	HSI YI, KQ, YQ	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Start/Stop Control	OC/CC	Output	Discrete	24 VDC	In	
			Motor Current	II	Input	Analog	4-20 mA	In	
			Speed Control	SC	Output	Analog	4-20 mA	In	
			Speed Indication	SI, SR	Input	Analog	4-20 mA	In	
1006	Pump 2	P - 1020	In Remote Run Indication	HSI YI, KQ, YQ	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Start/Stop Control	OC/CC	Output	Discrete	24 VDC	In	
			Motor Current	II	Input	Analog	4-20 mA	In	
			Speed Control	SC	Output	Analog	4-20 mA	In	
			Speed Indication	SI, SR	Input	Analog	4-20 mA	In	
1007	Pump 3	P - 1030	In Remote Run Indication	HSI YI, KQ, YQ	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Start/Stop Control	OC/CC	Output	Discrete	24 VDC	In	
			Motor Current	II	Input	Analog	4-20 mA	In	
			Speed Control	SC	Output	Analog	4-20 mA	In	
			Speed Indication	SI, SR	Input	Analog	4-20 mA	In	
1010	Channel Grinder	G-1040	Run Indication	YI, KQ, YQ	Input	Discrete	24 VDC	Out	
			Failure Indication	YA	Input	Discrete	24 VDC	Out	
1090	Generator	GEN-1090	Run Indication	YI, KQ, YQ	Input	Discrete	24 VDC	Out	
			Failure Indication	YA	Input	Discrete	24 VDC	Out	
			Fuel Level Low	LAL	Input	Discrete	24 VDC	Out	
1095	Automatic Transfer Switch	ATS-1095	On Utility Power	J1_Utility	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			On Generator Power	J1_Gen	Input	Discrete	24 VDC	In	Signal from 4PDT Relay.
			Failure Indication	YA	Input	Discrete	24 VDC	In	
1100	Parshall Flume								
1101	Influent Screenings Parshall Flume Flow	FIT- 1101	Flow Indication	FI, FR	Input	Analog	4-20 mA	Out	Ultrasonic Sensor. Signal from Signal Isolator.
			Failure Indication	YA	Input	Discrete	24 VDC	Out	Signal from 4PDT Relay.

Item No.	Equipment Item	Equipment Designation	Description	Function Designation	Input or Output	I/O Type	Electrical Characteristic	In/Out Building?	Remarks
PLC Status									
PLC-JVPS			PLC Memory Battery	MEM_BATT	Internal Value	Internal Value		In	
PLC-JVPS			AC Power Loss	AC_LOSS	Input	Discrete	24 VDC	In	N.O. contacts energized closed while power is On.
PLC-JVPS	Primary DC Power Supply Failure		Failure Indication	DCPS_PRI_FAIL	Input	Discrete	24 VDC	In	
PLC-JVPS	Uninterruptible Power Supply (UPS)		On Battery Indication	UPS_ON_BATT	Input	Discrete	24 VDC	In	
PLC-JVPS	Station Control Panel Open	DS-1	Door Open	ZSH	Input	Discrete	24 VDC	In	NC, Open when hatch open. Magnetic contact
PLC-JVPS	PLC Cabinet Internal Temperature	TT-1	Temperature Indication	TI, TAH, TAL, TR	Input	Analog	4-20 mA	In	

SECTION 11330
CHANNEL GRINDER

PART 1 GENERAL

1.01. SUMMARY

- A. Furnish, install, and test one channel grinder and control panel complete with all required accessories in accordance with the Contract Documents.

1.02. RELATED SECTIONS

- A. Section 05500 - MISCELLANEOUS FABRICATIONS
- B. Section 09900 - PAINTING
- C. Section 15170 - MOTORS
- D. Section 16055 - ELECTRICAL WORK
- E. Section 16161 - CONTROL PANELS AND ENCLOSURES
- F. Section 16475 - OVERCURRENT PROTECTIVE DEVICES
- G. Section 16484 - CONTACTORS AND MOTOR STARTING EQUIPMENT
- H. Section 16900 - AUXILIARY CONTROLS AND RELAYS

1.03. REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. A36 - Carbon Steel Plate
 - 2. A536-84 - Ferritic Ductile Iron Castings
 - 3. A48-83 - Grey Iron Casting
- B. American National Standards Institute (ANSI) - B16.42-1979, Class 150 flanges.
- C. American Iron and Steel Institute (AISI)
 - 1. 303 Stainless Steel
 - 2. 304 Stainless Steel
 - 3. 316 Stainless Steel
 - 4. 4130 Heat Treated Alloy Steel
 - 5. 4140 Heat Treated Alloy Steel
 - 6. 8620 Heat Treated Alloy Steel

7. 17-4 Stainless Steel

D. Society of Automotive Engineers (SAE) 660 Bearing Bronze

1.04. PERFORMANCE REQUIREMENTS

A. Grinders shall be capable of continuous operation, processing wet or dry.

B. Grinders shall operate under the conditions given below:

1. Channel Width (inches) - 30.0.

C. Operating Conditions at Full Motor Speed

1. Capacity (gpm) - 1,000.

2. Total Dynamic Headloss (inches)- 9.5.

3. Maximum Grinder Speed (rpm) - 1725.

4. Motor Horsepower (HP) - 3.0.

1.05. SUBMITTALS

A. Provide in accordance with Sections 01300, Submittals, and 01640, Equipment-General, and as supplemented herein. Submittals shall include, but not be limited to, the following:

1. Shop drawings.

2. Performance affidavits.

3. Shop test results.

4. Manufacturer's installation certificate.

5. Field testing results.

6. Special guarantees.

B. Provide operation and maintenance manuals and data where scheduled in Section 01640, Equipment-General.

1.06. SPARE PARTS

A. Furnish the following spare parts in accordance with the Section 01640, Equipment-General, in clearly identified dust-proof containers:

1. Spare parts as recommended by the manufacturer shall be provided in clearly identified dust-proof containers.

1.07. EQUIPMENT WARRANTIES AND SPECIAL GUARANTEES

A. The supplier shall provide the following warranties and special guarantees in accordance with Section 01640, Equipment-General.

1. The equipment manufacturer shall guarantee for a period of three years starting at the time of equipment delivery to the job site or one year starting at the time of Substantial Completion (whichever is shorter), that the equipment supplied is free from defects in materials or workmanship and will meet the specified performance requirements when operated in accordance with the manufacturer's recommendations. The manufacturer shall correct any breach in this warranty at their expense.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. JWC Environmental
- B. Or equal.

2.02. EQUIPMENT LAYOUT

- A. In the case of an "or-equal" or a substitution, demonstrate in writing, to the satisfaction of Owner that the manufacturer has produced the specified type and size of equipment for sanitary wastewater service that has been in successful operation for a minimum period of five years prior to the bid date.

2.03. EQUIPMENT DESIGN

- A. General
 1. Grinder shall reduce or shred influent solids for protection of downstream equipment. Grinder shall be two shafted design consisting of individual cutters and spacers of equal diameter on both shafts. Grinder shall have a motor and speed reducer for cutter drive.
 2. Grinder shall include cutters, spacers, shafts, shaft extension bearings and seals, in-line housing with pipe flanges, inspection ports, cutter stack adjustment port, reducer, and motor.
 3. The cutter cartridge and drive assembly shall be removable from the main housing as a complete assembly without further disassembly. The components of that assembly include cutters, spacers, shafts, reducer, motor, bearings, and seals.
 4. The grinder shall be of two-shaft design and be capable of continuous operation, processing wet or dry. Grinders designed with cutter and spacer cartridges rather than individual cutters and spacers, shall not be acceptable.
 5. Two-shaft design shall consist of two parallel shafts alternately stacked with individual intermeshing cutters and spacers positioned on the shaft to form a helical pattern. The two shafts shall counter-rotate with the driven shaft operating at approximately two-thirds the speed of the drive shaft.

B. Components

1. Individual Cutters and Spacers

- a. The cutting chamber shall be a nominal height of as shown on the Contract Drawings.
- b. Individual cutters and spacers shall be AISI 8620 treated alloy steel, surface ground for uniformity and through-hardened to a minimum
- c. 60-65 and 34-38 Rockwell C, respectively.
- d. The inside configuration of both the individual cutters and the individual spacers shall be hexagonal so as to fit the shafts with a total clearance not to exceed 0.015 inch (0.38 mm) across the flats to assure positive drive, minimize wear on the cutters, and increase the compressive strength of the spacers.
- e. Cutter configuration shall maintain particle size, the height of the tooth shall not exceed 1/2 inch (13 mm) above the root diameter. Cutter to cutter root diameter overlap shall be not less than 1/16 inch (1.6 mm) or greater than 1/4 inch (6 mm) to maintain the best possible cutting efficiency while incurring the least amount of frictional losses.
- f. The cutters shall exert a minimum force at the tooth tip of 2,051 lbs./HP (12,234 N/kW) during momentary load peaks.

2. Shafts

- a. Grinder drive and driven shafts shall be made of 4140 heat alloy steel with a tensile strength rating of not less than 149,000 psi (1,027 kPa).
- b. Each shaft shall measure a nominal 2 inches (51 mm) across parallel surfaces and hardened to a minimum 38-42 Rockwell C.

3. Intermediate Shaft Support

- a. Intermediate shaft supports shall be ASTM A351 stainless steel and AISI 17-4 stainless steel and SAE 660 bearing bronze.
- b. Shaft supports shall be lubricated with high temperature marine grade grease at the factory.
- c. Intermediate shaft supports shall provide additional support to the shafts during severe grinding demands.

4. Main Housing and Covers

- a. The main housing shall be a solid cast structure made of AISI 304 stainless steel. The one-piece flanged body shall be capable of remaining in-line if removal of the cutter cartridge and drive assembly is required for service.
- b. The inside profile of the main housing shall be concave to follow the radial arc of the cutters. To direct larger particles toward the cutters and assure fineness of grind, the main housing shall maintain a clearance not to exceed

5/16 inch (8 mm) between the major diameter of the cutter and the concave arc of the housing.

- c. The main housing shall be provided with a covered access port for equipment inspection. Inspection port covers shall be AISI 304 stainless steel.

5. Shaft Bearings and Seals

- a. The radial and axial loads of the cutter shafts shall be borne by sealed, oversized, deep-groove ball bearings at each end.
- b. Face materials shall be of tungsten carbide to tungsten carbide.
- c. O-rings shall be made of Buna-N elastomers.
- d. Products requiring continuous or occasional lubrication or flushing shall not be accepted.
- e. The mechanical seal shall be rated at 90 psi (620 kPa) continuous duty by the seal supplier.
- f. The bearings shall be housed in a replaceable cartridge that supports and aligns the bearings and seals, as well as protects the shafts and end housings. The seal elements shall be independent of the stack height, therefore cutter stack tightness shall not affect seal performance. The seal elements shall maintain their factory set preload independent of the cutter stack tightness.
- g. Seals shall meet required pressure rating regardless of cutter stack fit. The seal cartridge shall provide seal protection against axial loading on shafts and bearings during shaft deflection.
- h. Each seal element shall be positively locked to its corresponding rotating or static cartridge element. This positive lock on the seal elements is critical to long seal life in applications where grit or other abrasive materials are present.

6. Gear Housing and Cover

- a. The gear housing shall be provided with a covered access port for cutter stack tightening.
- b. The gear housing shall be AISI 304 stainless steel.
- c. The cutter stack tightening cover shall be A36 carbon steel.

7. Reducer

- a. The speed reducer shall be a grease-filled planetary-type of reducer with a 500 percent shock load capacity. The reduction ratio shall be 29:1.
- b. Reducer shall be grease lubricated.

8. Frame and Supports - Frame and/or supports shall provide a method for securing grinder in a structure that allows for proper operation. Frame and/or supports shall be AISI 304 stainless steel. Frame shall provide proper support and interface to guide influent flow into the grinder.

2.04. MOTORS AND DRIVES

- A. Provide in accordance with Section 15170, Motors, unless otherwise specified herein.
- B. Motors and drives shall be furnished by the equipment supplier and shall be designed specifically for use with the equipment provided.
- C. Motors shall be supplied with heaters in accordance with Section 15170. Heaters shall function when motor power is off.
- D. Motor Parameters

Motor Parameters	Tag Numbers
Maximum allowable motor horsepower	3.0 HP
Motor Selection Type Special applications	Vertical Special applications
Nominal motor speed	1725 rpm
Minimum allowable motor efficiency at full speed	Premium efficient
NEMA design	XPFC
Duty	Continuous
Insulation	Class F
Voltage, phase, Hertz	460 V, 3 phase, 60 Hertz
Service factor	1.15
Motor enclosure	Totally enclosed explosionproof
Protection	Integral motor winding thermostats (minimum 1 per phase winding)
Heater	Motor winding heaters shall be provided and operate when the motor is off
Maximum starts per hour	12, evenly spaced

2.05. CONTROLS

- A. General
 1. Each grinder shall be equipped with a controller and be located as shown on the Contract Drawings.
 2. The controller shall provide independent control of the grinder.
 3. Controller shall be UL/cUL listed Model PC2200.

4. The controller shall be rated for 3 HP, 480 volts, 3 phase, 60 Hertz.
- B. Operation - The controller shall be equipped with a Grinder On-Off/Reset two-position selector switch.
1. In the Off/Reset mode the grinder shall not run. In the On mode, the grinder will run continuously.
 2. The grinder shall only be reset by switching the Grinder On-Off/Reset switch to the Off/Reset position.
- C. Safety Features
1. When a grinder jam obstruction occurs, the controller shall stop the grinder and reverse the rotation to clear the obstruction. If the obstruction is cleared, the controller shall return the grinder to normal operation. If three reverses occur within a 30-second interval, the controller shall stop the grinder motor in a jam condition and activate the grinder Fail indicator and relay.
 2. When a power failure occurs while the grinder is operating, the grinder will resume operation once power is restored.
 3. If a power failure occurs while the grinder is in a fail condition the fail indicator shall reactivate when power is restored.
 4. The controller shall provide overload protection for the motor through an overload relay mounted directly on the grinder starter.
 5. Controller reset shall be from the local panel controls only.
- D. Components
1. Stainless Steel Enclosure
 - a. Stainless steel enclosures shall be in accordance with Section 16161, Control Panels and Enclosures, installed adjacent to the channel grinder.
 - b. Enclosure shall house the control devices, relays, terminal blocks and reversing motor starters.
 - c. Current Transducer - Current transducer shall have adjustable setpoint from 1-135A with 200ms or less response time.
 2. Control Devices - In accordance with Section 16900 and shall include
 - a. On-Off/Reset selector switch.
 - b. Pilot lights indicating:
 - 1) Power on.
 - 2) Run.
 - 3) Jam.

- 4) Overload.
- 5) Overtemperature.
3. Motor Starter
 - a. Starter shall be a full-voltage reversing type per Section 16484.
 - b. Forward and reverse contactors on the starters shall have both mechanical and electrical interlocks.
 - c. Overload relays shall be per Section 16484.
4. Overcurrent Protective Devices - In accordance with Section 16475.
5. Alarms - Provide auxiliary contacts to initiate an alarm for the following conditions:
 - a. Grinder run.
 - b. Grinder fail.
 - c. Loss of control panel power.
6. Motor winding thermal protection.
7. Motor space heater.

2.06. FABRICATION REQUIREMENTS

- A. Shop coat and field coat per Section 09900, Painting.
- B. All bolts, nuts, washers, and other fasteners shall be Type 316 stainless steel unless otherwise noted.
- C. Welds shall be continuous unless noted otherwise.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Furnish nameplates for each piece of equipment.
 1. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins.
 2. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the equipment performance ratings.

2.07. SHOP TESTING

- A. The following equipment shall be tested in the manufacturer's shop in accordance with the requirements of Section 01640 and as specified herein.

PART 3 EXECUTION

3.01. EQUIPMENT INSTALLATION

- A. Install in accordance with the Contract Documents and the manufacturer's written instructions.
- B. No modifications to equipment shall be made without the written consent of the manufacturer and approval of Engineer.
- C. Field verify all dimensions and elevations. Notify Engineer of specific differences
- D. Furnish all necessary materials (including lubricants, chemicals, etc.) and equipment (including measuring devices, etc.) for testing and startup.
- E. Surface preparation and field painting shall be in accordance with Division 9 specifications.
- F. All bolts, nuts, washers, and other fasteners shall be Type 316 stainless steel unless otherwise noted.
- G. Anchor rods (bolts) shall be Type 316 stainless steel HILTI-style adhesive anchors.
- H. Backpaint aluminum in contact with painted or galvanized steel or concrete with 5 mils of Tnemec Series, Hi-Build Epoxoline or DuPont 25P Epoxy.
- I. Isolate dissimilar metals by backpainting or with dielectric isolator using stainless steel fasteners.

3.02. TESTING AND STARTUP

- A. Testing and startup shall be performed in accordance with Section 01660 and as specified herein unless otherwise noted.
- B. All testing shall be done in the presence of the Engineer and the equipment manufacturer or their approved representative.
- C. Final acceptance of the equipment will be made after each unit has been demonstrated in the field to meet the performance requirements stated in this specification under all normal operating conditions and verification that the motors are not overloaded in normal operating conditions.
 - 1. The equipment can meet the performance requirements stated in this specification under all normal operating conditions and verification that the motors are not overloaded in normal operating conditions.
 - 2. The casing and motor shall be checked for abnormal noise and vibration while the grinder is running throughout the normal range of sludge pump motor speeds. Abnormal noise or excessive vibration will constitute failure of pump.
 - 3. Adjust, repair, modify, or replace any components of the system which fail to meet all specified requirements.

3.03. SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. Provide services of the equipment manufacturer or their approval representative in accordance with Section 01640 and as specified herein.
- B. Provide the following additional services:
 - 1. Provide jointly to the Owner and the Engineer an installation certificate from the equipment manufacturer or their approved representative stating that the equipment has been properly installed and tested to their satisfaction and that all final adjustments required have been made.

END OF SECTION

SECTION 14602

HOISTS AND CRANES

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Contractor shall furnish and install an electric hoist and davit crane at the Walden Woods Pump Station; and a portable gantry crane and electric hoist at the Jefferson Valley Pump Station; and related equipment.
- B. Design requirements.
- C. Regulatory codes and requirements.

1.02. RELATED SECTIONS

- A. Section 01640 - EQUIPMENT-GENERAL: Performance affidavits, operating instructions, time of delivery, standardization, equipment tests, and initial operation.
- B. Section 05500 - MISCELLANEOUS FABRICATIONS
- C. Section 09900 - PAINTING
- D. Section 15170 - MOTORS

1.03. SUBMITTALS

- A. Submit single-page catalog cuts clearly indicating items to be furnished, including maintenance and electrical requirements.
- B. The shop drawings shall show the exact layout with all suspension points, braces, cross section with clearance indication, hook height, lift range, trolley travel range, hoist and trolley type, travel and lift speeds, horsepower and voltage of all motors, type and mounting details of electrification.
 - 1. The Drawings shall be prepared specifically for this project.
 - 2. Provide manufacturer's data for galvanizing and paint systems proposed.
 - 3. Provide catalog cut for each type of gantry crane or davit crane.

1.04. REFERENCES

- A. ANSI C1 National Electric Code.
- B. ANSI B30.11, Monorail Systems and Underhung Cranes, and ANSI B30.16, Safety Standard for Overhead Hoists.
- C. American Institute of Steel Construction (AISC).
- D. American Welding Society (AWS).

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Davit crane shall be as manufactured by Thern, Inc., or equal.
- B. Gantry crane equipment cranes shall be Porta-Gantry Model PGSS00500S-2500 as manufactured by Thern, or equal.

2.02. EQUIPMENT DESIGN AND FABRICATION

A. Capacity

- 1. The capacity of each hoist shall be permanently marked in a conspicuous manner on the hoist, crane, and monorail track.
- 2. The hoists shall lift their rated capacities with a smooth and continuous operation without speed changes or vibration throughout the entire lifting height.

B. Materials

1. Electric Hoists

- a. Hoist for the Walden Woods Pump Station shall be of the cable type. Hoist for the Jefferson Valley Pump Station shall be of the chain type.

Electric hoist(s) shall be wire-rope type, rigged to provide a true vertical lift (double reeved), equipped with a mechanical load brake capable of supporting the full load and shall be easily accessible for external adjustment by removing cover plates.

- b. Shafts of the motor, drum, and drum pinion shall run on grease-lubricated ball or roller bearings, sealed for corrosion resistance and outdoor usage and storage. Provide waterproof covers.
- c. The mechanical load brake, the gear train, and bearings shall be oil bath lubricated.
- d. The drum shall have machine cut grooves and guarded flanges and shall have the capacity to take the entire run of cable in one layer without overlapping.
- e. The drum mechanism shall have an upper and lower limit switch to prevent reverse reeving.
- f. The cable shall be flexible, high-strength plow steel. The load chain shall be stainless steel for corrosion resistance and have a load safety factor of at least 5 to 1.
- g. The chain hoist shall be equipped with a chain collector basket.
- h. The load block shall be of rugged construction containing a ball bearing sheave and a high-grade forged steel swivel hook with anti-friction bearings.

- i. The hoist shall be hook-on, low headroom type.
 - j. The hoist motor shall be a single-speed motor. Lift speed 4/12 fpm.
 - k. The hoist and accessories shall be abrasive blasted and epoxy painted for corrosion resistance.
2. Trolleys
- a. Trolleys shall be integral to the hoist mechanism for manual hoists and provide for hook mounting for electric hoists.
 - b. Trolleys shall have four or more wheels and have sides extending beyond the wheel flanges to provide bumper protection.
 - c. Wheels shall have machined treads, surface hardened to Brinell hardness of 400, and set at the proper angle to bear the load evenly.
 - d. Wheels shall be provided with lifetime lubricated ball or roller bearings.
 - e. Trolleys shall be compatible with the track provided by the Contractor.
 - f. Trolleys shall be manually propelled. Each trolley shall have a round eyebolt for suspending the hoist.
 - g. The trolley for the gantry crane shall be manually propelled.
 - h. Trolley[s] shall be abrasive blasted and epoxy painted for corrosion protection.
3. End Trucks
- a. End trucks shall have four or more wheels and have sides extending beyond the wheel flanges to provide bumper protection.
 - b. Wheels shall have machined treads, surface hardened to Brinell hardness of 400, and set at the proper angle to bear the load evenly.
 - c. Wheels shall be provided with lifetime lubricated ball or roller bearings.
 - d. End trucks shall be compatible with the bridge crane rail as provided by the crane supplier.
 - e. Each end truck shall be motorized, gear driven, and powered by a variable speed electric motor and shall be provided with a retarding brake.
 - f. End trucks shall be abrasive blasted and epoxy painted for corrosion protection.
4. Controls
- a. All motorized hoisting equipment shall be floor controlled by a pushbutton pendant which is fully rubber encased and shall hang from the hoist or crane on a separate deluxe pendant cable gripper long enough to reach within 3 feet of the operating floor

- b. The controls shall have labeled, color-coded pushbuttons to control all hoist and crane functions.
 - c. The controls shall be fully magnetic with overload protection and be made from tough indestructible materials rated NEMA 4X for outdoor usage.
5. Electrification - Unless otherwise indicated on the Drawings or in the schedule, the power supply shall be 120 volts, single phase, cord and plug. Cord shall be a minimum of 20 feet.

2.03. DAVIT CRANES

- A. Self-supporting portable unit of tubular construction with a top-mounted base as indicated. Unit shall be all stainless steel construction using stainless steel fasteners and accessories.
- B. Crane shall provide 360-degree rotation with a sleeve bearing in the base.
- C. Cranes of 1,000-lb. capacity and greater shall have adjustable telescoping booms with height adjustment using a ratchet-style screw jack.
- D. Provide Thern, Inc. davit crane Model 5124M2 for up to 2,000-lb. capacity, or equal.
- E. Wire rope shall be 304 stainless steel with swivel hook. Provide 1/4-inch diameter for up to 500-lb. capacity, 5/16-inch diameter for up to 1,000-lb. capacity; and 3/8-inch diameter for up to 2,000-lb. capacity.
- F. Contractor shall coordinate supply of all davit cranes on the project to be of the same design specifications and from the same manufacturer.

PART 3 EXECUTION

3.01. PAINTING

- A. All steel components and accessories shall be abrasive blasted and epoxy painted for an exterior/corrosive environment.
- B. After complete installation and preliminary testing, provide touch-up or repainting of all components.

3.02. EQUIPMENT INSTALLATION

- A. Field Measurements and Dimensions - All measurements and dimensions shall be based on verified field conditions. Verification shall include examination of adjoining work.
- B. Erection - The equipment shall be erected by the Contractor in accordance with the instructions of the manufacturer.
 - 1. In addition to the general requirements of Section 01640, Equipment-General, and the foregoing paragraphs; equipment shall be shipped, assembled and constructed as follows:
 - a. All bolts shall be furnished and installed by the Contractor and shall be of ample size and strength for the purpose intended.

- b. All parts of the equipment shall be amply proportioned for all stresses that may occur during fabrication, erection and intermittent or continuous operation.
- c. The equipment shall be assembled by the manufacturer insofar as is practical and shipped in units which will minimize erection costs.

3.03. INSTALLATION AND TESTING

- A. Equipment shall be shop assembled and shop tested to the fullest extent possible prior to shipment to the job site.
- B. Installation shall include all necessary oil and grease for initial operation.
- C. Prior to turning the installation over to the Owner, the entire installation shall be tested for the following conditions:
 - 1. No-load operation in all moving stages for a period of 30 minutes.
 - 2. Operate and load test at 125 percent of field rated load capacity for at least 20 minutes, demonstrating starting hoisting, lowering, travel speed and lifting speeds.
 - 3. Suspend the rated load from the hook, held solely by the hoist brake, for a period of 10 minutes without change of position.
 - 4. The equipment shall demonstrate compliance with pertinent codes and specifications, that it has been properly erected and adjusted, and that it is ready for service.
 - 5. Should any defects develop during the tests, they shall be corrected at the Contractor's expense.
- D. Tests, trials and initial operation shall be performed as set forth in Section 01640 Equipment-General.

3.04. SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. Manufacturer's representative services shall be provided in accordance with Section 01640 and as specified herein.
 - 1. To assist with initial installation and startup, the equipment manufacturer shall be on site to provide assistance to the Contractor.
 - 2. After initial startup and during the first year of operation, a representative of the manufacturer shall make one visit to the plant for not less than eight hours.
 - 3. The purpose of this visit shall be to review equipment operation, assist the operators and inspect the equipment installation.
 - 4. Should the system or any of its components fail to operate satisfactorily for any reason other than proven Owner negligence, the Contractor shall make such repairs, replacements, or other modifications as required to render the system satisfactory.

3.05. SCHEDULE OF HOISTING EQUIPMENT

A. All equipment furnished under this section shall be in accordance with the equipment schedule below:

1. Movable Gantry Crane

Location	Capacity (tons)	Top of Track (feet)	Beam Length (feet)	Hoist Speed (ft/min)	Motor Size (HP)	Remarks
Jefferson Valley	1/2	15'-6"	15'-0"	3'	0.5	Electric hoist, manual trolley, portable gantry

2. Davit Crane

Location	Quantity	Capacity (Tons)	Lift (feet)	Remarks
Walden Woods	1	1/2	35	Electric hoist

END OF SECTION

SECTION 15060
INSIDE PROCESS PIPING

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Inside process pressure piping, fittings and specials located inside structures or on process tanks and equipment.
- B. Miscellaneous appurtenances.
- C. Shop tests.
- D. Installation.
- E. Testing.

1.02. RELATED SECTIONS

- A. Section 01039 - COORDINATION
- B. Section 01300 - SUBMITTALS
- C. Section 01700 - RECORD DOCUMENTS
- D. Section 09900 - PAINTING
- E. Section 15100 - INSIDE PROCESS VALVES AND HYDRANTS
- F. Section 15140 - SUPPORTS AND ANCHORS
- G. Section 15260 - PIPING INSULATION

1.03. REFERENCES

- American National Standards Institute (ANSI).
- American Water Works Association (AWWA).
- American Society for Testing Materials (ASTM).
- A. Ductile Iron and Gray Iron Pipe
 - 1. Handbook of Cast Iron Pipe - Cast Iron Pipe Research Association (CIPRA) - CIPRA Standard for Flanged Pipe With Threaded Flanges
 - 2. ANSI A21.4/AWWA C104 - Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water
 - 3. ANSI A21.10/AWWA C110 - Ductile Iron and Gray Iron Fittings, 3 inch through 48-inch, for Water and Other Liquids

4. ANSI A21.15/AWWA C115 - Flanged Ductile Iron and Gray Iron Pipe With Threaded Flanges
 5. ANSI A21.50/AWWA C150 - Thickness Design of Ductile Iron Pipes
 6. ANSI A21.51/AWWA C151 - Ductile Iron Pipe Centrifugally Cast in Metal Molds and Sand Lined Molds for Water and Other Liquids
 7. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 8. ASTM A536 - Ductile Iron Castings
 9. ANSI/AWWA C606 - Grooved and Shouldered Joints
- B. Copper Pipe and Fittings
1. ASTM B32 - Solder Metal
 2. ASTM B88 - Copper Pipe; Type L for Inside Service
 3. ASTM B584 - Copper Alloy Sand Castings for General Applications
 4. ASME/ANSI B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Product Data - Provide data, indicating conformance to ASTM/AWWA codes, pipe material, sizes, class, dimension, joint type, and accessories.
- C. Layout Drawings - Show complete piping layout, including materials, sizes, classes, locations, and dimensions.
- D. Results of shop tests, if required.
- E. Manufacturer's Certification - Certify that products meet or exceed specified requirements.

1.05. PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700, Record Documents

1.06. FIELD MEASUREMENTS

- A. Prior to start of construction, verify the field measurements and elevations that existing conditions are as shown on Drawings. Notify Engineer of specific differences.

1.07. TEST REQUIREMENTS

- A. Requirements for pressure testing of water distribution and process piping are described in Section 15060.

1.08. COORDINATION

- A. Coordinate work under provisions of Section 01039, Coordination.

- B. Coordinate the work with local owners where operation of existing structures, pumping stations, treatment facilities, industrial processes is affected.

PART 2 PRODUCTS

2.01. GENERAL

- A. All products included in this section shall conform to the requirements of the standard specifications referenced herein.
- B. Pipe material, pipe class and pipe sizes shall be furnished and installed as listed herein or as shown on the Drawings.
- C. All pipes and fittings shall be flanged joint or grooved end pipe coupling ductile iron except as follows:
 - 1. Air pipe shall be stainless steel.
 - 2. Gas pipe shall be steel, Schedule 80 minimum.
 - 3. Chlorine solution and chemical feed pipe shall be solvent weld socket joint polyvinyl chloride.
 - 4. Potable and non-potable water pipe 3 inches or less in diameter shall be copper.
- D. The inside process piping system shall be installed as shown on the Drawings.

2.02. MATERIALS - DUCTILE IRON

- A. Ductile Iron Pipe - AWWA C151/ANSI A21.51: Ductile iron pipe material minimum rated water pressure of 150 psi and minimum Class 53.
- B. Ductile iron pipe and fittings for all potable and non-potable water lines shall be double cement lined and seal coated inside and out in accordance with ANSI/21.4/AWWA C104.
- C. All ductile pipe and fittings used as process pipe shall be lined and coated with asphaltic material, minimum 1 mil thick in accordance with ANSI/AWWA C104/A21.4.
- D. Fittings shall conform to ANSI A21.10/AWWA C110.
- E. Joints - Fittings shall be furnished with either flanged joint or grooved end pipe coupling joints. The type of joint shall meet the following applicable requirements:
 - 1. Flanged Joint
 - a. Flanges shall be screw-on type flanges and the face of the flange shall be machined after installation of the flange onto the pipe.
 - b. No raised surface is allowable on cast iron flanges. Flanges shall be 125-lb. ASA flanges rated for a maximum working pressure of 150 psi.
 - c. The fittings shall be of standard lengths given under the ANSI Specification B16.1, unless otherwise noted.

- d. The pipe lengths shall be fabricated to meet the requirements of the Drawings.
2. Grooved End Pipe Joint
- a. Grooved end pipe couplings shall consist of housing, gasket, and bolts.
 - b. Housing shall be either malleable iron or ductile iron castings.
 - c. Gaskets shall be halogenated butyl, suitable for use with ductile iron pipe, and shall be in accordance with manufacturers' recommendations.
 - d. Bolts and nuts shall be heat treated carbon steel of the oval track head design conforming to ASTM A183.
 - e. Couplings shall be installed in accordance with manufacturers' recommendations.
 - f. Fittings shall be ductile iron or cast iron with radius cut grooved ends and shall be supplied by manufacturer of pipe couplings.
 - g. Groove dimensions for pipe and fittings shall be in accordance with manufacturers' recommendations and AWWA C606 for rigid grooving dimensions.
 - h. Grooved end valves will not be allowed.
 - i. Wall, floor and deck sleeve diameters shall remain the same as shown on the Drawings.
 - j. Contractor shall have a "cut grooving tool" located on site if grooved end pipe couplings are used in lieu of flanged joints.
 - k. The cut grooving tool is to be at the site during the major process piping installation.
 - l. The tool shall be suitable for cutting and grooving steel, cast iron and ductile iron pipe in sizes 2-inch through 12-inch diameter.
 - m. All groove cuts in piping and fittings shall be prime painted in accordance with Section 09900, Painting.
 - n. Pipe couplings shall be Style 31 Victaulic; Aeroquip Series 500 as manufactured by Gustin-Bacon-Napco; or equal.
3. Flanged Adapters
- a. Flanged adapters supplied by the manufacturer of pipe couplings, shall be provided at a minimum, at all couplings to equipment, tanks, valves and as otherwise shown on the Drawings.
 - b. Flanged adapters supplied by the manufacturer of pipe couplings shall be 125-lb. ASA flanges rated for a maximum working pressure of 150 psi.

- c. Flanged adapters for pumps shall be in accordance with couplings and adapters as stated hereinafter.

2.03. JOINTS IN PIPING

A. Flanged Joints

1. Shall be brought to exact alignment and all gaskets and bolts or studs inserted in their proper places.
2. Bolts or studs shall be uniformly tightened around the joints.
3. Where stud bolts are used, the bolts shall be uniformly centered in the connections and equal pressure applied to each nut on the stud.
4. Pipes in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot.
5. Gaskets shall be ring type, minimum 1/16-inch thick, cloth inserted rubber gaskets.
6. Flanges shall conform to AWWA Standard C115 (ANSI A21.15) with bolts provided in the size and number called for and in accordance with the American Standard with hexagonal nuts.
7. For bolt sizes and lengths, the "Handbook of Cast Iron Pipe" should be consulted.
8. Each flanged joint shall have a bead of silicone caulk applied to the full perimeter of the joint after finish painting is completed.

2.04. OUTSIDE COATINGS

A. All exposed steel and cast or ductile iron piping shall receive a rust inhibitive shop primer plus cover coats in accordance with Section 09900, Painting.

1. Surfaces to be painted shall be prepared in a workmanlike manner with the objective of obtaining a smooth, clean and dry surface.
2. Rust, dust, scale, oil, grease, as well as all other loose or foreign substances, including weld blisters, fins, and burrs shall be removed by cleaning, wire brushing, chipping, or sandblasting.
3. To prevent new rusting, cleaned surfaces shall be painted immediately after cleaning.
4. Surfaces located within 2 inches of joints which are to be field welded shall be left unpainted.

2.05. HANGERS AND SUPPORTS

A. All piping shall be adequately supported and braced by means of adequate hangers, concrete piers, pipe supports, brackets, or otherwise as may be required by the location. Refer to Section 15140, Supports and Anchors.

2.06. SLEEVES

- A. All piping passing through walls and floors shall be installed in sleeves or wall castings accurately located before concrete is poured, or placed in position during construction of masonry walls.
1. Sleeves passing through floors shall extend from the bottom of the floor to a point 3 inches above the finished floor, unless shown otherwise.
 2. Waterstop flanges are required on all sleeves located in floors or walls which are continually wet or under hydrostatic pressure on one or both sides of the floor or wall and on all sleeves penetrating walls of areas designed on the Drawings as "gastight."
 3. Sleeves shall be black steel pipe, or fabricated steel in accordance with details shown on the Drawings.
 4. If not shown on the Drawings, the Contractor shall submit to the Engineer the details of the sleeves he proposes to install.
 5. Steel sleeves shall be fabricated of structural steel plate in accordance with the standards and procedures of AISC and AWS.
 6. All steel wall and floor sleeves shall receive a commercial sandblast cleaning, and all surfaces shall be painted in accordance with Section 09900, Painting.
 7. The annular space between the installed piping and sleeve shall be completely sealed against a maximum hydrostatic (or gas) pressure of 20 psig with a modular mechanical type seal consisting of interlocking synthetic rubber links connected by stainless steel bolts and nuts with pressure plates under each end.
 8. Tightening the bolts shall compress the neoprene lines causing them to expand and form a continuous, airtight, watertight seal between pipe and sleeve. The seal shall be "Link-Seal," as manufactured by the Thunderline Corporation, Wayne, MI; or equal.
 9. Seal type, size and installation thereof shall be in strict accordance with the manufacturer's recommendations.
 10. In general, sleeves installed in walls, floors or roofs against one side of which will develop a hydrostatic (or gas) pressure, or through which leakage of liquid will occur, shall be so sealed.
 11. Refer to standard details as shown on the Drawings for wall, floor and deck sleeve details.

2.07. PIPE ACCESSORIES

- A. Fittings - Same materials, class, coatings and linings as pipe unless under Article 2.02 it was specifically described otherwise. Fittings molded or formed to suit pipe size and end design and in required tee, bends, elbow, couplings, adapters and other configurations.

2.08. IDENTIFICATION

- A. Each pipe length and fitting shall be clearly marked with:

1. Manufacturer's name and trademark.
2. Nominal pipe size and class.
3. Material designation.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that structures are complete enough to receive pipe.
- B. All pipe or fittings which have been damaged in transit or which are obviously deformed or refinished in any way shall be rejected, marked and removed from the site of the work.
 1. Any pipe or fitting which the Engineer suspects is improper for the job shall be temporarily rejected, marked and set aside for subsequent investigation to determine its conformity with the specifications.
 2. All pipe fittings and specials shall be carefully inspected in the field before installation. Cracked, broken, warped, out-of-round, damaged pipe joints including damaged pipe lining or coatings or specials, as determined by the Engineer, shall be culled out and not installed.
 - a. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the Contractor at his own expense.

3.02. INSTALLATION

- A. All piping shall be installed by skilled workmen in accordance with the best standard practice for piping installation, and in accordance with the manufacturer's installation instructions where applicable.
 1. Proper tools and appliances for the safe and convenient handling and installing of the pipe and fittings shall be used.
 2. Great care shall be taken to prevent any pipe coating from being damaged on the inside of the pipe and fittings. All pieces shall be carefully examined for defects and no piece shall be installed which is known to be defective.
 3. If any defective pieces should be discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor and at his own expense.
 4. Pipe and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are accepted in the complete work.
 5. All piping connections to equipment or tanks shall be provided with unions or coupling flanges located so that piping may be readily dismantled from the equipment or tank.
 6. At certain applications, Dresser or victaulic couplings may also be used, subject to the Engineer's approval.

7. All piping shall be installed in such a manner that it will be free to expand and contract without injury to itself or surrounding structures or equipment.
 8. All piping shall be erected to accurate lines and grades and shall be supported and braced against movement temporary or permanent.
- B. Where process piping assemblies connect to equipment, valves or tanks, such piping shall be rendered compatible with the approved equipment, valve or tank installed and any necessary modifications to the original piping shall be shown in scaled layout on appropriate shop drawings submitted to the Engineer.
- C. Piping assemblies under 4-inch size shall be essentially supported on walls and ceilings, unless otherwise shown on the Drawings, being kept clear of openings and positioned above "headroom" space; where practical, such piping shall be run in neat clusters, plumb and level along walls, and parallel to overhead beams.

3.03. TESTING

- A. All piping shall be tested in accordance with the procedures outlined below.
1. Where a section of pipeline has multiple uses, the pipe shall be tested at the highest pressure required.
 - a. Procedure A shall consist of a 15-minute test at 100 psi followed by a 3-hour test at 50 psi.
 2. All newly installed pipe or any valved section thereof shall be subjected to a hydrostatic pressure 50 percent in excess of the working pressure at the point of testing, but in no case less than 50 psi in any section of the pipe being tested, for a period of two hours.
 3. A leakage test shall be conducted concurrently with the pressure test. The section tested shall be driptight with no signs of leakage.
 4. Any leaks or defective pipe disclosed by any leakage and pressure tests shall be repaired or replaced and aforementioned tests repeated as often as necessary until conformance with the requirements.
 5. All water for tests shall be furnished and disposed of by the Contractor at his expense.
 6. The source and quality of water which the Contractor proposes to use in testing the lines shall be acceptable to the Engineer.
 7. All test water must be removed from the interior of all stainless steel pipe by draining, blowing, mopping, etc. Water must not be allowed to stand for long periods of time within stainless steel pipe.

3.04. STERILIZATION

- A. All pipe and fittings connected to and forming part of a potable water supply system shall be sterilized.

1. Sterilization shall be accomplished after the pipe has passed the hydrostatic tests and shall be in accordance with AWWA Specification C601.
2. The continuous feed method shall be used for chlorine application.
3. All new piping shall be filled with not less than 50, nor more than 75 parts per million (ppm) of available chlorine and held in contact for not less than 24 hours.
4. During this time, all valves in the section treated shall be operated in order to disinfect the appurtenances.
5. Final tests after 24 hours contact time shall show a minimum residual chlorine content of 25 ppm in all parts of the system.
6. Sterilization tests shall be repeated as often as necessary, and as directed by the Engineer, until the minimum residual chlorine content of 25 ppm has been reached.
7. All chlorine introduced into the system shall be totally dissolved.
8. The introduction of solid hypochlorite directly into the system is prohibited.
9. The chlorine solution shall be thoroughly flushed out prior to placing the new pipe in service.
10. The Contractor shall dispose of spent chlorine solution in such a way as not to be detrimental to animal, plant or fish life.

3.05. FLUSHING CONNECTIONS

- A. Each flushing connection shall consist of an eccentric blind flange tapped for 1-1/2-inch minimum IPS with a reducing bushing to 1-inch IPS, a 1-inch short nipple, and a 1-inch gate valve. Each gate valve on the flushing connections shall be provided with a 1-inch IPS to 1-inch quick disconnect female hose coupler, and as sized otherwise on the Drawings.
 1. Female hose couplers shall be provided with appropriate threads or adapters and any necessary nipples to make a leakproof seal when attached to the gate valves.
 2. Hose couplers shall be Ever-Tite; OPW Kamlock; or equal.
 3. Valves for flushing connections shall be in accordance with Section 15100.

3.06. COUPLINGS AND ADAPTERS

- A. Flanged adapters shall be used to join process piping to all pump flanges.
 1. Adapters shall be restrained to process piping by the use of tie rods.
 2. Couplings and/or adapters shall be provided by the Contractor for the alignment of similar types of pipe or connecting dissimilar pipe materials as required in accordance with the detail shown on the Drawings.
 3. Unions shall be provided adjacent to all pumps, tanks, valves and other pieces of equipment where soldered or screwed joints are utilized.

4. Provide couplings and flanged adapters as required and in accordance with this clause.
5. Where couplings and adapters are to be used they shall be installed in complete accordance with the manufacturer's recommendations.

APPLICATION	MANUFACTURE
Flange adapters for ductile	Dresser Style 127, Smith-Blair 913, or equal
Couplings suitable for pipe material	Dresser Style 38, Smith-Blair 411, or equal

3.07. EXPANSION JOINTS

- A. Expansion joints shall be installed on all piping and conduit wherever such piping crosses a structural expansion joint.
 1. A 1/8-inch gap shall be left between adjacent lengths of pipe with a Dresser Style 38; Smith-Blair; or equal coupling joining the piping.
 2. Piping shall be supported by pipe supports each side of the expansion joint as shown on the Drawings so that the coupling transmits no loads.
 3. Contractor shall provide permanent restraints for all expansion joints installed on piping.
 4. Restraints shall keep pipe from separating when subjected to pressures up to 175 psig.
 5. Permanent restraints shall consist of tie rods and straps or welded clip angles as shown on the Drawings.
 6. Permanent restraints shall also be furnished and installed on piping at adjacent pipe supports to prevent any longitudinal movement.
 7. All restraint hardware to be supplied and installed in accordance with manufacturer's recommendations.
- B. Expansion joint couplings to allow for thermal expansion of aeration piping shall be furnished and installed per manufacturer's instructions at locations designated in the approved piping layout prepared by the coupling manufacturer: "Depend-O-Loc" by Brico Industries, Inc., Atlanta, GA (D-O-L; FxF Type 1 Coupling). Submit piping layout to Engineer showing proposed coupling locations.

END OF SECTION

SECTION 15100

INSIDE PROCESS VALVES AND HYDRANTS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Furnishing the several types of valves and backflow preventers.
- B. Valve operators.
- C. Installation.

1.02. RELATED SECTIONS

- A. Section 01026 - LUMP SUM ITEMS: Requirements applicable to lump sum prices for the work of this section.
- B. Section 01039 - COORDINATION
- C. Section 01300 - SUBMITTALS
- D. Section 09900 - PAINTING
- E. Section 15060 - INSIDE PROCESS PIPING

1.03. REFERENCES

- A. ANSI/AWWA C500 - Gate Valves for Water and Sewerage Systems
- B. ANSI/AWWA C504 - Rubber Seated Butterfly
- C. ANSI/AWWA C510 - Backflow Prevention Devices - Double Check Valve Types
- D. ANSI/AWWA C507 - Ball Valves 6 inches through 48 inches
- E. ANSI/AWWA C508 - Swing Check Valves for Waterworks Service 2 inches through 24 inches NPS
- F. ANSI/AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems
- G. ANSI/AWWA C511 - Backflow Prevention Devices – Reduced Pressure Principle
- H. ANSI/AWWA C540 - Power-Activating Device for Valves and Sluice Gates
- I. ANSI/AWWA C550 - Protective Interior Coatings for Valves and Hydrants
- J. ASTM A126 - Gray Iron Castings
- K. ASTM A48 - Gray Iron Castings for Valves, Flanges and Pipe Fittings

1.04. DESIGN REQUIREMENTS

- A. The design working pressure shall be 200 psig for valves 12 inches NPS in diameter and smaller.
- B. Valves shall be required for normal cold water use.
- C. Gate valves shall be designed to be leak-tight with full pressure on either face with no pressure on the opposite face.
- D. Resilient seated gate valves shall be designed to be leak-tight with full pressure on either face with no pressure on the opposite face.
- E. Deck hydrants shall be designed for a 300 psig test pressure and 150 psig working pressure.
- F. All valves shall be compatible with all the materials the valves shall be exposed to.

1.05. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Submit shop drawings of types of valves, hydrants and appurtenances proposed for the project including conformance to ANSI/AWWA codes and related details for field assembly, operations and maintenance.
- C. Manufacturer's Installation Instructions - Indicate special procedures required to install products specified.
- D. Results of shop tests, if required.
- E. Manufacturer's Certificate - Certify that products meet or exceed specified requirements.

1.06. COORDINATION

- A. Coordinate work under provisions of Section 01039, Coordination.

PART 2 PRODUCTS

2.01. MATERIALS

- A. Valve size, type of valve, joint type, class, lining, coatings shall be installed as listed herein.
- B. Valves shall be of standard manufacturer and of highest quality, both as to material and workmanship, conforming to the latest edition of AWWA standards specified.
- C. All valves and deck hydrants shall have the manufacturer's name monogrammed or initialed by the manufacturer thereon and shall be identified by catalog numbers.
- D. All valves shall be provided with flange or screwed ends as described herein.
- E. Valves, 2 inches in nominal diameter and smaller shall be all brass or bronze unless thermoplastic valves are specifically called for in the specifications or drawings or are required for the given service.

- F. Valves over 2 inches in nominal diameter shall be iron bodied, fully brass or bronze mounted unless thermoplastic valves are specifically called for in the specifications or drawings or are required for the given service.
- G. All surface forming joints or bearing surfaces shall be machined to a perfect fit.
- H. All disc and seat rings shall be carefully and thoroughly secured in place with the iron castings machined where the rings are bare and the backs of the rings machined all over.
- I. After the rings have been fastened securely in place, the front shall be machined all over to a perfectly true and smooth bearing surface.
- J. All valves with non-rising stems shall have valve position indicators.
- K. Valves shall open counterclockwise (left) unless otherwise specified.

2.02. GATE VALVES

- A. Gate valves 2 inches and smaller shall be bronze gate valves with rising stem, double wedge disc, screwed bonnet, screwed ends, 125-pound rating and shall be repackable under pressure in full open position.
- B. All gate valves 2 inches and smaller shall be Stockham Figure B100; Hammon Figure 1B640; or equal.
- C. All other interior gate valves shall conform to AWWA Standard C500 and shall be of iron body, bronze mounted, double-disc type with outside screws and yokes and have 125-lb. ANSI flanged ends.
 - 1. Valves shall be constructed with bolted bonnets, provided with cast iron stuffing boxes having bolted followers.
 - 2. The stuffing boxes shall be so arranged as to be readily accessible and shall be packed ready for use with synthetic fiber, graphite impregnated stuffing.
- D. Stems shall be fabricated of brass or bronze with the lath-cut, half-V pattern threads. Double-disc type gate valves shall be Kennedy Valve Manufacturing, Mueller, or equal.
- E. All interior gate valves shall be equipped with handwheel operators unless otherwise specified. Handwheel or chain and wheel operators shall be replaceable with 2 inch operating nuts without replacing the valve stem or removing the bevel gears.

2.03. CHECK VALVES

- A. All check valves, except those installed on sump pump discharge lines, shall be of the horizontal single disc swing type designed to operate with a minimum loss of pressure.
- B. Check valves shall be so designed that when there is no flow through the line, the disc shall hang lightly against the seat and shall afford ample waterway with but a small angle of opening.
- C. All check valves shall be provided with screwed or bolted covers for access to the disc.

- D. Unless shown otherwise, all check valves shall be located in horizontal piping runs and shall be provided with extended hinge pin and outside lever and weight fully installed to assist the valve in closing.
- E. All check valves with outside lever and weights shall be provided with guards which protect operating personnel from the swinging action of the outside lever and weights.
- F. Guards shall be of a cage-type design using heavy duty wire mesh, easily removable, constructed as shown on the Standard Details in the Contract Drawings.
- G. All check valves, except for those installed on the discharge piping of raw wastewater pumps, sump pumps, and chemical feed systems shall be manufactured by ITT Kennedy Valve Manufacturing Company, Inc. or equal.
- H. Check valves for sump pumps shall be Series 100 rubber flapper as manufactured by Apco; Darling; or equal.
- I. Check valves on the discharge side of the raw sewage pumps shall be provided with a suitably sized cushioning dashpot to prevent slamming of the valve. These check valves shall be Golden Anderson Model 250-D or equal.

2.04. PLUG VALVES

- A. Plug valves shall be non-lubricated, eccentric type and shall close drop-tight at the rated pressure of 150 psig.
- B. Port areas shall be rectangular and at least 80 percent of the full pipe area to provide clog-free operation.
- C. The valve body shall be cast iron or semi-steel with a welded-in-place nickel seat. The body shall have a bolted bonnet for permitting removal of the plug while body remains in line.
- D. Flanges shall be 125-lb., faced and drilled.
- E. The plug shall be cast iron with synthetic rubber facing, suitable for frequent open-close operation and for flow throttling.
- F. Journal bearings shall be provided at each end of the plug and shall be of the wetted type to prevent binding. Bearings shall be fabricated from oil-impregnated 316 stainless steel so that the plug will operate freely after long periods of inactivity.
- G. Packing shall be adjustable U-rings.
- H. Valves shall be provided with adjustable stops.
- I. Valves for interior installation and smaller than 8 inches in diameter shall be equipped with standard 2-inch nuts for wrench operation.
- J. Valves 8 inches in diameter and larger shall be equipped with worm gear and handwheels.
- K. Chain operators shall be furnished in accordance with chain wheel operators as stated hereinafter.
- L. Unless otherwise specified, valves shall be installed so that when closed, the plug is at the upstream end of the valve.

- M. In horizontal piping with the plug shaft installed horizontally, the plug shall be in the upper part of the valve body when open.
- N. Plug valves on digester gas piping shall be NBR Hydrocarbonated for corrosion protection.
- O. Plug valves shall be as manufactured by DeZurik, Val Matic, or equal.

2.05. PRESSURE REDUCING, RELIEF, AND REGULATING VALVES

- A. Pressure reducing, relief, and regulating valves shall be installed where shown on the Drawings.
- B. Each valve shall be provided with "Y" strainer as specified hereinafter.
- C. All valves provided shall be designed such that repairs can be made without the valve being removed from the line.
- D. The General Contractor shall coordinate with equipment suppliers for required pressure settings where these valves are to be used for seal water.
- E. Metallic Valves
 - 1. Pressure reducing, relief, and regulating valves shall have cast iron bodies and covers, with bronze trim, with valve opening to be at least as large as the size of valve.
 - 2. Each valve shall automatically reduce a constant or variable higher inlet pressure to a constant lower downstream pressure by means of pilot operated regulator, with the downstream pressure being adjustable by means of a single screw. The pilot system shall be bronzed-bodied and be protected by a sedimentation chamber and bronze bodied strainer.
 - 3. Pressure reducing, relief, and regulating valves shall have a maximum pressure rating of at least 175 psi.
 - 4. These valves shall be manufactured by G.A. Industries, Inc., Mars, PA; Cla-Val Company, Newport Beach, CA; the Ross Valve Manufacturing Company, Troy, NY; or equal.
- F. Thermoplastic Valves
 - 1. Pressure reducing, relief, and regulating valves shall have PVC bodies and covers with valve opening to be at least as large as the size of the valve.
 - 2. Each valve shall automatically reduce a constant pressure or variable higher inlet pressure to a constant lower downstream pressure by means of a pilot-operated regulator, with the downstream pressure being adjustable by means of a single screw. The pilot system shall be PVC bodied and be protected by a sedimentation chamber and a PVC strainer as manufactured by Plast-O-Matic, Hayward, Asahi, or equal.
 - 3. Pressure reducing, relief, and regulating valves shall have a maximum pressure rating of at least 150 psi.
 - 4. These valves shall be manufactured by Plast-O-Matic, Hayward, or equal.

2.06. BACKFLOW PREVENTER

- A. Reduced pressure zone backflow preventers shall be supplied where shown on the Drawings.
- B. The backflow preventers shall consist of two spring-loaded check valves and a spring-loaded diaphragm-actuated, differential pressure relief valve located in the zone between the check valves.
- C. The unit shall include properly located test cocks and operation shall be completely automatic. The total headloss shall not exceed 10 psi at AWWA rated flow.
- D. All parts shall be manufactured from corrosion-resistant materials.
- E. A continuous discharge from the relief valve opening shall provide a visual inspection of need of repair.
- F. Manufacturers - Reduced pressure zone backflow preventers shall be listed on approved list of University of California Foundation for Cross Connection Control and Hydraulic Research (FCCCHR). Manufacturer shall provide documentation of FCCCHR listing.

2.07. GLOBE VALVES

- A. All globe valves shall be of suitable design to provide the full pipe opening and to operate with full pressure on either side of the seat.
- B. Valves shall be of the inside screw-type seat with yoke to insure square seating of the disc.
- C. Globe valves shall be provided with the normal composition disc of a material suitable for water.
- D. Metallic Valves
 - 1. Shall be equipped with cast iron handwheels and shall be packed ready for use.
 - 2. Globe valves for the waterseal piping system shall be bronze bodied as manufactured by Powell; Lunkenheimer; or equal.
- E. Thermoplastic Valves
 - 1. All valves shall be PVC.
 - 2. Shall be equipped with PVC handwheels and shall be packed ready for use.
 - 3. Globe valves shall be as manufactured by Asahi, Hayward, or equal.
- F. Refer to the Contract Drawings for size and location.

2.08. HANDWHEEL OPERATOR

- A. Valves specified with handwheel operator shall have the proper size handwheel to provide an effortless operation.
- B. Handwheels shall be made of bronze or cast iron materials, and shall be properly secured to the valve stem to prevent displacement during use.

2.09. WRENCH OPERATOR

- A. Wrench for wrench-operated valves located above ground shall be of bronze or cast iron, and shall be of suitable size and length to facilitate an effortless operation. One such wrench shall be provided for each valve on the project requiring wrench operation.

2.10. CHAIN AND WHEEL OPERATIONS

- A. All valves located with center of shaft 6-1/2 feet or higher from the operating floor shall be equipped with chain-and-wheel operators.
- B. The chain-and-wheel operators shall have a straight or a beveled gear reducer type operator depending on the type recommended by the manufacturer.
- C. The length of the operating chain shall extend to 6 feet 0 inches above the operating floor.

2.11. EXTENDED OPERATORS

- A. All submerged valves, valves located below walkways and as otherwise shown on the Drawings shall be provided with extended operators.
- B. Extended operators shall be cold rolled steel supported by bronze bushed guide brackets at intervals not to exceed 10 feet.
- C. Extended operators shall be provided with position indicators and shall be of sufficient length to allow operation of valve from approximately 36 inches above the surface of the walkway.
- D. Anchor bolts for guide brackets shall be stainless steel.
- E. Right angle extended operators of the same material shall be furnished where shown on the Drawings. Each right angle extended operator shall be provided with a minimum of two bearing blocks.

2.12. VALVE TAGS AND DIRECTORY

- A. Provide valve tags for all valves.
- B. Tags shall be made from a plastic laminate of heavy plastic with a brass eyelet in the corner and shall indicate the valve number and fluid in the pipe.
- C. Tags shall be fastened to each valve with a brass chain.
- D. Tags to be made by Seton Name Plate Company, New Haven, Connecticut; W.H. Brady Company; or equal.
- E. A valve directory shall be provided listing all valve numbers, the valve function, and location. The directory shall be typewritten and framed with a glass cover and delivered to the Owner after approval by the Engineer.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that structures are complete and ready to receive work.

- B. All valves, deck hydrants and appurtenances shall be carefully inspected in the field before installation. Cracked, broken, warped, out-of-round, damaged joints, including damaged linings or coatings, or otherwise defective valves, hydrants and stops, as determined by the Engineer, shall be culled out and not installed. Such rejected material shall be clearly tagged in such manner as not to deface or damage it, and the material shall then be removed from the job site by the Contractor at his own expense.
- C. The Contractor shall have on the job site all the proper tools, gauges, pipe cutters, lubricants, etc., to properly install valves, deck hydrants, etc.
- D. The Contractor shall verify all valve positions and locations before installation.

3.02. TOLERANCES

- A. Valves, backflow preventers and appurtenances shall be installed at the elevations and locations shown on the Drawings.

3.03. INSTALLATION

- A. The Contractor shall furnish slings, straps, and/or approved devices to provide satisfactory support of the valves or hydrants when lifted. Transportation from storage areas to the work area shall be restricted to operations which can cause no damage to the coating or lining or castings.
- B. The valves or deck hydrants shall not be dropped from trucks onto the ground.
- C. All valves shall be installed in accordance with the specifications for the pipe to which they are to be connected and as previously described for individual types of valves.
- D. Joints of valves shall be made up in accordance with the Drawings and/or as described under the appropriate pipe joint descriptions found in other sections of these specifications.
- E. The valves shall be so located that they are accessible for operating purposes and shall bear no stresses due to loads from the adjacent pipe.
- F. All valves shall be inspected before installation, and they shall be cleaned and well lubricated before being installed in the line.
- G. Deck hydrants shall be set at locations specified on the Drawings.
- H. All iron bodied valves shall be primed and finish painted in accordance with Section 09900, Painting.

END OF SECTION

SECTION 15140
SUPPORTS AND ANCHORS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Piping and equipment hangers and supports.
- B. Equipment bases and supports.
- C. Inserts.

1.02. RELATED SECTIONS

- A. Section 01640 - EQUIPMENT-GENERAL
- B. Section 05500 - MISCELLANEOUS FABRICATIONS
- C. Section 09900 - PAINTING
- D. Section 15060 - INSIDE PROCESS PIPING
- E. Section 15100 - INSIDE PROCESS VALVES AND HYDRANTS
- F. Section 15260 - PIPING INSULATION

1.03. REFERENCES

- A. ASME B31.1 - Code for Pressure Piping (Power Piping)
- B. ASME B31.2 - Fuel Gas Piping
- C. ASME B31.5 - Refrigeration Piping
- D. ASME B31.9 - Building Services Piping
- E. ASTM F708 - Design and Installation of Rigid Pipe Hangers
- F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer
- G. MSS SP69 - Pipe Hangers and Supports - Selection and Application
- H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices
- I. NFPA 13 - Installation of Sprinkler Systems
- J. NFPA 14 - Installation of Standpipe and Hose Systems
- K. UL 203 - Pipe Hanger Equipment for Fire Protection Service
- L. Seismic Considerations - Refer to State Building Codes

1.04. SUBMITTALS

- A. Product Data - Provide manufacturers catalog data including materials and load capacity.
- B. Design Data - Indicate load carrying capacity of trapeze, unistrut, multiple pipe, and riser support hangers.
- C. Manufacturer's Installation Instructions - Indicate special procedures and assembly of components.

1.05. REGULATORY REQUIREMENTS

- A. Conform to applicable code for support of plumbing piping.
- B. Supports for Sprinkler Piping - In conformance with NFPA 13.
- C. Supports for Standpipes - In conformance with NFPA 14.

PART 2 PRODUCTS

2.01. GENERAL

- A. All hangers and supports shall be manufactured or fabricated from materials suitable for the particular area in which they are installed.
 - 1. The Contractor shall install hanger supports that are similar in material construction regardless of piping or conduit application within a given area.
 - 2. Pipe hangers and supports for process pipe, conduit, heating and ventilating piping and plumbing piping shall be constructed of similar materials, (e.g., all hangers and supports located in an interior wet location shall be manufactured from Type 316 stainless steel or polyvinyl chloride (PVC)-coated galvanized steel).
 - 3. Where applicable, fasteners, brackets and supports shall be fabricated in accordance with Section 05500 and as specified herein.

2.02. MATERIALS

- A. Stainless Steel - For the purpose of this section, all stainless steel shall be Type 316.
- B. PVC-Coated Materials - PVC coated hangers and supports shall be installed where applicable for chemical and corrosion resistant applications as required in the specified areas, or as specifically called out in other sections of these specifications. PVC coating process shall be as follows:
 - 1. Hanger or support shall be hot dipped galvanized including the threads.
 - 2. The zinc surface shall be treated with chromic acid prior to coating to enhance the bond between metal and plastic.
 - 3. All surfaces shall be coated with an epoxy acrylic primer of approximately 0.0005-inch thickness.
 - 4. The coating shall be applied by the liquid plastisol method.

5. The plastisol shall be compounded of pure materials and shall be free of any fillers or secondary plastisizers.
 6. A PVC coating shall be bonded to the galvanized outer surface of the product. The bond between the PVC coating and the product surface shall be greater than the tensile strength of the plastic. The thickness of the PVC coating shall be a minimum of 0.040 inch (40 mil).
 7. Coating system shall be OCAL-40 as provided by Occidental Coating Company, Van Nuys, CA; Plasti-Bond Red as provided by Robroy Industries, Verona, PA; or equal.
- C. Steel, Steel Alloys - Steel or steel alloy hangers and supports shall conform to ANSI B31.10 and MSS Standard Practice SP-58.

2.03. MANUFACTURERS

- A. Hangers and supports shall be as manufactured by Anvil International, Providence, RI; Basic Engineering (B.E.), Pittsburgh, PA; Carpenter & Patterson, Lakeport, NH; Unistrut Corporation; B-Line Systems; Globe Division of United States Gypsum; Robroy Industries; OCAL; or equal.

2.04. CORROSION RESISTANCE

- A. All pipe supports in wet, corrosive, hazardous or exterior locations shall have stainless steel support rods, stainless steel mounting hardware, stainless steel fasteners, and stainless steel concrete inserts. All non-stainless steel parts of the hangers and supports shall be PVC coated.
- B. All other areas shall have cadmium plated appurtenances unless specified otherwise.

2.05. HANGER AND SUPPORT SCHEDULE

- A. The following schedules are provided to identify the type of hangers and supports acceptable under this contract. The Contractor shall provide the type of hangers and supports in these schedules; however, the acceptable materials of construction shall be provided as identified in the Application Schedule for the various systems and the intended location of the hanger or support.

PIPE HANGER AND SUPPORT SCHEDULE INSIDE PROCESS PIPING

TYPE	PIPE SYSTEM	DESIGNATION	ANVIL	B.E.
A	Steel	Clevis hanger	260	BE120
A	Steel, insulated	Clevis hanger	300	BE119
A	Ductile iron	Clevis hanger	590	BE174
A	PVC	Clevis hanger	65	--
B	Ductile iron, steel	Pipe stanchion saddle, pipe support and floor plate with S.S. yoke.	259	BE141
C	Ductile iron, PVC	Split pipe clamp with base flange	138R	--
D	PVC and steel	PVC coated clamp.	262	--
E	Ductile iron, steel	Pipe support in trench	--	--
F	Ductile iron	Concrete base fitting support	--	--
G	Ductile iron, steel	Concrete pipe support	--	--
H	Ductile iron, steel	Welded steel bracket	199	BE203

TYPE	PIPE SYSTEM	DESIGNATION	ANVIL	B.E.
I	PVC, hose	Pipe channel support	--	--
J	Ductile iron, steel PVC	Channel framing	--	--
K	Ductile iron, steel	Steel pipe floor support	--	--
L	Ductile iron, steel, PVC	Concrete pipe support in trench	--	--
M	Ductile iron, steel, PVC	Steel angle pipe support	--	--

1. Type J and E pipe supports shall be an applicable channel system, for the pipe loading and Unistrut span utilized by Unistrut Corporation, B-Line Systems, Globe Division of United States Gypsum; or equal.
 - a. System shall permit rigid metal construction without welding or drilling.
 - b. All members shall be fully adjustable, demountable and reusable.
 - c. One manufacturer shall furnish system complete with all nuts, bolts, couplers, channels and all other required fittings and mechanical accessories.
 - d. Channels and accessories shall be galvanized steel with 20 mil PVC coating, all of the same color.
 - e. All mounting hardware, fasteners and concrete inserts shall be Type 316 stainless steel.
 - f. Pipe clamps shall be PVC-coated galvanized straps with stainless steel rods, nuts, and flat washers.
 - g. Verify that the load carrying capacity of the Unistrut system is adequate for weight of pipes and contents and span utilized.

PLUMBING PIPING

TYPE OF PIPE	INSULATED	ANVIL HANGER FIGURE NO.
Hung Piping - Stationary:		
Steel, wrought or cast iron	No	97
Copper	No	CT-99C-plastic coated
Steel or wrought iron	Yes	97 with 167 shield
Copper	Yes	97 with 167 shield
Hung Piping - Subject to Movement:		
Steel, wrought or cast iron	No	174
Steel, wrought or cast iron	Yes	174 with saddle
Copper	Yes	174 with saddle
Wall Supported Piping – Stationary:		
Steel, wrought or cast iron	No	260 with 213, 194, 195, or 199 wall bracket
Copper	No	CT-99C and rod with 194 wall bracket
Steel or wrought iron	Yes	260 with saddle mounted on 194, 195 or 199 wall bracket
Copper	Yes	C-97 with rod and 167 shield

PART 3 EXECUTION

3.01. GENERAL

- A. All piping to be supported from floors, concrete slabs, ceilings or walls shall have supports and parts required for the installation of the piping systems which conform to the requirements of Chapter 1, Section 6 of the ANSI Code for Pressure Piping (B31.1), except as modified and supplemented by the requirements set forth in these specifications.

3.02. HANGER AND SUPPORT APPLICATION SCHEDULE

- A. The materials of construction for all hangers and supports, applicable to: inside process piping, fire protection, plumbing and HVAC systems, used on the project, shall be in accordance with the Hanger and Support Application Schedule at the end of this section.

3.03. SUPPORT INTERVALS

- A. At a minimum, additional supports or anchors will be required at:
 - 1. All bends on pump discharge line to prevent vertical or horizontal movement resulting from pressure thrusts.
 - 2. Each side of all couplings in the horizontal plane to eliminate vertical force on couplings.
 - 3. All branch connections to eliminate vertical and horizontal movement.
 - 4. Both side of expansion joints to prevent horizontal movement.
 - 5. All pipe joints subject to torque along centerline of pipe. Piping shall be supported so that pumps and other equipment may be removed without providing additional pipe support.
 - 6. Where depicted on the Drawings, pipe supports shall be of the type indicated.
- B. Flanged Ductile Iron Pipe - Supports and hangers for flanged ductile iron and steel pipe 1-1/4 inches and larger shall not be more than 10 feet on center.
 - 1. Additional supports and hangers will be required for grooved end ductile iron pipe and fittings at the Contractor's expense.
- C. Copper Pipe - Copper pipe 1/2-inch to 1-inch, 6 feet 0 inches maximum support spacing; 1-1/4-inch and over 10 feet 0 inches maximum.

3.04. EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported pumps. Refer to Division 3 specifications.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of Steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05. INSERTS

- A. Provide inserts for suspending hangers from concrete slabs and sides of concrete beams.

3.06. HANGER AND SUPPORT APPLICATION SCHEDULE

AREA	ACCEPTABLE MATERIALS
EXTERIOR:	
Exposed to outdoor conditions	Stainless steel
INTERIOR:	
Wet Hose-down Areas	
Pump Room	Stainless steel

END OF SECTION

SECTION 15170

MOTORS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. All electric motors supplied under these Contract Documents shall conform to this specification as minimum requirements.
- B. All electric motors shall conform to ANSI Standards for Rotating Electrical Machinery (Designation C50) and to NEMA Standards MG-1 for Motors and Generators (NEMA Standard Publication latest revision) and to NEC, Article 430.
- C. The rating of the motors offered shall in no case be less than the horsepower required in the Contract Documents.
- D. Motors shall operate without an undue noise or vibration and shall show no signs of electrical unbalance.
- E. Motor efficiency shall be a prime consideration in selection of all motors. Unless otherwise specified in the individual equipment specifications, motors shall meet the requirements of Article 1.08.

1.02. RELATED SECTIONS

- A. Section 09900 - PAINTING
- B. All other sections where motors are specified or required.

1.03. SUBMITTALS

- A. Shop Drawings of Electric Motors - Submit in accordance with Sections 01300, Submittals, and 01640, Equipment-General.
- B. Include with submittals:
 - 1. Electric characteristics.
 - 2. Design characteristics.
 - 3. Mechanical construction.
 - 4. Manufacturer's name.
 - 5. Manufacturer's type.
 - 6. Pertinent specifications for the use intended.
 - 7. Name of the equipment to be driven.
- C. Tabulate the following information in one location on each electric motor shop drawing submittal:

Motor manufacturer	Nameplate horsepower
Model	Motor rpm, full load nameplate
Frame number	Insulation class
Type of enclosure	Service factor
Volts	Maximum ambient temperature
Hertz	Maximum temperature rise
Phase	Shop painting
NEMA design	Nominal efficiency
Code letter	Guaranteed minimum efficiency at 50, 75 and 100% full load
Locked rotor amps	Minimum power factor at 50, 75 and 100% load
Locked rotor torque	Resistance temperature device information (if applicable)

1.04. INSULATION

- A. Minimum NEMA Class B insulation unless otherwise noted in the individual equipment specifications.
- B. Provide Class F insulation if required by the manufacturer to meet specified energy efficiency.
- C. Use Class F or H insulation where ambient temperatures exceed 104 degrees F (40 degrees C) as shown on the Contract Drawings or elsewhere in the specifications.

1.05. RATINGS AND DESIGN

- A. Furnish with adequate ratings to accelerate and drive connected equipment under all normal operating conditions without exceeding nameplate ratings.
- B. Furnish with service factors in accordance with NEMA standards as follows unless otherwise noted in individual equipment specifications.

TYPE OF MACHINE	MINIMUM SERVICE FACTOR (SF)
Mill and chemical duty	1.15
Open drip-proof	1.15
All others	1.0
Submersible	1.15
Inverter duty	1.0

- C. Motors shall operate successfully under running conditions at rated load and frequency with a voltage variation up to 10 percent; at rated load and voltage with a frequency variation up to 5 percent; and at rated load with a combined variation in voltage and frequency not more than 10 percent above or below the rated voltage and frequency provided that the frequency variation does not exceed 5 percent.
- D. Assume voltage unbalance to be 1 percent. Altitude is less than 3,300 feet.
- E. Assume ambient temperatures to be 40 degrees C for motors in air and 25 degrees C for submersible motors.
- F. Motor winding temperature rise shall be as follows:

	Class of Insulation		
	B	F	H
Open, drip-proof motors	80°C	105°C	125°C
Totally enclosed fan-cooled motors	80°C	105°C	125°C
Totally enclosed non-ventilated motors	85°C	110°C	135°C
Explosionproof motors	80°C	105°C	125°C
All other motors with 1.15 SF or higher	90°C	115°C	--

- G. Use the applicable paragraphs of NEMA MG1 12.42 in making design selections.
- H. Unless otherwise specified, all three phase motors shall be constant speed, squirrel cage induction type.
1. The Contractor shall provide multi speed (multiple windings or consequent poles - single winding, wound rotor, etc.) where required as specified in individual equipment specifications.
- I. Motor Voltages
1. Motors of 1/2 HP and Larger - Squirrel cage induction type designed for 3 phase, 60 cycle, 230/460 volt operation unless otherwise specified.
 2. Motors Smaller Than 1/2 HP - Capacitor type designed for single phase, 60 cycle, 120 volt operation unless otherwise specified.
 3. Motors indicated on the Contract Drawings and/or specified in the specifications as 208 volt shall be specially wound for voltage indicated and/or specified.
 4. Dual-rated motors (i.e., 208/230 volts) are not acceptable for operation on 208 volts.
- J. Unless otherwise specified, all single-phase motors shall be NEMA design letter M or N, designed to withstand full voltage starting in accordance with MG12.32.
1. Motors shall comply with NEMA Standards for Definite Purpose Motors (paragraphs 18.001 18.717).
- K. In general, capacitor start induction run or split phase type motors shall be used unless otherwise approved by the Engineer.
- L. Shaded pole motors larger than 1/8 HP will not be allowed.
- M. Thermal overload protectors and any auxiliary components necessary to provide required starting characteristics including capacitors, resistors and automatic switching devices shall be furnished and mounted integrally unless motor starters with overload protection are provided.

1.06. MECHANICAL CONSTRUCTION

- A. Unless otherwise specified, electric motors shall be of the following types of construction according to the degree of mechanical protection:
1. Totally Enclosed, Explosionproof Motors - When located in areas designated as hazardous locations (explosionproof) (NEC locations Class I, Divisions 1 or 2).

- a. See the Contract Drawings for other hazardous area classifications.
- 2. Totally Enclosed, Fan Cooled (TEFC) Motors - When located outdoors or indoors in wet areas such as washdown areas or elsewhere if specified.
 - a. Winding heaters shall be provided when specified.
- 3. Mill and Chemical Duty or Severe Duty - Suitable for use in corrosive areas unless otherwise specified in individual equipment specifications.
- 4. Submersible Motors - For submerged application.
 - a. Provide motor winding thermal protection in motors 1 HP and larger.
- 5. In all other cases, they shall be open drip-proof.
- B. Encapsulated Windings - Where specified, an additional "dip and bake" will not be acceptable. Encapsulation shall be Contour Mold Everseal by U.S. Motors; Costum Polyseal by General Electric; or equal.
- C. Bearings
 - 1. Unless otherwise specified or required, motors rated above 2 HP shall have the bearings of the grease lubricated, anti friction ball type with conveniently located grease fittings.
 - 2. Provide a means of preventing bearings from becoming overgreased (such as double shields on bearings or pressure sensitive relief fittings).
 - 3. Unless otherwise specified, bearings shall be rated at a minimum B 10 life of 20,000 hours under axial loads.
 - 4. Submersible motors shall have bearings rated of an L 10 or B 10 life of minimum of 17,500 hours.
- D. Vertical shaft construction, the motors shall have adequate thrust bearings to carry all motor loads and any other operating equipment loads.
 - 1. Grease slingers to be provided.
- E. Horizontal Shaft Construction - Coupled to fluid pumps, the motors shall either have adequate thrust bearings or they shall have the couplings end play and rotor float coordinated to prevent damage to rotor bearings.
- F. Rotors
 - 1. Statically and dynamically balanced.
 - 2. Have secondary bars of heavy copper silver brazed to one piece end rings or they shall have rotor windings of one piece cast aluminum.
 - 3. Where applicable, construct with integral fans.
- G. Non-reversing ratchets shall be provided where specified in the individual equipment specifications.

- H. Nameplates - Stainless steel furnished with all motors, with markings in accordance with NEMA MG1, latest revision, MG1 10.38.
- I. Terminal Boxes
 - 1. Sized in accordance with NEC, Article 430-12 and of sufficient size to accommodate conduits and conductor sizes as shown on Contract Drawings.
 - 2. Furnish rubber gasketed terminal boxes with splash proof and totally enclosed motors.
 - 3. Horizontal Motors - Locate on the left hand side, when viewing the motor from the drive shaft ends and design such that conduit entrance can be made from above, below, or either side of the terminal box.
 - 4. Include grounding lug in terminal box.
 - 5. Oversize terminal boxes in the following applications:
 - a. Motors 7-1/2 HP and larger operating at 208 or 230 volts.
 - b. Motors 20 HP and larger operating at 460 volts.
- J. Motors used with belt drives shall have grease slingers on the sheave end and sliding bases to provide for belt take-up.
- K. Cast iron construction for all motors, when available for the application.

1.07. MOTOR POWER FACTORS

- A. Provide when called for on the Contract Drawings.
- B. Provide for all three phase motors, 7 1/2 HP or larger, 1200, 1800, and 3600 rpm (nominal), 60 Hertz, constant single speed (not VFD controlled), squirrel cage induction type, which do not have a minimum power factor of 85 percent. Motors which cannot meet this criteria shall have power factor correction capacitors, switched integrally with the motors (unless otherwise required by either the motor or starter manufacturer), which will bring the power factor up to a minimum of 90 percent.
- C. Furnish and install, at no additional cost to the Owner, the capacitors and provide all necessary wiring to connect them to the motor terminals or motor controller terminals.
 - 1. Properly size fused switch or circuit breaker to serve as a disconnect for the capacitor.
- D. Capacitor and Disconnect Enclosure

Indoors mounting (non-hazardous)	NEMA 12 wall mounted
Indoor wet areas	NEMA 4 wall mounted
Outdoors mounting	NEMA 4 wall, pad, or mounting stand mounted
Explosionproof areas	NEMA 7 wall mounted (DS only)*
Corrosive areas	NEMA 4X wall mounted*

*Locate capacitor outside the hazardous or corrosive area.

- E. Size capacitors so they do not increase the self excitation voltage above the motor nameplate rating.
- F. Do not use capacitors on motors controlled by VFDs.
- G. When used with solid-state starters, energize only after bypass or full speed bypass contactor is energized. Verify with starter manufacturer their connection requirements and follow them.

1.08. MOTOR EFFICIENCY

- A. All single speed, three phase, squirrel cage induction-type motors 1 HP or larger, 60 Hertz, shall have nominal efficiencies in accordance with attached Table 1, unless specifically otherwise specified in the respective equipment section.
 - 1. Determine efficiencies by using IEEE Test Procedure 112, Test Method B using segregated losses. Motors shall be listed by their manufacturers and be nameplated with words such as "High Efficiency," "Premium Efficient," and "Energy Saver."
 - 2. List guaranteed minimum efficiencies on motor nameplate. Adhere to the latest nominal efficiencies eligible for a rebate published by the local utility where rebates are available. Those efficiencies may be higher than those listed in Table 1.
 - 3. Where rebates are available, submit to the Owner paid invoices for each specific motor supplied for which a rebate is being sought.

1.09. FIELD TESTING

- A. All three phase electric motors 1/2 HP and larger and all single phase electric motors 1 HP and larger shall be field tested by the Contractor at as near operating conditions as possible. Complete and submit all of the information required by the attached "Motor Test Record" for all motors to be tested per the above. Submit record prior to the issuance of the "Substantial Completion Certificate." See Section 01700. Contractor, for the purposes of this item, is the one furnishing and/or installing the final motor-driven unit.
- B. All testing shall be witnessed by the Owner.
- C. Submit completed forms in quadruplicate (one set to be submitted at the time when substantial completion is requested, and one set to be placed in each of the submitted O&M manuals).

1.10. MOTOR SHOP TESTS

- A. Perform motor shop tests in accordance with the IEEE Code for polyphase induction machines. Use NEMA report of test forms and submit results to the Engineer, in five copies, for his approval.
- B. Test each motor and submit report for power factor and efficiency at 50, 75, and 100 percent of its rated horsepower; for insulation resistance and dielectric strength; for heating; and for compliance with all specific performance requirements.
- C. For motors less than 50 HP, provide guaranteed performance data based on previous testing of the motor design. For motors of 50 HP or larger, make complete tests of each motor and furnish certified test data sheets.

1.11. VERTICAL HOLLOW SHAFT MOTORS

- A. Where specified, design vertical hollow shaft motors to carry the motors, pumps, and associated equipment's full thrust. Equip motors with oil lubricated spherical roller thrust bearings and lower grease lubricated radial guide bearings. Provide motors with visual oil level indicators and sufficient oil to fill the motor.
- B. Vertical Adjustment - By means of a lockable nut at the top of the shaft.
- C. Non-Reversing Ratchets - Provide where specified in the individual equipment specifications and where suitable for continuous operation at any speed between 50 and 100 percent of rated speed.

1.12. TWO-SPEED MOTORS

- A. Motors 1/2 HP and Larger Specified as Two Speed Motors - Two windings unless otherwise noted. Motors less than 1/2 HP will be permitted with single windings. Speeds of the motors shall be as specified. Two speed motors shall be tested at the higher speed.

1.13. PAINTING

- A. All motors shall have a manufacturer's standard shop rust-resisting priming coat. Finish coat, either shop or field applied, shall be in accordance with Section 09900, Painting.

(continued)

TABLE 1

NOMINAL EFFICIENCIES FOR “NEMA PREMIUM™” INDUCTION MOTORS
RATED 600 VOLTS OR LESS (RANDOM WOUND)

HP	OPEN DRIP-PROOF*				TOTALLY ENCLOSED FAN-COOLED*			
	900	1200	1800	3600	900	1200	1800	3600
1	74.0	82.5	85.5	77.0	74.0	82.5	85.5	77.0
1.5	75.5	86.5	86.5	84.0	77.0	87.5	86.5	84.0
2	85.5	87.5	86.5	85.5	82.5	88.5	86.5	85.5
3	86.5	88.5	89.5	85.5	84.0	89.5	89.5	86.5
5	87.5	89.5	89.5	86.5	85.5	89.5	89.5	88.5
7.5	88.5	90.2	91.0	88.5	85.5	91.0	91.7	89.5
10	89.5	91.7	91.7	89.5	88.5	91.0	91.7	90.2
15	89.5	91.7	93.0	90.2	88.5	91.7	92.4	91.0
20	90.2	92.4	93.0	91.0	89.5	91.7	93.0	91.0
25	90.2	93.0	93.6	91.7	89.5	93.0	93.6	91.7
30	91.0	93.6	94.1	91.7	91.0	93.0	93.6	91.7
40	91.0	94.1	94.1	92.4	91.0	94.1	94.1	92.4
50	91.7	94.1	94.5	93.0	91.7	94.1	94.5	93.0
60	92.4	94.5	95.0	93.6	91.7	94.5	95.0	93.6
75	93.6	94.5	95.0	93.6	93.0	94.5	95.4	93.6
100	93.6	95.0	95.4	93.6	93.0	95.0	95.4	94.1
125	93.6	95.0	95.4	94.1	93.6	95.0	95.4	95.0
150	93.6	95.4	95.8	94.1	93.6	95.8	95.8	95.0
200	93.6	95.4	95.8	95.0	94.1	95.8	96.2	95.4
250	94.5	95.4	95.8	95.0	94.5	95.8	96.2	95.8
300	--	95.4	95.8	95.4	--	95.8	96.2	95.8
350	--	95.4	95.8	95.4	--	95.8	96.2	95.8
400	--	95.8	95.8	95.8	--	95.8	96.2	95.8
450	--	96.2	96.2	95.8	--	95.8	92.2	95.8
500	--	96.2	96.2	95.8	--	95.8	96.2	95.8

*Nominal speed; for two-speed motors, the efficiency applies to the highest speed.

For submersible motors, other motor horsepowers, speeds, and for Design C and D motors, the efficiencies shall be in accordance with the applicable equipment specification sections.

MOTOR TEST REPORT

Equipment Description _____ Equipment No. _____
Equipment Loc. _____
Drawing Nos. and Rev. _____
MCC/Panel No. _____ Section/CKT. No. _____
Control CKT. No. _____

NAMEPLATE DATA

Motor Mfr. _____ HP _____ Rpm _____ S.F. _____
Volts _____ Phase _____ F.L. Amp _____ KVA Code _____ O° Rise _____
Serial No. _____ Other _____
Locked Rotor KVA _____ Efficiency _____

Prestart Checks

Date

Lubrication Checked (Motor and Driven Equipment) _____
Motor Rotates Freely _____
Overload Heater Size/Setting _____ (located at starter) _____
Control Circuit Tested _____
Breaker Size (Frame Size/Trip Element Rating) _____
Motor Insulation Resistance (Megger) _____
Test Volts _____ (500V for up to 250V motors and 1000V for up to 600V motors)
Test Duration - 1 minute

Phase A to Gnd _____ Phase B to Gnd _____ Phase C to Gnd _____
Phase A to B _____ Phase B to C _____ Phase C to A _____

UNCOUPLED DATA

(Provide this only when motor is shipped, uncoupled.
Do not uncouple motor from drive to test.)

Bus Voltage _____ Inrush Current _____ Amps _____ Sec Run in Time _____
Average Running Current _____ A _____ B _____ C Rotation * _____
Rpm _____
Performed by _____ Date _____
Approved by _____ Date _____
Test Engineer

COUPLED DATA

Bus Voltage _____ Inrush Current _____ Amps _____ Sec Run in Time _____
Average Running Current _____ A _____ B _____ C Rotation * _____
Rpm _____ System Lineup/Conditions _____

Test Equipment Control Nos. _____

Remarks: _____

Performed by _____ Date _____
Approved by _____ Date _____
Test Engineer

*As viewed from motor outboard end. EQUIPMENT NO. _____

END OF SECTION

SECTION 15260
PIPING INSULATION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.
- C. Removable valve and fitting jackets.
- D. Hanger inserts.

1.02. PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 15060 - Inside Process Piping: Placement of hangers and hanger inserts.
- B. Section 15140 – Supports and Anchors: Placement of hangers and hanger inserts.
- C. Section 15410 - Plumbing-Supply Piping: Placement of hangers and hanger inserts.

1.03. RELATED SECTIONS

- A. Section 01300 - SUBMITTALS
- B. Section 01600 - MATERIAL AND EQUIPMENT

1.04. REFERENCES

ASTM B209	Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C177	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
ASTM C195	Mineral Fiber Thermal Insulation Cement
ASTM C335	Steady-State Heat Transfer Properties of Horizontal Pipe Insulation
ASTM C518	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C547	Mineral Fiber Preformed Pipe Insulation
ASTM C585	Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM D2842	Water Absorption of Rigid Cellular Plastics
ASTM E84	Surface Burning Characteristics of Building Materials
ASTM E96	Water Vapor Transmission of Materials
NFPA 255	Surface Burning Characteristics of Building Materials

ASHRAE/IESNA 90.1	Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings
National Commercial and Industrial Insulation Standards (Third Edition)	
UL 723	Surface Burning Characteristics of Building Materials
Mechanical Code of New York State (latest edition)	
Plumbing Code of New York State (latest edition)	
Energy Conservation Construction Code of New York State (latest edition)	

1.05. SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data - Provide product description, list of materials and thickness for each service, and locations. Submit catalog information on valve and fitting covers.
- C. Manufacturer's Installation Instructions - Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.06. QUALITY ASSURANCE

- A. Materials - Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84.

1.07. QUALIFICATIONS

- A. Applicator - Company specializing in performing the work of this section with minimum five years' experience.

1.08. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products under provisions of Section 01600, Materials and Equipment.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.09. ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01. GLASS FIBER

A. Manufacturers

1. Manville - Model Micro-Lok.
2. Owens Corning - Model ASJ/SSL-II.
3. Knauf - Model ASJ/SSL.
4. CertainTeed - Model Snap On.
5. Or equal.

B. Insulation - ASTM C547; rigid molded, noncombustible.

1. "K" ("ksi") Value - ASTM C335, 0.24 at 75 degrees F.
2. Minimum Service Temperature - 0 degrees F.
3. Maximum Service Temperature - 300 degrees F.
4. Maximum Moisture Absorption - 0.2 percent by volume.
5. Maximum Flame Spread – ASTM E84; 25.
6. Maximum Smoke Developed – ATM E84; 50.

C. Vapor Barrier Jacket

1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Transmission - ASTM E96; 0.02 perm inches.
3. Secure with self-sealing longitudinal laps and butt strips.

D. Vapor Barrier Lap Adhesive - Compatible with insulation or integral lap adhesive.

E. Indoor Vapor Barrier Finish - Vinyl emulsion type acrylic, compatible with insulation, white color.

2.02. JACKETS

A. PVC Plastic

1. Manufacturers
 - a. Manville - Model Zeston.
 - b. Knauf - Model Proto.
 - c. Or equal.

2. Jacket - ASTM C921, One piece molded-type fitting covers and sheet material, off white color.
 - a. Minimum Service Temperature - 40 degrees F.
 - b. Maximum Service Temperature - 150 degrees F.
 - c. Moisture Vapor Transmission - ASTM E96; 0.002 perm inches.
 - d. Maximum Flame Spread - ASTM E84; 25.
 - e. Maximum Smoke Developed - ASTM E84; 50.
 - f. Thickness - 20 mil.
 - g. Connections - Brush-on welding adhesive or pressure-sensitive color matching vinyl tape.
3. Covering Adhesive Mastic - Compatible with insulation.
 - a. Fabric - ASTM C921, 6 oz/sq.yd., plain weave cotton treated with dilute fire retardant lagging adhesive.
 - b. Lagging Adhesive - Compatible with insulation.

2.03. HANGER INSERTS

- A. For hot or cold piping systems 1-1/2 inches in diameter or larger, operating at nominal temperatures of 200 degrees F or less, inserts shall be high density such as ASTM C640 cork, hydrous calcium silicate insulation, wood, or foam with sufficient compressive strength to support the weight of the piping system.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02. INSTALLATION

- A. Install all piping insulation and jacketing in accordance with National Commercial and Industrial Insulation Standards and Mechanical Code of New York State.
- B. Install materials in accordance with manufacturer's instructions.
- C. On exposed piping, locate insulation and cover seams in least visible locations.
- D. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature.
 1. Provide vapor barrier jackets, factory applied or field applied.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
 3. Finish with jackets listed.
 4. PVC fitting covers may be used.
 5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, air separators, and expansion joints.
- E. For insulated pipes conveying fluids above ambient temperature.
1. Provide standard jackets as per piping insulation schedule.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
 3. Finish with jackets noted.
 4. PVC fitting covers may be used.
 5. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. Inserts and Shields
1. Application - All insulated piping 1 1/2 inches diameter or larger.
 2. Shields – Fiberglass reinforced plastic between pipe hangers or pipe hanger rolls and inserts in corrosive areas.
 3. Insert Location - Between support shield and piping and under the finish jacket.
 4. Insert Configuration - Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material - Insulating material suitable for the planned temperature range.
- G. Finish insulation at supports, protrusions, and interruptions.
- H. For exterior applications, provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- I. For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03. TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04. PIPING INSULATION SCHEDULE

A. The following insulation and jacket types are referenced in the insulation schedule:

1. Insulation Types

Type 1 - Glass fiber.

2. Jacket Types

Type A - All service jacket.

Type B - All service jacket with vapor barrier.

Type C - PVC jacket.

B. Insulation Schedule - Provide insulation types and thickness as indicated in the table below.

	PIPE SIZE (INCHES)	INSULATION TYPE	JACKET TYPE	INSULATION THICKNESS
PLUMBING SYSTEMS				
Potable hot water	All	1	A and C	1 inch minimum
Potable tempered water	All	1	A and C	1 inch minimum
Potable cold water	All	1	B and C	3/4 inch minimum
Non-potable water	All	1	B and C	3/4 inch minimum

END OF SECTION

SECTION 15400
PLUMBING-GENERAL

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. The Contractor shall furnish all labor, materials, equipment, tools, and services to install plumbing systems as specified herein and as shown on the Drawings. All materials shall be new. All work shall be subject to applicable sections of these specifications.

1.02. RELATED SECTIONS

- A. Specifications - The specification sections listed below are an integral part of this equipment specification. The Contractor shall be responsible for providing these sections to the equipment suppliers and for the provisions specified in these sections:
 - 1. Section 09900 - PAINTING
 - 2. Section 15140 - SUPPORTS AND ANCHORS
 - 3. Section 15170 - MOTORS
 - 4. Section 15260 - PIPING INSULATION
 - 5. Section 15410 – PLUMBING – SUPPLY PIPING
 - 6. Section 15440 – PLUMBING – FIXTURES
 - 7. Section 16055 – ELECTRICAL WORK
- B. The specifications direct attention to certain required features of the equipment, but do not purport to cover all details of design and construction. Nevertheless, Contractor shall furnish the equipment complete in all details and ready for operation.
- C. Drawings - The Drawings accompanying these specifications are generally diagrammatic and do not show all details required for the complete system. They should, however, be followed as closely as possible in the general arrangement and location of piping and equipment. All dimensions shall be checked and all structural and finish conditions investigated and the Contractor shall coordinate his work with these conditions and provide such offsets, brackets and other necessary accessories as may be required. Architectural and Structural Drawings shall take precedence over the Plumbing Drawings regarding building construction, dimensions, and arrangement. Immediately upon discovery of any discrepancy in the Drawings or Specifications, or points of conflict therein, the Contractor shall notify the Engineer, who will clarify such discrepancy in writing prior to the progress of the work beyond the point concerned.

1.03. SUBMITTALS

- A. Shop Drawings - Shop drawings shall be furnished in accordance with Section 01300, Submittals, and for the listed equipment.

- B. Upon completion of the work, the Contractor shall obtain certificate(s) of inspection and approval from the inspection organization having jurisdiction and shall deliver same to the Engineer and the Owner.

1.04. REFERENCES

- A. All work, equipment and materials furnished and installed under Division 15, Plumbing, shall conform with the most recent edition of the existing rules, requirements and specifications of the following organizations:
 - 1. American National Standards Institute (ANSI)
 - 2. American Society of Testing Materials (ASTM)
 - 3. American Water Works Association (AWWA)
 - 4. National Electric Code (NEC)
 - 5. National Electric Manufacturers Association (NEMA)
 - 6. National Fire Protection Association (NFPA)
 - 7. Occupational Safety and Health Association (OSHA)
 - 8. Underwriters Laboratories (UL)
 - 9. Building Code of New York State
 - 10. Fire Code of New York State.
 - 11. Plumbing Code of New York State.
 - 12. Local and State Health Code.
 - 13. New York State Department of Environmental Conservation Certified Water Saving Plumbing Fixtures
- B. All work shall be installed in compliance with the local, state and international plumbing codes. Where conflict arises between the local codes and the requirements of the National Electrical Code, the National Fire Code, NEMA, ASTM, etc., the more stringent requirements shall prevail.

PART 2 PRODUCTS

2.01. COVERING AND INSULATION

- A. The Contractor shall furnish and install pipe insulation on plumbing pipelines as indicated in the pipe insulation schedule in Section 15260, Piping Insulation.

2.02. FABRICATION REQUIREMENTS

- A. Painting, including surface preparation, shall be in full accordance with Section 09900, Painting.

- B. Factory finishes on all equipment shall be maintained in good condition by the Contractor, as determined by the Engineer, clean and free from rust, abrasions and dents. Field and touch up painting will be performed by the Contractor.

PART 3 EXECUTION

3.01. COORDINATION

- A. Coordinate work with that of other trades. Provide information for setting sleeves, inserts, anchors, equipment pads, and advise appropriate trades of all opening sizes, and supply all items to be installed by other trades to them in ample time. Do not rough in equipment without an approved shop drawing.
- B. All wiring will be done by the electrical trade on the job. Advise him of all requirements in ample time. All motor starters, controllers, etc., will be provided by the electrical trade unless noted. All motors supplied with equipment shall conform to Section 15170, Motors, unless otherwise noted.

3.02. FINAL CLEANING

- A. Cleaning will be required for all equipment, fixtures, piping, and accessories, including but not limited to the following:
 1. Removal and cleaning of all debris from trenches, crawl spaces, ceilings, and other unoccupied spaces.
 2. Removal and cleaning of all filters, strainers, drains, traps.
 3. Cleaning of all valve seats.
 4. Removal of labels, protective coatings, and wrappings.
 5. Removal of grease and dirt from finished surfaces.
 6. Removal of dents and scratches from damaged equipment.

3.03. ADJUSTMENTS

- A. Proper adjustment and inspection will be required for all equipment and systems including but not limited to the following:
 1. Temperature control devices.
 2. Miscellaneous control systems.
 3. All electrical work checked free from grounds.
 4. Piping systems air free.
 5. Overload protective elements for proper size.
 6. Check all systems for undue noise. Replace or repair as directed by Engineer.

3.04. INSTALLATION

- A. Plumbing equipment shall be installed by the Contractor in accordance with manufacturer's instructions.
- B. Equipment and piping shall be kept free of dirt. Pipe openings shall be protected by caps, plugs or other suitable means. Equipment shall be covered and protected against dirt, water and chemical or mechanical damage.
- C. Fasteners on the underside of precast/prestressed concrete members (planks or double tees) which serve for direct attachment or for hangers of mechanical/electrical equipment, piping, ducting, etc. may not be drilled in or shot in the vicinity of the prestressing tendons. This means that fasteners at concrete planks can be placed only at the joints between units. Any intermediate supports needed to accomplish this shall be provided by the Contractor. If template or tendon location is obtained from manufacturer of planks, intermediate attachments can be allowed for special cases. Heavy loads must be carried by through bolts which must be installed before the roofing is applied.

END OF SECTION

SECTION 15410
PLUMBING-SUPPLY PIPING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. The Contractor shall furnish all labor, materials, equipment, tools and services to install plumbing systems as specified herein and as shown on the Drawings. All materials shall be new. All work shall be subject to applicable sections of these specifications.

1.02. RELATED SECTIONS

The specification sections listed below are an integral part of this equipment specification, and the Contractor shall be responsible for providing these sections to the equipment suppliers:

- A. Section 09900 - PAINTING
- B. Section 15100 - INSIDE PROCESS VALVES AND HYDRANTS
- C. Section 15140 - SUPPORTS AND ANCHORS
- D. Section 15260 - PIPING INSULATION
- E. Section 15400 - PLUMBING-GENERAL

1.03. SUBMITTALS

- A. Shop Drawings - Provide shop drawings in accordance with Section 01300, Submittals, for the following equipment:
 - 1. Piping materials.
 - 2. Valves and hydrants.
 - 3. Hose bibbs.
 - 4. Sleeves
 - 5. "Y" strainers.
 - 6. Shock absorbers.
 - 7. Pressure reducing valves.
 - 8. Pressure gauges
 - 9. Wall hydrants.
 - 10. Pipe insulation.
 - 11. Supports and anchors.

12. Hose racks.

13. Water meter.

PART 2 PRODUCTS

2.01. PIPING MATERIALS

- A. Type L Copper Piping - Shall conform to ASTM B88. Solder fittings shall be of red brass, conforming to ASTM D145, or shall be wrought copper.
- B. All piping shall be Type L copper pipe unless shown otherwise on the Contract Drawings.

2.02. VALVES AND HYDRANTS

- A. All valves and hydrants shall be provided in accordance with Section 15100, Inside Process Valves and Hydrants, and shall be rated for 125 psi working pressure minimum unless otherwise noted. Provide the type valve as shown on the drawings or required by the specifications. Manufacturer's numbers as listed or approved equal. Valves and hydrants shall be constructed of brass or bronze unless otherwise noted.

2.03. HOSE BIBBS

- A. Hose bibbs shall be supplied and installed where shown on the Contract Drawings. Hose bibbs shall be 1-inch ball valve with 1-inch male-by-male hose and pipe nipple. Hose bibbs shall be Milwaukee Valve Co., or equal.

2.04. SLEEVES

- A. All piping passing through walls and floors shall be installed in sleeves accurately located before concrete is poured, or placed in position during construction of masonry walls. Pipe sleeves, except for those passing through structural members, shall be 12 gauge galvanized iron. Pipe sleeves passing through structural members shall be Schedule 40 steel. Sleeves passing through floors shall extend from the bottom of the floor to a point 3 inches above the finished floor, unless shown otherwise. All steel wall and floor sleeves shall receive a commercial sandblast cleaning and only surfaces not in contact with concrete shall be painted, in accordance with Section 09900, Painting.
- B. Watertight sleeves shall be furnished for all pipes passing through floors or walls which are continually wet or under hydrostatic pressure on one or both sides of the floor or wall or for pipes passing through floors or walls below grade.
- C. Sleeves shall be in accordance with details shown on the General Drawings. If not shown on the Drawings, the Contractor shall submit to the Owner the details of the sleeves he proposes to install, and no fabrication or installation thereof shall take place until the Owner's approval is obtained.
- D. The annular space between the installed piping and sleeve shall be completely sealed against a maximum hydrostatic (or gas) pressure of 20 psig with a modular mechanical type seal consisting of interlocking synthetic rubber links connected by stainless steel bolts and nuts with pressure plates under each end. Tightening the bolts shall compress the neoprene lines causing them to expand and form a continuous, air tight, watertight seal between pipe and sleeve. The seal shall be "Link Seal" as manufactured by the Thunderline Corporation, Wayne, MI; Innerlynx; or equal. Seal type, size, and installation thereof shall be in strict

accordance with the manufacturer's recommendations. In general, sleeves installed in walls or floors against one side of which will develop a hydrostatic or gas pressure, or through which leakage of liquid will occur, shall be so sealed. Seals shall be provided for all piping passing through walls between hazardous and non-hazardous. Refer to standard details as shown on the Drawings for wall, floor, and deck sleeve details.

- E. Sleeves through fire/smoke walls and floors shall be installed per NFPA and seal all cracks and voids with fireproof sealant.

2.05. "Y" STRAINERS

- A. "Y" strainers shall be provided upstream of all solenoid valves, pressure reducing and regulating valves, and needle valves, and as otherwise shown on the Drawings. Strainers shall be of the same size as the pipeline into which it is installed. Strainers shall be of the angular type, constructed of carbon steel with removable 316 stainless steel water screen. Screen shall be recessed and shall lock into accurately machined seats to prevent bypassing. Threaded and gasketed blow off plug shall be provided for blowing off accumulated dirt and replacement of screen without disconnection from pipe. "Y" strainers shall be as manufactured by Hayward; Watts; or equal.

2.06. SHOCK ABSORBERS

- A. Provide shock absorbers for all branch lines, sized and installed according to the Plumbing and Drainage Institute "Standard P.D.I. WH201" using the fixture unit method. Shock absorbers shall be stainless steel shell, elastomer bellows and orifice type. Smith "Hydrotrol" Series 5000, Josam 1485 Series; Zurn; or equal. Intent of this specification is to provide shock absorbers for all branch lines where equipment or fixtures are located whether shown on the Drawings or not.

2.07. PRESSURE REDUCING VALVES

- A. Provide pressure reducing valves in accordance with Section 15100 where shown on the Contract Drawings and as required for specific pressure requirements of connected equipment. Valves shall be constructed of brass or bronze material.

2.08. VALVE TAGS AND DIRECTORY

- A. Provide valve tags and directory in accordance with Section 15100, Inside Process Valves and Hydrants.

2.09. FABRICATION

- A. Painting, including surface preparation, prime and finish coats, shall be in accordance with Section 09900, Painting.

2.10. PRESSURE GAUGES

- A. Gauges shall be 2-inch dial, simple or compound type, with 1/4-inch NPT bottom connections. Pressure ranges shall be selected for proper sensitivity and so that the dial indicator points to the approximate center of the dial in normal operation. A brass tee handle air relief cock shall be installed before each gauge. Gauges shall conform to the requirements of ANSI B40.1 for Grade AA gauges. Pressure gauges shall be easily readable from the floor, where shown on the Contract Drawings, and shall be manufactured by H.O. Terice Company, Ashcroft, or equal.

2.11. NON-FREEZE WALL HYDRANTS

- A. Wall hydrants shall be supplied and installed where shown on the Drawings. All wall hydrants shall be non-freeze, cast bronze, with 3/4 inch male inlet connection, union elbow assembly, and 3/4-inch threaded outlet. Each hydrant shall have polished face, backflow preventer, pressure relief valve, integral vacuum breaker, bronze casing, bronze operating parts, and tee handle key. Wall hydrants shall be Jay R. Smith 5609, Zurn Z1321, or equal. The Contractor shall verify wall thickness for each wall hydrant supplied.

PART 3 EXECUTION

3.01. INSTALLATION

- A. General - Run all piping true, parallel and plumb to walls. Run exposed piping as high as possible unless otherwise noted. Do not run within 6 inches of finished floors across windows, doors, or in such a way as to interfere with access to or operation of equipment, or with less than head clearance without approval. All piping in finished rooms shall be concealed unless otherwise noted. If furred, install to require minimum furring. No piping shall touch any other system except at final connection.

Ream, file, and remove all burrs. Make all offsets and joints with fittings. Hand bent and sprung pipe not permitted. Machine bent pipe permitted with specific approval of the Engineer, if it does not restrict cross sectional area. Do not use reducing bushings, close nipples, or concealed unions without permission of Owner.

Refit or replace pipe, seals, or equipment where leaks occur. Sealing compounds not permitted. Use insulated connections for all joints of dissimilar metals.

- B. Pipe Joints

1. Screwed Joints - All screwed joints shall have long tapered threads to be made with the appropriate paste of jointing compound, depending on the type of liquid to be processed through the pipe. All pipe up to, and including 1-1/2 inches, shall be reamed to remove burr and stood on end and well pounded to remove scale and dirt. Pipe in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot. Joints in plastic piping shall be made with compounds recommended by the manufacturer.
2. Soldered Joints - Shall have the burrs removed and both the outside of the pipe and the inside of fittings shall be thoroughly cleaned by proper tools recommended for that purpose. Flux shall be applied to both pipe and inside of fittings and the pipe placed into fittings and rotated to insure equal distribution of flux. Joints shall be heated and solder applied until it shows uniformity around the end of joints between fitting and pipe. Use 95/5 tin/antimony solder. All joints shall be allowed to self cool to prevent the chilling of solder. Wipe all joints after cooling to remove flux residue. Combination flux and solder paste manufactured by a reputable manufacturer is acceptable.

- C. Valves - Intent of this specification in general is that section valves shall be installed to isolate all branch lines to grouped fixtures and to otherwise make possible the isolation of each individual fixture or piece of equipment not otherwise provided with stops.
- D. Piping Support - All pipe supports and hangers shall be provided in accordance with Section 15140, Supports and Anchors.

3.02. TESTING

- A. All water pipelines shall be tested hydrostatically for 15 minutes at a pressure 50 percent in excess of the pressures to which the pipe will normally be subjected, but in no case less than 100 pounds per square inch (psi). Test duration shall be long enough to determine if there are any leaks but not less than 1/2 hour for each 500 cubic feet of pipe volume or fraction thereof. Any obvious leaks or ruptured piping disclosed by the tests shall be repaired or replaced, and the test repeated to the Engineer's satisfaction.
- B. The Contractor shall accomplish the required tests on the pipeline by individually testing each component section of line designated by the Engineer. All water for tests shall be furnished and disposed of by the Contractor at his expense. Source and/or quality of water which the Contractor proposes to use in testing the lines shall be acceptable to the Engineer.

3.03. CLEANING WATER SYSTEMS

- A. Thoroughly flush out all piping in the system. Clean all gauge glasses, strainers, valve seats, etc.
- B. All pipe and fittings connected to and forming a part of the potable water system shall be sterilized in a manner acceptable to the Engineer. Sterilization shall be accomplished after the pipe has passed the hydrostatic tests. The method proposed by the Contractor shall be in full accordance with the requirements of the State (or County) Department of Health or AWWA C601 68 and shall be acceptable to the Engineer.

END OF SECTION

SECTION 15440
PLUMBING FIXTURES

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Service sinks.

1.02. RELATED SECTIONS

- A. Section 07900 - JOINT SEALERS: Seal fixtures to walls and floors.
- B. Section 15140 - SUPPORTS AND ANCHORS

1.03. SUBMITTALS FOR REVIEW

- A. Product Data - Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.04. SUBMITTALS FOR INFORMATION

- A. Manufacturer's Instructions - Indicate installation methods and procedures.

1.05. SUBMITTALS AT PROJECT CLOSEOUT

- A. Section 01700, Record Documents - Procedures for submittals.
- B. Maintenance Data - Include fixture trim exploded view and replacement parts lists.
- C. Warranty - Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06. QUALITY ASSURANCE

- A. Manufacturer Qualifications - Company specializing in manufacturing the products specified in this section with minimum three years' experience.

1.07. DELIVERY, STORAGE, AND PROTECTION

- A. Section 01600, Materials and Equipment - Transport, handle, store, and protect products.
- B. Accept fixtures on site in factory packaging. Inspect for damage.
- C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08. EXTRA MATERIALS

- A. Section 01700 - Operation and maintenance data.

PART 2 PRODUCTS

2.01. GENERAL

- A. All trim including but not limited to bolt heads, stops, and exposed supplies and fixture wastes shall be chrome plated unless otherwise noted. Provide chrome-plated brass escutcheon plates with set screws for all pipes passing through walls and floors. All supplies shall have stops whether included in the plate number or not, unless otherwise noted.
- B. Unless otherwise indicated, furnish fixtures in white color.

2.02. SERVICE SINKS

- A. Service Sink (Wall-Hung, Plain Back) - Furnish wall-hung service sinks and install as shown on the Contract Drawings. Service sink shall be acid-resisting, enameled cast iron with all accessories for a complete installation as indicated below in white color.
 - 1. Cast iron American Standard Akron 7695.000 with 8379.026 rim guard, Kohler K 6719 with rim guard, or equal.
 - 2. Faucet - Service sink faucet with 3/4-inch hose thread outlet, bucket hook, top spout brace, cast brass "H" and "C" indexed level handles, 1/2-inch female adjustable inlet "C" union couplings, rough chrome finish and vacuum breaker as manufactured by Chicago No. 897, or equal.
 - 3. Trap - Trap shall be cast iron, acid-resisting enamel inside, painted outside, and shall have 3-inch outlet and strainer. Trap shall be American Standard, Kohler, or equal.

2.03. INSTANTANEOUS WATER HEATER

- A. Instantaneous Water Heater (~~34.68~~ kW) - The tankless water heater shall be equipped with a copper sheathed heating element housed in a copper tank with a mechanical pressure differential type flow switch operating the heating element. Unit shall have safety high-limit switch with manual reset, a separate self-resetting thermostat to maintain water temperature below 130 degrees F at the top, tamper-proof flow adjustment for flow control and a housing of polycarbonate plastic. Unit shall provide minimum of ~~1.5-0~~ gpm flow rate at a temperature rise of ~~252~~ degrees F, ~~2408~~ volt, single phase at ~~34.68~~ kW as manufactured by Stiebel Eltron Model DHC 5-2, Bosch, or equal.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Section 01039 - Verification of existing conditions before starting work.
- B. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- C. Where required, verify that electric power is available and of the correct characteristics.
- D. Fixtures shall be free from imperfections, true as to line, angles, curves and color, smooth, watertight, complete in every respect.

3.02. PREPARATION

- A. Rough-in fixture piping connections in accordance with required location(s), height, and size of fixtures.
- B. Fixture mounting height to be acceptable for A.D.A. compliance access at locations indicated on the Drawings.
- C. Water supplies to fixtures shall be valved at fixture.

3.03. INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Install components level and plumb.
- C. Install and secure fixtures in place with wall supports and bolts.
- D. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900; color to match fixture.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.
- F. Trim shall be permanently stamped with manufacturer's identification visible after installation.

3.04. CLEANING

- A. Section 01700 - Cleaning installed work.
- B. Clean plumbing fixtures and equipment.

3.05. PROTECTION OF FINISHED WORK

- A. Section 01700 - Protecting installed work.
- B. Do not permit use of fixtures.

END OF SECTION

SECTION 15835

TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Standard electric unit heaters.

1.02. RELATED SECTIONS

- A. Section 15140 - SUPPORTS AND ANCHORS
- B. Section 15170 – MOTORS
- C. Section 15985 - HVAC CONTROLS AND SEQUENCE OF OPERATION
- D. Section 16120 – CONDUCTORS
- E. Section 16142 - WIRING DEVICES

1.03. REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code (NEC)

1.04. SUBMITTALS

- A. Submit shop drawings under provisions of Section 01300, Submittals.
- B. Submit shop drawings indicating cross section of cabinets, grille, bracing and reinforcing, and typical elevation.
- C. Submit product data under provisions of Section 01300, Submittals.
- D. Submit product data including catalog information showing equipment arrangements and accessories as well as any NEC equipment ratings.
- E. Indicate mechanical and electrical service locations and requirements, specifically indicating deviations from indicated products.
- F. Submit manufacturer's installation instructions under provisions of Section 01640, Equipment-General.

1.05. PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 01700, Record Documents.

1.06. OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01700, Record Documents.

- B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.07. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum five years' documented experience.

1.08. REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70 code for internal wiring of factory wired equipment.
- B. Unit support requirements shall be in accordance with ANSI/AMACNA 001-2000.

1.09. DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Section 01600, Materials and Equipment.
- B. Store and protect products under provisions of Section 01600, Materials and Equipment.
- C. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

1.10. SEQUENCING AND SCHEDULING

- A. Sequence and schedule work under the provisions of Section 01010, Summary of Work.

1.11. WARRANTY

- A. Provide three-year manufacturer's warranty under provisions of Section 01700, Record Documents.
- B. Warranty - Include coverage of unit heater motors.

PART 2 PRODUCTS

2.01. STANDARD ELECTRIC UNIT HEATERS

- A. Manufacturers
 - 1. Modine Model HER and VE.
 - 2. Q-Mark Model MUH.
 - 3. Chromalox Model LUH.
 - 4. Or equal.
- B. Assembly - UL listed and labeled assembly with terminal box and cover, and built-in controls.
- C. Heating Elements - Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.
- D. Cabinet - 18 gage steel with easily removed front panel with integral air outlet and inlet grilles.

- E. Element Hangers - Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.
- F. Fan - Direct drive propeller type, statically and dynamically balanced, with fan guard.
- G. Motor - Refer to Section 15170, Motors; horizontal models with permanently lubricated sleeve bearings.
- H. Accessories – Provide with factory installed power disconnect switch.
- I. Control – Provide with transformer and terminal strip for remote wall-mounted thermostat control as specified in Section 15985, HVAC Controls and Sequence of Operation.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.02. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Hang unit heaters from building structure, with pipe hangers or other approved hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- C. Protect units with protective covers during balance of construction.
- D. Install electric devices furnished by manufacturer but not factory mounted. Furnish copy of manufacturer's wiring diagram submittal. Verify that electrical wiring installation is in accordance with manufacturer's submittals and installation requirements of Division 16 sections.

3.03. CLEANING

- A. Clean work under provisions of Section 01010, Summary of Work.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION

SECTION 15865

AXIAL FANS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Propeller sidewall fans.
- B. Motors and drives.
- C. Accessories.

1.02. RELATED SECTIONS

- A. Section 15170 - MOTORS
- B. Section 15890 - DUCTWORK
- C. Section 15940 - AIR OUTLETS AND INLETS
- D. Division 16 Electrical Specifications

1.03. REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings
- C. AMCA 99 - Standards Handbook
- D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes
- E. AMCA 300 - Test Code for Sound Rating Air Moving Devices
- F. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices
- G. NEMA MG1 - Motors and Generators
- H. NFPA 70 - National Electrical Code
- I. SMACNA - HVAC Duct Construction Standards - Metal and Flexible

1.04. SUBMITTALS

- A. Submit under provisions of Section 01305, Submittals.
- B. Shop Drawings - Drawing showing assembly of axial fans with accessories, fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- C. Product Data - Provide data on axial fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated

capacity, and electrical characteristics and connection requirements. Submit fan bearing life data.

D. Manufacturer's installation instructions.

1.05. OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01640, Equipment - General.

B. Maintenance Data - Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.06. DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600, Materials and Equipment.

B. Protect motors, shafts, and bearings from weather and construction dust.

1.07. EXTRA MATERIALS

A. Furnish under provisions of Section 01640, Equipment-General.

B. Provide two sets of belts for each belt drive fan.

PART 2 PRODUCTS

2.01. PROPELLER SIDEWALL FANS

A. Manufacturers

1. Greenheck - Model SE1

2. Other Acceptable Manufacturers Offering Equivalent Products – Hartzel, Loren Cook, Penn Barry.

3. Substitutions - Under provisions of Section 01300, Submittals.

B. Product Requirements

1. Performance Ratings - Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

2. Sound Ratings - AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

3. Fabrication - Conform to AMCA 99.

4. UL Compliance - UL listed and labeled, designed, manufactured and tested in accordance with UL 705.

5. Performance - As scheduled on the Contract Drawings.

6. Disconnect Switch - Factory wired, manual motor starting switch, in housing for thermal overload protected motor.

C. Construction

1. Impeller – Aluminum blade riveted to steel hub, statically and dynamically balanced, keyed and locked to shaft.
2. Frame –square galvanized steel with die-formed venturi orifice, mounting flanges and corrosion resistant fasteners/supports.
3. OSHA approved motor-side guard. Protective guard shall completely enclose the motor and drive side of the fan.
4. Finish – Provide frame and impeller with polyester powder coat, baked enamel or corrosion-resistant epoxy finish.

D. Electrical Characteristics and Components

1. Electrical Characteristics - As noted on Contract Drawings schedule.
2. Motor to be a DC electronic commutation type motor specifically designed for fan applications. AC induction type motors are not acceptable. Provide 0-10V motor mounted potentiometer dial.
3. Wiring Terminations - Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.01. INSTALLATION

- A. Install in accordance with manufacturer's instructions. Manufacturer shall provide installation services in accordance with Section 01640, Equipment-General.
- B. Install with resilient mountings and with flexible electrical leads.
- C. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 15910
DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Furnish, install, and test ductwork accessories in accordance with the Contract Documents.
 - 1. Parallel blade motor-operated dampers.
 - 2. Insect screens.
 - 3. Duct test holes.

1.02. RELATED SECTIONS

- A. Section 15985 – HVAC CONTROLS AND SEQUENCE OF OPERATIONS

1.03. REFERENCES

- A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
- B. SMACNA - Low Pressure Duct Construction Standards

1.04. SUBMITTALS

- A. Provide in accordance with Sections 01300, Submittals; 01640, Equipment-General; and as supplemented herein. Submittals shall include, but not be limited to, the following:
 - 1. Shop drawings.
- B. Provide product data for hardware used.

PART 2 PRODUCTS

2.01. PARALLEL BLADE MOTOR-OPERATED DAMPERS

- A. Manufacturers
 - 1. Greenheck - Model ICD-45.
 - 2. T.A. Morrison – 9000 Series
 - 3. Or equal.
- B. Parallel dampers shall be AMCA rated, aluminum construction. Frame shall be thermally broken with minimum 12 gage (0.081-inch) thick extruded aluminum frame and 12 gage (0.081-inch) thick extruded blades with polyurethane foam fill.

- C. Frames to be extruded aluminum channel with reinforcing bosses and groove inserts for silicone seals. Bearings to be double-sealed type. Provide motor mounting bracket as required.
- D. Blades shall be provided with continuous silicone seal at blade edges.

2.02. INSECT SCREENS

- A. Provide internally mounted stainless steel insect screen for intake louvers and vents. If connect to ductwork, provide in channel frame with access door to allow for insect screen removal.
- B. Frame:
 - 1. Extruded aluminum channel, 65 mm x 18 mm.
 - 2. Extruded aluminum angle, 40 mm x 25 mm x 3 mm screen frame retainers.
 - 3. Screen Retention Frame - Extruded aluminum with rubber retainer gasket.
 - 4. Insect Screen - 18 x 14 mesh, .011-inch diameter, grade 304 stainless steel.
- C. Maximum Section Size - 60 inches x 60 inches.
- D. Mounting
 - 1. Ducting Mounting
 - a. "Slide-out" screen.
 - b. Rubber gasket around screen slot in frame.
 - c. Cast aluminum handle rigidly attached to screen retention frame. Two handles per screen section.
 - 2. Face Mounting
 - a. "Lift and remove" screen.
 - b. Nylon finger pulls, mounted in screen retention frame
- E. In locations where removable insect screen is associated with air control dampers, supply the two units as an integrated, factory assembled unit.

2.03. DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

PART 3 EXECUTION

3.01. EQUIPMENT INSTALLATION

- A. Install in accordance with the Contract Documents and the manufacturer's written instructions.
- B. Provide duct test holes where required for testing and balancing purposes.
- C. Ductwork accessories specified herein shall be constructed of the same material as the ductwork.

END OF SECTION

SECTION 15940
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Fixed louvers.
- B. Blank-off panels.

1.02. RELATED SECTIONS

- A. Section 15910 - DUCTWORK ACCESSORIES

1.03. REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual
- B. AMCA 500 - Test Method for Louvers, Dampers and Shutters
- C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems
- D. ARI 650 - Air Outlets and Inlets
- E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets
- F. SMACNA - Low Pressure Duct Construction Standard

1.04. QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

1.05. REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.

1.06. SUBMITTALS

- A. Submit product data under provisions of Section 01300, Submittals.
- B. Provide product data for items required for this project.
- C. Submit schedule of outlets and inlets indicating type, size, location, application, free area, free area velocity and noise level.
- D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

- E. Submit manufacturer's chart for color selection by Engineer. If required color is not available from manufacturer's standard color offering, a custom color may be requested at no additional cost.
- F. Submit manufacturer's installation instructions under provisions of Section 01700, Record Documents, for louvers.

PART 2 PRODUCTS

2.01. FIXED LOUVERS

- A. Manufacturers
 - 1. Greenheck - Model ESJ-401.
 - 2. Arrow - Model EA-400.
 - 3. Construction Specialties - Model A4100.
 - 4. Or approved equal.
- B. Fabricate of heavy gauge 0.125-inch thick extruded aluminum channel frame and .08-inch thick blades position at 45-degree angles, with factory 70 percent flouropolymer finish.
- C. Submit manufacturer's color chart for color selection by ENGINEER. If required color is not available from manufacturer's standard color offering, a custom color may be requested.
- D. Louver shall be licensed to bear the AMCA seal for air performance and water penetration. Intake louver rating for beginning of water penetration shall exceed the louvers applied free area velocity.
- E. Provide with aluminum bird screen with 1/2-inch square mesh for exhaust and 3/4-inch for intake. Finish to match louver.

2.02. INSULATED LOUVER BLANK-OFF PANEL

- A. Furnish blank-off panels as noted on Contract Drawings. Blank-off panel shall be provided by the louver manufacturer and shall match the color and finish of the louver. The panel shall be sandwich construction with 2 inch rigid construction sandwiched between aluminum skin.

PART 3 EXECUTION

3.01. INSTALLATION

- A. Install items in accordance with manufacturers' instructions.
- B. Contractor shall field verify dimensions of existing louvers and wall openings prior to submitting shop drawings for replacement equipment. Modify louver dimensions to match existing conditions.

END OF SECTION

SECTION 15985

HVAC CONTROLS AND SEQUENCE OF OPERATION

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. Furnish, install, and test HVAC control systems and components and sequence of operation of HVAC equipment and all required accessories in accordance with the Contract Documents.

1.02. RELATED SECTIONS

- A. Section 15865 – AXIAL FANS
- B. Section 15910 - DUCTWORK ACCESSORIES
- C. Section 15985 – HVAC CONTROLS AND SEQUENCE OF OPERATIONS

1.03. SYSTEM DESCRIPTION

- A. This section defines the manner and method by which controls for HVAC systems function. Requirements for each type of control system operation are specified. Equipment, devices and system components required for control systems may not be specified in detail; however, the Contractor shall supply and install complete systems of control for all heating, ventilating and air conditioning equipment.
- B. Control systems, where possible, shall be provided by one manufacturer: Honeywell, Invensys, Johnson Controls, or equal. All control panels shall meet all of the requirements of this section and related Division 16 Electrical specification sections.
- C. All electrical equipment, including control panel components and devices specified herein shall be in accordance with the Division 16 electrical specification sections.
- D. Control systems shall be industrial quality and shall be suitable for the environments in which they are to be installed.

1.04. SUBMITTALS

- A. Provide in accordance with Sections 01300, Submittals; 01640, Equipment-General; and as supplemented herein. Submittals shall include, but not be limited to, the following:
 - 1. Shop drawings.
- B. Shop Drawings - Shop drawings shall include, but not be limited to the following:
 - 1. Written description of control.
 - 2. Control equipment, including NEMA rating and dimensions.
 - 3. Damper motor operators and installation details showing damper motor operator location in relation to louver/damper and linkage arrangement.
 - 4. Thermostats.

5. Conduit type and materials. Refer to electrical specifications for conduit requirements.

1.05. QUALIFICATIONS

- A. Company specializing in performing the work of this section shall have minimum five years' experience.

PART 2 PRODUCTS

2.01. DAMPER OPERATORS

- A. Manufacturers
 1. Belimo.
 2. Barber Colman.
 3. Honeywell.
 4. Valvcon.
 5. Or equal.
- B. All damper operators shall be provided with an unfused disconnect switch provided by the Contractor. The switch shall be of the single pole, single-throw toggle type mounted in a single gang box. The box shall be connected to the operator with a close nipple and shall be of similar construction as the damper motor enclosure. The switch and box shall be installed and wired by the Contractor. Where required by damper size, multiple damper operators shall be provided or, high torque operators shall be provided to match the operating characteristics of the proposed damper/louver.
- C. Where noted on the Contract Drawings, damper operators shall be enclosed in corrosion-resistant enclosures meeting the NEMA ratings noted in these specifications and as noted on the Contract Drawings.
- D. Damper operators shall be as follows:
 1. Standard, Two-Position, Power Open/Spring Return - NEMA 1 or 2 enclosure for inside use and out of airstream (not suitable for unducted dampers or operable louvers used for outside air inlets) Honeywell Model M4185A; Invensys Model MA Series; Belimo Model AF, NF; or equal.
 2. Weatherproof - Standard motor operators with Belimo ZS-300, NEMA 4X enclosure, actuator cover; suitable for direct exposure to outside air at temperatures to -40 degrees F; cast aluminum housing or other corrosion-resistant finish suitable for exposure to outside air required; other equal units with required NEMA rating are acceptable.
 3. Corrosion Resistant - Same construction as weatherproof units above, but also provided with corrosion-resistant finish (with as heresite or baked phenolic coating) suitable for the particular corrosive environment noted on the Contract Drawings. In some cases, the standard unit casing (such as cast aluminum) may be inherently

corrosion resistant for the specific application. Other equal units with required NEMA rating may be acceptable.

- E. Damper operators located in outside air intake ducts, mixing boxes or plenums or which could be exposed to outside air temperatures shall be suitable for operating in ambient temperatures as cold as -22 degrees F and shall be provided with a NEMA 3R weatherproof enclosure.

2.02. THERMOSTATS

- A. All thermostats, except where otherwise indicated, shall be wall mounted and easily accessible for reading and adjusting purposes. Thermostats shall be provided as follows:
 - 1. Type 1 - Standard, industrial quality; Markel Model TW, Honeywell Model T7079, or equal; line voltage 40 to 90 degrees F range.
 - 2. Type 2 - Single-stage fan cooling; Honeywell T631B1005 or equal; for high limit temperature control of exhaust fans in areas with high ambient temperatures, nominal 50 to 100 degrees F range.

PART 3 EXECUTION

3.01. EQUIPMENT INSTALLATION

- A. Install in accordance with the Contract Documents and the manufacturer's written instructions.
- B. Final acceptance of the control systems shall be made after each system has met the stated performance requirements to the satisfaction of the Owner's authorized representative.
- C. Thermostats shall not be mounted behind cabinets, equipment, ducts, etc. or in direct airstream of supply or outside air.

3.02. DESCRIPTION OF AUTOMATIC CONTROL

- A. Pump Station
 - 1. Upper/Lower Level (F-1, MOD-1, MOD-2, MOD-3, EUH-1, EUH-2)
 - a. Fan F-1 shall operate during high indoor temperatures to ventilate the space for waste heat removal.
 - 1) Exhaust fan F-1 shall be controlled by a high limit, Type 2 thermostat. F-1 shall operate when the high limit setpoint of the thermostat is reached. Whenever fan F-1 is energized, dampers MOD-1, MOD-2 and MOD-3, normally spring closed, shall power to the open position.
 - 2) Unit heaters EUH-1 and EUH-2 shall each be controlled by individual Type-1 pilot duty thermostats.

END OF SECTION

SECTION 15990

TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

A. Provide testing, adjustment, and balancing of air systems and measurement of final operating condition of the HVAC systems in accordance with the Contract Documents.

1. Testing, adjustment, and balancing of air systems.
2. Measurement of final operating condition of HVAC.

1.02. RELATED SECTIONS

- A. Section 15865 - AXIAL FANS
- B. Section 15910 - DUCTWORK ACCESSORIES

1.03. REFERENCES

AABC	National Standards for Total System Balance
ADC	Test Code for Grilles, Registers, and Diffusers
ASHRAE 111	Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems
NEBB	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
SMACNA	HVAC Systems Testing, Adjusting, and Balancing

1.04. SUBMITTALS

A. Provide in accordance with Sections 01305, Submittals; 01640, Equipment—General; and as supplemented herein. Submittals shall include, but not be limited to, the following:

1. Shop drawings.
- B. Submit name of adjusting and balancing agency for approval.
 - C. Field Reports - Submit under provisions of Section 01400, Quality Control.
 - D. Field Reports - Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
 - F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/County Engineer and for inclusion in operating and maintenance manuals.

- G. Provide reports in soft cover, letter size, three-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- H. Include detailed procedures, agenda, sample report forms prior to commencing system balance.
- I. Test Reports - Indicate data on one of the following:
 - 1. AABC National Standards for Total System Balance forms.
 - 2. Forms prepared following ASHRAE 111.
 - 3. NEBB forms.
- J. Air system schematic showing location of all manual balancing dampers and with all inlets and outlets shown with design and actual air flows.

1.05. PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01640, Equipment-General.

1.06. QUALIFICATIONS

- A. Agency - Company specializing in the testing, adjusting, and balancing of systems specified in this section with minimum five years' documented experience.
- B. Perform Work under supervision of one of the following:
 - 1. AABC Certified Test and Balance Engineer.
 - 2. NEBB Certified Testing, Balancing and Adjusting Supervisor.
 - 3. Registered professional engineer experienced in performance of this work and licensed in the State of Maryland.

1.07. SEQUENCING

- A. Sequence work under the provisions of Section 01010, Summary of Work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.

2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters and screens are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Air outlets are installed and connected.
 8. Duct system leakage is minimized.
 9. All necessary dampers are in place to allow balancing to take place.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

3.02. PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to County Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.03. INSTALLATION TOLERANCES

- A. Air Handling Systems - Adjust to within ± 5 percent of design for supply systems and ± 5 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets - Adjust total to within +10 percent and -5 percent of design to space. Adjust outlets and inlets in space to within ± 10 percent of design.

3.04. ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, speed dials (ECM motors) and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.05. AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. For fan systems using ECM motors, utilize speed controlling for air volume adjustment. Balancing dampers shall not be used for balancing main branch air flows.
- H. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- I. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- J. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- K. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- L. Where modulating dampers are provided, take measurements and balance at extreme conditions.

3.06. SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing
 - 1. Fans.
 - 2. Air inlets and outlets.
- B. Report Forms
 - 1. Title Page
 - a. Name of testing, adjusting, and balancing agency
 - b. Address of testing, adjusting, and balancing agency
 - c. Telephone number of testing, adjusting, and balancing agency

- d. Project name
 - e. Project location
 - f. Project Engineer
 - g. Project Contractor
 - h. Project altitude
 - i. Report date
2. Summary Comments
- a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
3. Instrument List
- a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
4. Electric Motors
- a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP
 - d. Phase, voltage, amperage; nameplate, actual, no load
 - e. RPM
 - f. Service factor

- g. Starter size, rating, heater elements
 - h. Sheave make/size/bore
 - i. ECM motor control type and location
5. Return Air/Outside Air Data
- a. Identification/location
 - b. Design air flow
 - c. Actual air flow
 - d. Design return air flow
 - e. Actual return air flow
 - f. Design outside air flow
 - g. Actual outside air flow
 - h. Return air temperature
 - i. Outside air temperature
 - j. Required mixed air temperature
 - k. Actual mixed air temperature
 - l. Design outside/return air ratio
 - m. Actual outside/return air ratio
6. Fan and Blower Data
- a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual
 - f. Total static pressure (total external), specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave make/size/bore
 - j. Number of belts/make/size

k. Fan RPM

END OF SECTION

SECTION 16055
ELECTRICAL WORK

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. General work description and requirements for electrical work included in this contract.
- B. Conductors and accessories.
- C. Grounding.
- D. Nameplates and labels.
- E. Equipment testing.

1.02. RELATED SECTIONS

- A. Section 01010 - SUMMARY OF WORK
- B. Section 01019 - CONTRACT CONSIDERATIONS
- C. Section 01026 - LUMP SUM ITEMS
- D. Section 01039 - COORDINATION
- E. Section 01300 - SUBMITTALS
- F. Section 01400 - QUALITY CONTROL
- G. Section 01500 - TEMPORARY FACILITIES
- H. Section 01600 - MATERIAL AND EQUIPMENT
- I. Section 01640 - EQUIPMENT-GENERAL
- J. Section 01660 - TESTING AND STARTUP
- K. Section 01700 - RECORD DOCUMENTS
- L. All other Division 16 sections

1.03. GENERAL REQUIREMENTS

- A. All work shall be subject to applicable sections of these specifications, not necessarily the aforementioned related sections.
- B. Examination of Premises
 - 1. Before submitting a proposal, the Contractor shall examine all drawings and specifications relating to work of all trades to determine scope and relation to other work.

2. Ascertain access to site, available storage, and delivery facilities.
3. Before commencing work, verify all governing dimensions and examine all adjacent work at site and/or buildings.

1.04. SCOPE OF WORK

- A. The principal items of electrical work include, but are not necessarily limited to, the following:
1. Demolish all existing electrical work at the Walden Woods and Jefferson Valley Pump Stations.
 2. Maintain existing alarms before, during, and after construction.
 3. Pump station are to remain operational. Coordinate sequence of construction and training with Contractor.
 4. Provide new electrical services, power distribution, and equipment as shown on the Contract Drawings and as called for in the specifications for complete, functional, and operating pump stations.
 5. Provide all system and equipment grounding in conformance with the requirements of these specifications and the NEC.
 6. Provide electrical labels, signs, and nameplates per this section.
 7. Install all electrical equipment, conduit, wire, conductor cable, connections, etc., required for complete and operating systems.
 8. Coordinate work with the work of others for timely completion of the work of this Contract.
 9. Repair, fill and/or patch surfaces of all building components including walls, floors, ceilings, and roofs damaged or left open or bare as a result of the electrical work.
 10. Have an Owner-approved inspecting agency inspect electrical installation. Submit a final certificate approving all work to the Engineer prior to final acceptance of the electrical work.
 11. See Section 01700, Record Documents, for additional requirements for record drawings, operation and maintenance manual, final testing and inspection, and guarantees and warranties.
 12. Provide all materials, equipment, and labor required for complete and operating electrical systems.

1.05. CODES AND STANDARDS

- A. Reference to various codes and standards are a minimum installation requirements standard. In case(s) of discrepancy between the Contract Documents and the NEC, the stricter requirement shall apply.
- B. All work, equipment, and materials furnished shall conform with the existing rules, requirements, and specifications of the Insurance Rating Organization having jurisdiction; the National Electrical Code (NEC); the National Electric Manufacturer's Association (NEMA); the Underwriters Laboratories (U.L.); and the respective utilities.

- C. All material and equipment shall bear the inspection labels of Underwriters Laboratories, unless otherwise allowed by the Engineer in writing and if the material and equipment is of the class inspected by said laboratories. All labeling shall be for the intended usage.
- D. The Contractor shall be held responsible for adherence to all rules, requirements, and specifications as set forth above. Any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the bid price. Ignorance of any rule, requirement, or specification shall not be allowed as an excuse for non-conformity. Acceptance by the Owner or Engineer does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

1.06. SUBMITTALS

- A. Submit shop drawings under provisions of Section 01300, Submittals.
- B. The Engineer's approval shall be obtained for all equipment and material for which shop drawings are required before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- C. Provide submittals for all starters, overloads, overcurrent devices, control panels and all other electrical equipment as listed in other sections.

1.07. RECORD DRAWINGS

- A. In addition to the requirements of Section 01700, Record Documents, regarding record drawings, prepare and submit two additional copies of the marked-up field record drawings, which shall include all addenda items and changes made during construction, to the Engineer prior to final acceptance. Additionally, submit record drawings consisting of the following three types of drawings:
 - 1. Elementary or Schematic Diagrams - All control schematics and elementary diagrams. Those constructed as shown on Contract Drawings need only be verified on the marked-up field set. For those that changed, submit preliminary diagrams before work on the final block diagrams is begun.
 - 2. Contractor's As-built Drawings - Provide one 24-inch by 36-inch copy of electrical as-built drawings of the Contract Drawings with all field notes and comments to illustrate actual construction conditions. As-built drawings shall include all addenda items issued during bidding and all other changes to the documents that occurred during construction. Drawing to be titled "Contractor's As-built Drawing, Prepared by: (name of Contactor), Date Issued: _____."
- B. Provide the final approved record drawings on 24-inch by 36-inch vellum.
- C. All drawings shall be produced using the computer aided drafting system, AutoCad 2010.

PART 2 MATERIALS AND EXECUTION

2.01. CONDUCTORS AND ACCESSORIES

- A. Conductors: Application - Material - Manufacturers
 - 1. Service - Entrance cable (in conduit or direct burial in earth).

- a. Application - For use from the point of connection to the utility to the service disconnect then to the power distribution means.
 - b. Description - Type USE.
 - 1) Conductor - Copper.
 - 2) Insulation Voltage Rating - 600 volts.
 - 3) Insulation Material - XLP (cross-linked polyethylene) or EP.
 - c. Manufacturers
 - 1) Okonite Company - Model 112-32-3.
 - 2) Manhattan - Model M8628.
2. Multi-Conductor Power and Control Cable
- a. Application - For use in place of building wire and cable when powering three-phase equipment or for consolidating the number of power and control cables between two locations.
 - b. Description - Multi-conductor, Type TC cable.
 - 1) Conductor - Stranded copper.
 - 2) Insulation Voltage Rating - 600 volts.
 - 3) Insulation Material - PVC with phase indicators for individual conductors and nylon or PVC for overall jacket.
 - c. Manufacturers
 - 1) Anixter - Model 3G
 - 2) Cablec - Model AP14321
3. Building Wire and Cable
- a. Application - For general use for all conductor applications unless specifically called out otherwise. Not for use as instrumentation cable or in manufactured control panels, service entrance cable, power distribution cable, and submersible cable.
 - b. Description - Single conductor insulated wire type as indicated below.
 - 1) Conductor - Stranded copper.
 - 2) Insulation Voltage Rating - 600 volts.
 - 3) Insulation Type - Type THW for feeder and branch circuits larger than 4 AWG; Type THHW/THWN for feeders and branch circuits 6 AWG and smaller.
 - 4) Insulation Material - PVC or thermoplastic with nylon overall jacket.

- c. Manufacturers
 - 1) Anixter - Model 6G
 - 2) Okonite - Model 116-67
4. Instrumentation Cable
- a. Application - For use where called for on Contract Drawings.
 - b. Description - Single or multi, twisted pair and twisted triad cable with overall shield.
 - 1) Conductor - Stranded copper, Size 16 AWG.
 - 2) Insulation Voltage Rating - 600 volts.
 - 3) Insulation Material - Color coded PVC for individual conductors and nylon or overall jacket.
 - 4) Shielding - Single pair or triad tinned copper braid. Multi-pair or triad 4 mil soft copper overall cover tape.
 - 5) Drain - Tinned copper wire.
 - c. Manufacturers
 - 1) Alpha - Model 5616B
 - 2) Okonite - Model 261
5. Bonding and Grounding Conductors
- a. Application - For use as needed to meet the requirements of this specification as shown on the Drawings and the NEC for bonding and grounding.
 - b. Description - Multi-conductor cable, Insulated conductor are twisted into pairs.
 - 1) Conductor - Bare copper wire.
 - 2) Stranding - Solid ASTM B-1 for Sizes No. 8 and smaller. Stranded ASTM B-8 for Sizes No. 6 and larger.
 - 3) Grounding system conductor from inside equipment to grounding rods or plates and under ductbanks shall be tin-plated rope lay type.
 - c. Manufacturers
 - 1) Anixter - Model 1A or 1B
 - 2) Cablec - Molded "bare and coated copper conductors" listed under Section 7, "Special Purpose Cables."
6. Control Panel Wire
- a. Application - For use in all manufactured control panels.

- b. Description - 90 degrees C Machine Tool Wire (MTW).
 - 1) Conductor - Minimum Size AWG #16, 19 strand.
 - 2) Insulation - PVC, 2/64-inch for 600 V service.
- c. Manufacturers
 - 1) Carol - Catalog Series 7600
 - 2) Anixter - Catalog Series 6W

B. Wire Terminations and Connectors

- 1. General
 - a. Connector material shall be compatible with the wire that it is to be used with.
 - b. Connectors made of aluminum shall not be used with copper conductors.
 - c. Connectors listed below are for use with copper wire. Connectors to be used with aluminum wire shall be of the same general type and construction as those listed below, but shall be suitable for use with aluminum conductors.
- 2. Terminal Block Manufacturers
 - a. Control Wiring
 - 1) Buchanan - Model 0241
 - 2) Connectron - Model NSS3
 - b. Equipment Power Wiring
 - 1) Buchanan - Model 416
 - 2) Connectron - Model NC3
- 3. Two-Way Splices
 - a. Description - Tubular compression type for conductors 1/0 and larger. Rated 600 VAC and uninsulated.
 - b. Manufacturer
 - 1) Burndy - Model YS-L "Hylink"
 - 2) Thomas & Betts - Model 545
 - 3) 3M Model 10000
- 4. Crimp Connectors
 - a. Description - For branch circuit connections, other than lighting and receptacle circuits.

- b. Manufacturer
 - 1) Ideal - Series 30; Model 410
 - 2) Thomas & Betts - Model PT66M
- 5. Bus or Lug Terminals, Manufacturer - 600 VAC, Crimp Type
 - a. Burndy - "HYLUG" Catalog, Series YA
 - b. Ideal - Catalog Series CCL and CC
- 6. Terminal Strip Connectors
 - a. Description - For control and instrumentation connections to terminal strips. Locking fork, vinyl self insulated, crimp type connectors or tubular clamp type.
 - b. Manufacturers
 - 1) Burndy - "VINYLUG" Types TP-LF and BA-EL.
 - 2) Thomas & Betts - Catalog Series 18RA, 14RB, and 10RC.
 - 3) Ideal - Series 83-7.
- 7. Wire Nuts
 - a. For Unclassified Areas - Hexagonal-shaped for use with a nut driver, compact swept-wings, ribbed cap, UL-listed for 600V with temperature rating of 105 degrees C (221 degrees F).
 - 1) Ideal - Models 341 and 342.
 - 2) 3M - Models 212, 312, and 512.
 - 3) Buchanan - Models B-1, B-2, and B-4.
 - b. For Wet, Corrosive, and Hazardous Areas - Compact swept-wings, ribbed cap, filled with non-hardening sealant, UL listed for 600V with temperature rating of 105 degrees C (221 degrees F).
 - 1) Ideal - Model DB Plus
 - 2) Buchanan - Model BTS2 and BTS4.
- 8. Bolted Wire Connectors - Mechanical connectors for all combination of copper and aluminum conductors. Connectors shall be of a compact high-strength design, tin-plated copper alloy, two-piece connector, and shall utilize two hex head bolts.
 - 1) Burndy - Model KVSU.

2.02. NAMEPLATES AND LABELS

A. Nameplates

- 1. Material - Rigid laminated plastic.
- 2. Lettering Height - 5/16-inch high.

3. Lettering Color - White.
4. Background Color - Black.

B. Labels

1. Self-debossing, aluminum foil type.
2. Typewritten or preprinted black legends on white background.
3. Permanent Pressure-Sensitive Adhesive - Provide high temperature adhesive for labels on heat producing devices.
4. Use preprinted sleeve type for conductors. Label at each termination or splice.
5. Manufacturers - Seton or equal.

C. Equipment and Control Identification

1. In addition to the requirements of the National Electrical Code, install an identification label which will clearly indicate information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), safety switches, separately enclosed circuit breakers, individual breakers and controllers in switchgear and motor control assemblies, control devices and other significant equipment.
2. Provide nameplates for all electrical equipment and controls.
3. Attach nameplates with stainless steel or other non-corrosive metallic rivets or screws.
4. Provide a nameplate at each remote switch or control device when the controlled function is not readily identifiable.
5. All wiring except major power conductors shall have each end of the conductor labeled. Label wires at each junction box.

PART 3 EXECUTION

3.01. CONDUCTOR INSTALLATION

A. Installation

1. Install products in accordance with manufacturers' instructions.
2. Do not pull thermoplastic wire at temperatures below 35 degrees F.
3. Protect exposed cable from damage.
4. Neatly train and lace wiring inside boxes, equipment, and panelboards.
5. Install electrical circuit loadings as designed on Contract Drawings unless approved otherwise by Engineer.
6. Where instrumentation cables are installed in panels, etc., the Contractor shall arrange wiring to provide maximum clearance between instrumentation cables and other

conductors. Instrumentation cables shall not be installed in the same bundle with conductors of other circuits.

7. Intrinsically safe conductors shall be in separate conduits both inside and outside enclosure and shall be terminated on terminal strips with barriers. Barriers are to physically isolate intrinsically safe conductors from non-intrinsically safe conductors.
8. Wiring Diagrams
 - a. Any wiring diagrams shown on plans for hookup of equipment furnished by others are approximate and are for bidding purposes only.
 - b. Obtain wiring diagrams, certified correct for the job, from respective supplier for all equipment and systems furnished by them.
 - c. Install all work in accordance with certified wiring diagrams.
9. Electrical trade to provide all power, control, and signal wiring and conduits between system components (including installation of any conductors supplied by other trades), including final connections to labeled terminal strips integral in equipment, as shown on Drawings, and in accordance with approved manufacturer's wiring diagrams.

B. Color Coding

1. Provide color coding for all service, feeder, branch, control, and signaling circuit conductors.
2. Grounded Conductor Color Coding in New Installations
 - a. Ground - Green
 - b. Neutrals - White*

*Exception - Where neutrals of more than one system are installed in the same raceway or box, each neutral shall be white with a different colored (not green) stripe.

3. In addition to existing facilities, ungrounded conductors in different voltage systems shall match the existing system and/or be as follows:
 - a. 120/208-volt, 3 phase: Phase A - Black
120/240* Phase B - Red
 Phase C - Blue
 - *For high ("wild" or red) leg delta system, the high leg shall be orange.
 - b. 277/480-volt, 3 phase: Phase A - Brown
 Phase B - Orange
 Phase C - Yellow
 - c. 120/208-volt, single phase: Red and black
 - d. DC Power - Positive Lead - Red.
 - Negative Lead - Black.
 - e. DC Control - All blue.

- f. 120-volt Control Wiring - Single conductor AC control wire shall be red, except a wire entering a motor control center compartment or control panel which is an interlock shall be color coded yellow.
- g. 24-volt Control Wiring - Orange.
- h. Neutral (Grounded Conductor) - White or gray.
- i. Grounding Conductor - Green.

C. Conductor Sizing

- 1. Conductor sizes that are shown for equipment branch circuits are the minimum sizes allowed. Refer to Schedule in paragraph 3.02.C.2.c. below for sizing conductors on circuits longer than the minimum length shown for the various voltages. Adjust conduit sizes accordingly.
- 2. Wiring shown without size to be sized by one of the following methods, whichever is larger. No additional payment will be made for oversized conduit or conductor.
 - a. Control Circuits - Minimum size No. 14 AWG. Quantity as required for proper operation, use 3/4-inch conduit, type as required for the area where conduit is installed.
 - b. Increase minimum size conductors for 20 ampere single phase circuits where distance between power source and item served exceeds noted length in accordance with the following table. No more than 2 percent voltage drop of all branch circuits at equipment's rated full load current is permitted.

120 VOLTS	60' to 100'	#10	100' to 150'	#8	150' up	#6
208/240 VOLTS	100' to 150'	#10	150' to 225'	#8	225' up	#6
265/277 VOLTS	125' to 200'	#10	200' to 300'	#8	300' up	#6
460/480 VOLTS	225' to 350'	#10	350' to 525'	#8	525' up	#6

- d. Minimum size of branch circuits over 20 amps per requirements of NEC Tables 310.16 thru 310.31.
- 3. Neutral Wire - To be equal to ungrounded wires unless otherwise shown.
- 4. Ground Wire - Minimum size as required by the NEC.

- D. Spare Conductors - Wherever groups of control and instrumentation conductors are required, provide the following minimum numbers of spare conductors. Terminate at terminal strips on both ends and mark as spare and indicate the location of opposite end.

CONDUCTORS	SPARES
Up to 10	2
11 to 18	4
19 and over	6

3.03. CONNECTORS AND TERMINATIONS

- A. Use manufacturer's standard lugs for connection of conductors to equipment panel or devices.

- B. Use UL approved wire nuts for lighting and receptacle circuits and for other circuits, compression connectors for connection of conductors to other conductors.
- C. Terminal Board Terminations - All interconnecting instrumentation wiring to terminal boards and strips to be made with insulated crimp type connectors (locking fork type). Stranded wire is not to be directly connected to terminals without the use of connectors unless the terminations are specifically made to accept bare stranded wire, i.e., tubular clamp type termination. No loose strands shall be permitted outside of the connector, whichever is utilized.
- D. Motor Connections
 - 1. Motors Less Than 1 HP - Use wire nut appropriate for the environment where the motor is located.
 - 2. Motors From 1 to 20 HP - Use branch circuit crimp-type connectors.
 - 3. Motors Above 20 HP - Use bolted wire connectors. Insulate the connector with insulating putty to at least 7/64 inch and tape the insulated connection with two layers half lapped of neoprene splicing tape.
- E. Splicing - Make splices in accessible locations and in junction boxes. No splices will be permitted in pulling fittings or MCC wiring spaces.

3.04. GROUNDING

- A. Maintain electrical integrity of conduit system throughout. Provide bonding jumpers at fittings as required; jumpers to be no longer than required. Provide separate ground wire for all non-metallic conduit systems and where grounding integrity is doubtful.
- B. Basic intent of grounding specification is that grounding conductor be completely separate from system neutral and that neutral only be connected to ground at the main service grounding point. Run equipment ground independently back to main service ground. Use separate insulated (green) grounding conductors for all grounding conductors. Where ground passes through panels and disconnects, braze ground lugs to panel or disconnect housings. Isolate neutral bus or lug from ground. Ground all conduits at each panel.
- C. Shielding to be continuous and grounded at one point only unless otherwise required by equipment manufacturer's recommendations.
- D. Install ground grid as shown on plans. Connect building structural steel, concrete pad rebar, major equipment, and enclosure frames to ground grid.

3.05. ELECTRICAL SUPPORTS, ANCHORS, AND FASTENERS

- A. General
 - 1. Do not drill or cut structural members.
 - 2. Obtain the Engineer's written approval of any drilling or cutting on the structure.
 - 3. Welding as a means of support is prohibited.
 - 4. Provide materials, sizes, and types of anchors, fasteners, and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products and designing system supports.

5. All fasteners shall be stainless steel.

B. Support of Boxes, Control Panels, Starters, Disconnects, and Other Similar Enclosures

1. Support boxes independent of raceway using fittings designed for the application.
2. The use of tie wires, section of conduit, section of pipe, scrap metal, etc., as supporting means is strictly prohibited.
3. When called for on drawings, install on plywood or aluminum mounting panels or stands. Plywood shall be pressure treated.
4. Enclosures not called to be mounted on plywood or aluminum panels or stands to be supported by 1/2-inch electrical channel.

C. Support of Raceways

1. General - Perform a thorough review of all shop drawings related to work. Determine how equipment, raceway, etc., are to be supported, mounted, or suspended, while providing:
 - a. Extra stainless steel bolts, inserts, pipe stands, brackets, or any other items required for proper support.
 - b. Supporting accessories where required, whether or not shown on the Drawings.
2. Support all raceways only with approved fittings. Do not hang supporting devices from any but structural members without approval of the Engineer. Deflection of any conduit shall not exceed 1/100th of span. Support all riser conduit at each floor. Rows shall not be used.
 - a. Raceway supports shall be spaced at intervals to meet NEC requirements. Provide supports at all bends and pull fittings.
3. Use grouted anchor on masonry for loads of 100 lbs or more. For loads less than 100 lbs, drilled inserts may be used. Use precast inserts on poured-in-place concrete. Use lag screws or through bolts on wood.
4. Install supports in a manner that does not interfere with or weaken the bolts when attaching to structural steel.
5. Provide standoffs for all conduit; mount conduit 1/4-inch off walls.
6. The use of wire is prohibited.
7. Provide rods, channels, angles or other structural shape to suspend conduit away from building structures.

3.06. EQUIPMENT TESTING (600 VOLTS AND BELOW)

- A. Operational - Perform operational test to determine that all components including controls, protective and switching devices and auxiliary associated equipment are in operable condition and can function as described and shown on relevant specifications, operating instructions and drawings. Provide a tabulation of all breaker trip settings.

- B. Final Operational Check - Provide a check of each item in each system to determine that it is set for proper operation. With the Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. If final corrections or adjustments are required, conduct additional test runs to make the final corrections or adjustments of systems refining and improving performances where possible. These additional test runs shall include noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices to permit observation of actual system performances and demonstrate that controls and items requiring service or maintenance are accessible. A final test run shall be conducted with both the Owner and Engineer present to demonstrate the complete system operation and to describe to the Owner the full functionality of each system.
- C. Test ground system with a ground resistivity meter. Ground is acceptable with a resistance to ground of 5 ohms or less. Test to be performed a minimum of 90 days after ground system installation. If test reading is larger than 5 ohms, add rods to the system until a read of less than 5 ohms is obtained. Provide written test data and a certification of the completed test.
- D. Cleaning and Lubrication - After final performance test run of each electrical system, clean system both externally and internally, comply with manufacturer's instructions for lubrication of both power and hand operated equipment, and remove excess lubrication. Touch up minor damage to factory-painted finishes and other painting specified as electrical work. Refinish work where damage is extensive.

END OF SECTION
SECTION 16497

TRANSFER SWITCHES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Automatic transfer switch.

1.02. RELATED SECTIONS

- A. Section 11310 - SUBMERSIBLE GRINDER PUMP STATIONS
- B. All Division 16 Electrical specifications

1.03. REFERENCES

- A. NFPA 70 - National Electrical Code
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems
- E. UL 1008 - Standard for Transfer Switch Equipment
- F. NFPA 110 - Emergency and Standby Power Systems

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Shop drawings shall be submitted for all materials furnished under this section.
- C. Furnish the shop drawing for the automatic transfer switch.
- D. The shop drawing shall include, as a minimum, the following equipment specification information. The information shall be highlighted and prove compliance with these specifications.
 - 1. Electrical Ratings - voltage, switch ampere rating, and short circuit ratings.
 - 2. Protective devices and ratings.
 - 3. Layout drawings.
 - 4. Performance functions.
- E. Manufacturer's Instruction - The Contractor shall furnish three copies of a composite instruction book covering this equipment. Each instruction book shall not necessarily be limited to, but shall include as a minimum, the following:

SECTION 16161

CONTROL PANELS AND ENCLOSURES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Terminal blocks.
- B. Accessories.

1.02. RELATED SECTIONS

- A. All Division 16 sections.

1.03. REFERENCES

NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 4	Terminal Blocks for Industrial Control Equipment and Systems
ANSI/NFPA 70	National Electrical Code
UL	Underwriters Laboratories, Inc.

1.04. SUBMITTALS

- A. Submit under provisions of Sections 01300, Submittals, and 16055, Electrical Work.
- B. Submit shop drawings for all control subpanels. The submitted information shall be detailed specification information proving compliance to these Specifications. Submittals shall include, but not be limited to, the following:
 - 1. Enclosure information including size and NEMA classification.
 - 2. Subpanel layout.
 - 3. Wiring diagrams and elementaries.
 - 4. Bill of materials.
 - 5. Internal components (Specification information, cut sheets).
 - 6. List of nameplate titles.
 - 7. Dimensions.
- C. Shop drawings shall be submitted for all materials used as enclosures.
- D. Submit equipment and material samples as requested by the Engineer.
- E. Manufacturer's Instructions - Indicate application conditions and limitations of use stipulated by product testing agency specified under Article 1.06. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.05. DEFINITIONS

- A. Power Wiring - Shall mean conductors, conduit, wireway and connections, and related electrical work to supply electrical power to equipment, including electrical power to supply point for equipment control systems.
- B. Control Wiring - Shall mean conductors, conduit, wireway, construction and related work to connect or interconnect relays, solenoids, contact devices, signal lights and audible signals, as well as any and all other electrical control devices indicated as related to the control functions.

1.06. REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01. ACCESSORIES

- A. Manufacturer - Cable Ties
 - 1. Thomas & Betts - Model Nylon TY-WRAPS.
- B. Manufacturer - Terminal Blocks
 - 1. Buchanan - Model 0241.
 - 2. Connectron - Model N553.
- C. Manufacturer - Wire Duct
 - 1. Stahlin Brothers - Model XT-Panel Channel.
 - 2. Panduit Corporation - Model Type E-Dark Grey.
- D. Manufacturer - Grounding Terminals
 - 1. Burndy - Model OA4C-AB.
- E. Provide one drawing pocket in the panel, minimum size 10 inches wide by 10 inches high by 1/2 inch deep, panel manufacturer's standard material and finish.
- F. Power Disconnect Switch - Built in to door of enclosures and MCC compartment with door interlock.

PART 3 EXECUTION

3.01. ELECTRICAL CONTROLS

- A. Shall be in accordance with Section 16900, Auxiliary Controls and Relays.

3.02. POWER CIRCUIT PROTECTIVE DEVICES

- A. Shall be in accordance with Section 16475, Overcurrent Protective Devices.

3.03. NAMEPLATES

- A. Provide nameplates on the exterior of each enclosure identifying the application or function of the enclosed equipment.

3.04. FINISH REPAIR

- A. Repair damage to the factory finish. Depending on the extent of damage to the factory-finish and/or the closeness of the color match of any field-applied paint, a complete repainting may be ordered by the Owner at his discretion.

3.05. CONTROLS AND ASSOCIATED CIRCUITRY

- A. Each control panel shall contain all applicable disconnects, including a single main power disconnect (unless specifically shown otherwise on the drawings); motor circuit disconnect - one for each motor; necessary control pushbuttons; timers; relays; door interlock switches; indicator lights; selector switches; alarms; instruments and associated circuitry to monitor and control the associated equipment.

3.06. CONTROL PANEL WIRING

- A. Wire Type - See Section 16055, Electrical Work.
- B. Wire Duct - Used for wiring between devices that are mounted on the back panel of control panels.
- C. Wire Bundling - Where it is not possible to run wire in wire duct, such as wire run from devices located in the back of a panel to devices mounted on the door of a panel, the wire is to be bundled. Wire lacing or twine is not acceptable.

Bundles are to be wrapped by a spiral plastic protective sheath. Secure bundles to the panel structure for a stable support with a spacing of no less than every 8 inches.

A wire bundle which must cross a hinge shall run along the hinge as far as possible or have a large loop in bundle and be secured at both ends so that the twisting is taken over the longest length of hinge possible. Wire shall not be split off from the bundle along this length.

- D. Wiring and Termination Methods - Interior wiring to be point-to-point with no splices. All wiring from and to the control panel to be through terminals located in the panel. Solderless insulated crimp-type locking fork lugs shall be used for terminations to screw-type terminals. Where screw-type terminals are not used, terminals shall be of the tubular clamp type. Install lugs such that no uninsulated wire is visible at the wire entry point, and wire strands are visible but not protruding from the screw connections end. Use solderless connectors or tubular clamp connectors for all connections to terminals and equipment.
- E. Shielded Wire - Separate from other wires and equipment with suitable barriers and with terminal blocks for continuous shield grounding to the connecting cables.
- F. Separate intrinsically safe wiring from all other wiring with barriers.
- G. Furnish sub-panels factory-wired and tested with all equipment and appurtenances mounted thereon.

- H. Wire Labeling - Mark wires at both ends with numbers from Engineer-approved elementaries per Section 16055, Electrical Work. Color coding per Section 16055.
- I. Panel Wiring - All panel wiring shall be installed by the panel manufacturer.
- J. Lamp Test Switch – For panels with more than five indicating lights. Provide a single lamp test switch in lieu of push-to-test type indicating light.

3.07. TERMINAL BLOCKS

- A. Arrange terminals in alphabetic and numeric order in columns on removable subplates. Locate columns at least 4 inches from any edge of the subplate and space 6 inches on centers and at least 2 inches from a wiring duct.
- B. Provide marked terminals with wire number from Engineer-approved elementaries. Locate terminals with the same wire number adjacent to each other and jumpered.
- C. Make a maximum of two connections to each side of a terminal, including jumpers.
- D. Provide an additional 20 percent spare terminals with the following as minimum requirements:
 - 1. Power Terminals - Two spares.
 - 2. Control Terminals - Ten spares.
- E. At least one position on a terminal block must be reserved for termination of each incoming wire. Locate all such positions on the same side of the column of terminals. A wiring duct to feed the terminals must be sized to include wires for these positions.
- F. Connect all ground terminals of power receptacles solidly to the frame of the MCC. Provide the panel with one grounding terminal in the control panel. Mount grounding terminals to the frame of the panel or rack.

3.08. WIRING DUCT

- A. Size wiring duct at 60 percent fill according to the maximum number of wires at any cross section, including field wiring terminations and spares. Wiring duct must be plastic.

3.09. EQUIPMENT HOUSING TYPES

- A. Exterior Locations - NEMA 4 epoxy coated.
- B. Interior Wet Locations - NEMA 4 epoxy coated.
- C. Corrosive Areas - NEMA 4X stainless steel.
- D. Hazardous Areas - NEMA 7.
- E. All Other Areas - NEMA 12.

END OF SECTION

SECTION 16421

UTILITY SERVICE ENTRANCE

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Modified electrical service entrances for three pumping stations.
- B. Motor starters.

1.02. RELATED SECTIONS

- A. Section 02222 - EXCAVATING
- B. Section 02223 - BACKFILLING
- C. Section 02225 - TRENCHING
- D. All Division 16 specifications

1.03. REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. New York State Electric & Gas - Requirements for the installation of electric services and meters.
- C. Con Edison Electrical Service Installation Specifications.

1.04. SYSTEM DESCRIPTION

Station	Utility	Existing Meter No.	New Service Characteristics
Walden Woods	NYSEG	50 610 962 VM66A	208/120 wye, 3 phase, 4 wire, 200 amp
Jefferson Valley	NYSEG	07 351 715 KZG007351715	480/277 wye, 3 phase, 4 wire, 400 amp

1.05. QUALITY ASSURANCE

- A. Perform work in accordance with utility companies' requirements.
- B. Maintain one copy of each utility company's and inspection agency documents on site.

1.06. REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to requirements of the utilities.

1.07. UTILITY COORDINATION

- A. Coordinate with the utilities and arrange for a pre-installation conference to convene one week prior to commencing work of this section, under provisions of Section 01039, Coordination. Conference shall be at the site of the work and include the Owner and Engineer.
- B. The Engineer has made initial contact with the utility on behalf of the Owner regarding service(s) at the Jefferson Valley Pump Station. NYSEG's upgrade/relocation number for this station is 10300209428. Contact has not been made for Walden Woods.
- C. The Contractor is responsible for completing any applications including all required application or inspection fees relative to permanent equipment, cable or devices.
- D. Coordinate with the electric utilities for connection of electrical service. Abide by utilities' requirements.

1.08. FIELD MEASUREMENTS

- A. Verify field measurements.

1.09. EXISTING SYSTEM

- A. The Contractor shall schedule and coordinate his work so that at no time shall service to the existing equipment be interrupted, except when specifically approved by the Owner.
- B. During switchover of the electrical service, including primary and secondary feeders, transformer and service entrance/main distribution equipment as required, the Contractor shall furnish and have on site a standby generator sized to accommodate pump station equipment. Unit shall be connected into the existing non-emergency powered electrical distribution system via a manually operated transfer switch. This unit and the existing emergency generator shall be operated continuously by the Contractor's staff during the electrical service switchover. All costs of operating these systems shall be the Contractor's responsibility.

PART 2 PRODUCTS

2.01. UTILITY METERS

- A. Coordinate with utility companies and provide required metering equipment.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify conditions under provisions of Section 01039, Coordination.
- B. Verify that service equipment is ready to be connected and energized.
- C. Provide inspection certificates.

3.02. PREPARATION

- A. Make arrangements with utility companies to obtain permanent electric service to the project.
- B. Coordinate location of utility companies' facilities to ensure proper access is available.

3.03. UTILITY METERING ACCOMMODATIONS

- A. Install all test devices furnished by the utility.
- B. Provide grounding, connections and miscellaneous materials required.

END OF SECTION

SECTION 16475

OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Circuit breakers below 600 volts.
- B. Fuses below 600 volts.

1.02. RELATED SECTIONS

- A. All Division 16 sections

1.03. REFERENCES

NECA (National Electrical Contractors Association) "Standard of Installation"	
NEMA AB 1	Molded Case Circuit Breakers
NFPA 70	National Electrical Code
NEMA FU 1	Low Voltage Cartridge Fuses

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Product Data - Provide catalog sheets showing ratings, trip units, time current curves, dimensions, and enclosure details.
- C. Manufacturer's Installation Instructions - Indicate application conditions and limitations of use stipulated by product testing agency specified under Article 1.05. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- D. Samples as requested by the Engineer.

1.05. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Circuit Breakers - Conform to requirements of NEMA AB-1 and UL 489.
- C. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Circuit Breakers
 - 1. Square D
 - 2. Cutler Hammer

3. General Electric

4. Siemens

B. Main Fuses, Unless Otherwise Noted

1. Bussman

2. Gould-Shawmut

C. Motor and Device Fuses, Unless Otherwise Noted

1. Bussman

2. Gould-Shawmut

2.02. GENERAL REQUIREMENTS

A. Circuit breakers shall be of the molded case type.

B. Shall consist of the number of poles, ampere rating and interrupting rating as shown or specified.

C. Molded case circuit breakers shall have overcenter toggle type mechanism, providing quick-make, quick-break action. Mechanism shall be mechanically trip-free from the handle so the contacts cannot be held closed against short circuit currents.

D. Multiple pole breakers shall be common trip type.

E. ON and OFF positions shall be clearly marked and color coded.

F. All breakers in panels for switching duty shall be "SWD" or "T" rated, for switching duty.

G. Breakers 250 ampere frame and larger shall have interchangeable trip.

H. All main service entrance breakers with frame sizes rated at 800 amperes or more shall have integral ground fault protection.

I. All main service breakers shall have 100 percent ampere rating and shall be service entrance rated.

J. Breakers over 100 ampere frame size shall have front adjustable magnetic trip elements to provide instantaneous tripping over a range of 400 to 1000 percent of the continuous ampere trip rating.

K. All breakers shall be of the bolt-on type.

L. Dimensions and Performance - NEMA FU 1, Class as specified or indicated.

M. Voltage - Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

2.03. CONTACTS

A. Contacts shall be non-welding under rated operating conditions.

B. Silver-to-silver type.

- C. Provide with suitable arc interrupting devices.

2.04. TERMINATIONS

- A. Circuit breakers shall have lugs that accommodate wire sizes shown on the Contract Drawings, including additional lugs where shown or required.
- B. Lugs shall be UL listed for copper conductors only.
- C. Breakers shall be UL listed for mechanical-type lugs.

2.05. GROUND FAULT PROTECTION

- A. 800-ampere frame circuit breakers or larger
 - 1. Integral with circuit breaker.
 - 2. Adjustable Ground Fault Pickup - .2, .3, .4, .5, .75 times sensor rating 800-ampere frame sizes and larger.
 - 3. Ground Fault Delay - 5 bands.
 - 4. Ground fault test button and indicator shall be provided on breaker. Provides UL listed method for field testing ground fault protection system.
 - 5. Neutral current transformer shall be available for four wire circuits.
- B. 100-ampere frame circuit breakers or less.
 - 1. Integral with circuit breaker.
 - 2. Push to test.
 - 3. Reset feature.
 - 4. Trip indication.
 - 5. 0.8-second maximum pickup time.

2.06. RATINGS

- A. All circuit breakers shall meet or exceed the following unless otherwise noted on the Contract Drawings or Specifications.

Frame Size Maximum Constant Current-Amps	NEMA* Interrupting Capacity Symmetrical-Amps	Poles	Maximum Voltage Rating
100	10,000 @ 120 volts	1	120
100	10,000 @ 240 volts	2,3	240
100	18,000 @ 480/277 volts	1	480
100	18,000	2,3	600
250 Branch	25,000	2,3	600
250 Main	35,000	2,3	600
400 Branch	30,000	2,3	600
400 Main	35,000	2,3	600
1000 Branch	30,000	2,3	600
1000 Main	65,000	2,3	600

Frame Size Maximum Constant Current-Amps	NEMA* Interrupting Capacity Symmetrical-Amps	Poles	Maximum Voltage Rating
1200	100,000	2,3	600
2000	100,000	2,3	600

*Interrupt ratings are at 480 volts unless noted otherwise.

2.07. BREAKER TRIP CHARACTERISTICS

All breakers shall be Type A thermal magnetic type unless noted otherwise on the Contract Drawings or specified.

A. Thermal Magnetic Type (Type A)

1. Long time, nonadjustable, thermal overload, trip.
2. Instantaneous, electromagnetic trip.
3. Ambient compensating.
4. "Push-to-trip" test button.

PART 3 EXECUTION

3.01. GENERAL

- A. Circuit breaker trip ratings and fuse sizings shown on the Contract Drawings are maximum for the specific application.
- B. Breakers shall be removable from the front of the panel or board without disturbing adjacent units.
- C. All breakers and fuses shall be suitably mounted in an enclosure in accordance with Section 16161, Control Panels and Enclosures.

3.02. HANDLE OPERATORS

- A. All enclosures for individually-mounted circuit breakers or fuses shall have enclosure-mounted handle operators, operating through approximately 180-degree arc. Flush mounted circular rotating handle operators are unacceptable.

3.03. IDENTIFICATION

- A. Circuit breakers shall be provided with uniformly designed nameplates to clearly indicate the type, rating, listing/recognition/certification marks, and other information as defined in UL 489 in accordance with Section 16055, Electrical Work.

3.04. TERMINALS

- A. All terminals shall comply with UL 486A and B and CSA 1165 Standards. Torque markings shall be provided and followed per UL 489.

- B. Terminals shall be amply sized, including adapters or special lugs to connect the conductor(s) as shown, specified or required.

3.05. RATINGS - FUSES

- A. Motor and device fuses shall be sized as per the manufacturer's requirements in accordance with the NEC.

3.06. ADJUSTING

- A. Adjust work under provisions of Section 01700, Record Documents.
- B. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit.
- C. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

END OF SECTION

SECTION 16480

VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01. DESCRIPTION

- A. This Section covers the requirements for variable frequency drives (VFDs).
- B. Provide the hereinafter specified equipment as part of the systems called for in the Specifications and the Contract Drawings.

1.02. RELATED SECTIONS

- A. All Division 16 Specifications.

1.03. REFERENCES

- A. The latest revisions of the following standards and specifications are incorporated herein by reference and form a part of this specification to the extent that sections or portions of section are applicable hereto.
 - 1. National Electric Code (NEC)
 - 2. Underwriter's Laboratories, Inc. (U.L.) - U.L. 508.
 - 3. National Electrical Manufacturers Association (NEMA)
 - a. NEMA - 1C - 1
 - b. NEMA ICS 3.1
 - c. NEMA 250
 - 4. American National Standards Institute (ANSI)
 - 5. Standards for Industrial Control (J.I.C.)
 - 6. Institute for Electronic and Electrical Engineering (IEEE) - IEEE 519.

1.04. SYSTEM DESCRIPTION

A. Performance Requirements

- 1. The VFD manufacturer shall provide performance affidavits for each standard drive or configured drive package when provided as such directly from the manufacturer.

The VFD supplier shall provide performance affidavits for each drive or system of drives when the manufacturer's standard drive is provided as part of a control system, fabricated by the VFD supplier, systems integrator, or panel shop; and when components external to the manufacturer's VFD are required for proper operation as described in these specifications.

Performance affidavits shall be provided in accordance with Section 01640, Equipment-General.

B. Harmonic Filters

1. The VFD supplier shall provide harmonic filters (either integral to the VFD or at the location from which the drive is powered) for each drive which shall reduce harmonic distortion below levels specified in IEEE STD. 519.
2. The VFD supplier shall submit design calculations with the VFD shop drawing submittal proving compliance with IEEE STD. 519. Electrical Contractor shall obtain electrical utility service and transformer data required for harmonic analysis.
3. The Electrical Contractor shall coordinate (with the Engineer, Owner, and General Contractor) the location and installation of harmonic filters external to supplied VFDs, should they be required as determined by the VFD supplier and the electrical utility. The Electrical Contractor shall provide all interconnecting conduit and wiring between VFDs and these external harmonic filters.

1.05. SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300, Submittals.
- B. Submit performance affidavit per Section 01640, Equipment-General.
- C. Submit harmonic analysis (calculations) and electrical utility approval of proposed VFD installation.
- D. Submit written description of sequence of operation for each set of VFDs.
- E. Submit dimensional data for each VFD. Include as a minimum: height, width, depth, distance from bottom of enclosure to center line of disconnect handle, conduit openings, size and location of cooling vents.
- F. Submit drawings showing interior enclosure layout and MCC door layout.
- G. Submit elementary diagrams and block diagrams for each VFD system. Indicate how/where remote equipment is wired to each VFD system.
- H. Submit manufacturer's literature containing information needed to prove conformance with these specifications.

1.06. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum three years' experience.
- B. The VFD supplier shall have service facilities within 300 miles of the site.
- C. The same supplier shall provide the VFDs and wet well level controls.

1.07. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle equipment to site under provisions of Section 01600, Materials and Equipment.
- B. Deliver in 36-inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.

- C. Store in a clean dry space. Maintain factory wrapping or provide a heavy canvas or heavy plastic to protect units from dirt, water, debris, and traffic. The Electrical Contractor shall replace any equipment damaged during shipping, handling, or storage.

1.08. SPARE PARTS

- A. The following spare parts shall be furnished for each size VFD provided.

Either:

1. Two of each type of control fuse used.
2. One spare of each type of PC card.
3. One complete power semiconductor assembly for each supplied.
4. All other spare parts normally recommended.

1.09. WARRANTY

- A. The VFD and all equipment provided by the VFD supplier shall be provided with a two-year warranty. The warranty period shall begin upon delivery to the site. The warranty shall cover all parts and labor necessary to repair equipment which is inoperable due to defects in material or workmanship.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Whenever possible, all VFDs provided shall be by the same manufacturer.
 1. Allen Bradley - 1336 (PLUS) Series
 2. A.C. Tech - QC3000 Series
 3. General Electric - AF300 Series
 4. Square 'D' - Altivar 66 Series
 5. ABB - ACS Series
- B. All materials and equipment furnished shall be current products of manufacturers regularly engaged in the manufacturer of VFD and for which replacement parts are available.

2.02. PULSE-WIDTH MODULATED VARIABLE FREQUENCY DRIVE

- A. General
 1. The Electrical Contractor shall furnish and install the complete VFD system(s) described in this specification and as shown on the Contract Drawings.
 2. Drives shall be microprocessor controlled with digital display and programming/status keypad.

3. The VFDs shall be rated for the full horsepower and full load amperes and rpm of the equipment as indicated. Motor service factors shall be minimum 1.0, unless otherwise specified in respective equipment Sections. VFDs shall be specifically designed to provide continuous speed adjustment of three phase, inverted duty, NEMA design 'B' squirrel cage motors.

The VFD applications shall be for the systems listed in Table 16480-1 at the end of this section.

4. Complete configured VFD system shall be U.L. listed per U.L. 508.
5. Minimum efficiency shall be 95 percent at motor full load. Unit service factor shall be minimum 1.0.

B. Construction

1. The VFDs shall be provided on a sub-panel suitable for installation in a new MCC. Provide replaceable, cleanable filters in enclosure cooling fan/vent openings. Each VFD sub-panel shall also house other components, such as control power transformers, relays, circuit breakers, by-pass contactors, thermal overloads, and other devices when such are necessary to achieve conformance to the specified system.
2. An input circuit breaker shall be supplied for the VFD. The circuit breaker shall operate with the handle on the MCC enclosure door. Interlocking provisions shall prevent unauthorized opening of the enclosure door while the handle is in the "on" position. A defeater shall be provided. When a bypass contactor is used, provide separate disconnecting means for both the VFD and the bypass contactors.
3. The VFD shall be capable of converting 480 volt, 3 phase, 60 Hertz power to a fixed potential DC bus level. The DC voltage shall be inverted to an adjustable frequency pulse width modulated (PWM) sine coded output waveform. The drive shall utilize solid state full wave diodes and IGBT power transistors.
4. The VFD shall be insensitive to the phase rotation of the AC line and shall not cause displacement power factor of less than 0.95 lagging under any speed or load condition.
5. The VFD shall have the following ratings:
 - a. Minimum efficiency of 95 percent at rated load.
 - b. Overload Rating
 - 1) Constant Torque - 150 percent rated current for 1 minute.
 - 2) Variable Torque - 110 percent rated current for 1 minute.
 - c. Ambient operating temperature of 0 degrees C to 40 degrees C continuously, without derating.
 - d. Operating humidity of 5 to 90 percent, non-condensing.
6. The following basic control features shall be provided standard on each VFD:
 - a. Manual-Off-Auto Switch - When this switch is in the "Manual" position, the VFD shall start and stop using pushbuttons located on the VFD enclosure. When this switch is in the "Off" position, the VFD shall be off. When this switch is in the

“Auto” position, the VFD shall start and stop via remote contacts. VFDs shall be capable of both 3 and 4 wire control for remote starting and stopping.

- b. Local-Remote Switch - When this switch is in the “Local” position, the speed of the VFD shall be controlled by a potentiometer on the VFD. When this switch is in the “Remote” position, the speed of the VFD shall be capable of being controlled by either a remote potentiometer or remote 4-20mA signal.
- c. Unidirectional operation, programmable acceleration and deceleration, restart into spinning loads. Implementation of the programmable acceleration and deceleration ramping shall be achieved without the programming of devices external to the VFD. The supplier shall provide acceleration and deceleration ramp programming as requested during system startup.
- d. Full time torque limit, adjustable. Reduces speed to shed load when over current conditions exists.
- e. Programmable torque performance from 4 to 60 Hz. Electrical Contractor shall coordinate with manufacturer of each motor controlled by a VFD. Program minimum VFD speed per motor manufacturer’s recommendations to avoid overheating the motor.
- f. Integral or remote AC power line reactors or isolation transformers. See paragraph 1.04.B.
- g. Frequency stability of 0.5 percent for 24 hours with voltage regulation of ±2 percent of maximum rated output voltage.
- h. Status indication for the following:
 - 1) Power On
 - 2) Run
 - 3) Motor Direction
 - 4) Over Current
 - 5) Over Temperature
 - 6) High and Low Phase Loss
 - 7) Current Limit
 - 8) Ground Fault
- i. Control power transformer (CPT) for 120 volt AC power for operator devices.
- j. Motor slip dependent speed regulation.
- k. Minimum one cycle logic power carry-over during loss of power.
- l. Programmable automatic restart upon the return of power following a power outage.
- m. Automatic restart after fault, minimum three attempts and shutdown with manual reset.
- n. Critical frequency rejection or lockout.
- o. Programmable preset speeds, minimum of three.

- p. Local speed potentiometer and speed indication, configurable in either rpm, percent of full speed, or hertz.
 - q. Fault log for minimum of last three faults.
 - r. Isolated process instrument follower input signal of 4-20mA DC, grounded or ungrounded.
 - s. 4-20mA DC output proportional to 0 to 100 percent speed.
 - t. Provide auxiliary run output contacts for remote run indication. Run output contacts shall be wired to an interposing relay. The interposing relay shall be provided with a minimum of two normally open and two normally closed contacts, rated for 10 amps at 120 volts.
 - u. All wiring connections to the VFD shall be made on labeled terminal strips in accordance with Section 16161.
 - v. Common local and remote start/stop contacts, and protective automatic shut down contacts/switches shall be used by the control circuits of both the VFD and the bypass contactor.
 - w. Bypass contactors shall be on the same sub-panel as the VFD.
7. The following protective features shall be provided standard on each VFD:
- a. AC input line current limiting fuses for short circuit fault protection of AC to DC converter sections.
 - b. Electronic over current trip for instantaneous or timed overload protection
 - c. Undervoltage and phase loss protection.
 - d. Overfrequency protection.
 - e. Overtemperature protection.
 - f. Surge protection from AC line transients.
 - g. Electrical isolation between power and logic circuits.
 - h. Ground fault protection.
 - i. VFD enable terminals. Normally closed, field-mounted protective devices, (such as auxiliary contacts on disconnect switches, emergency stop pushbuttons, high discharge pressure switch, low suction pressure switch, high motor temperature switches - see Contract Drawings and system specifications) shall be wired in series across the enable terminals.
 - j. Provide a minimum of three sets of programmable output contacts for remote alarm indication. Programmable VFD output contacts shall be wired to interposing relays. The interposing relays shall be provided with a minimum of two normally open and two normally closed contacts, rated for 10 amps at 120 volts.
 - k. LCD or LED diagnostic display.

- i. Password protection for VFD programming.
8. The following VFD operating parameters shall be capable of being independently adjusted on the VFD:
 - a. Minimum Speed - 4 to 40 hertz (see paragraph 2.02.B.6.e.).
 - b. Maximum Speed - 40 to 90 Hertz.
 - c. Acceleration Time - 2 to 300 seconds.
 - d. Deceleration Time - 2 to 300 seconds.
 - e. Low Frequency Boost - Up to 46 volts.
 - f. Volts per hertz.
 - g. Current limits up to 110 percent for variable torque VFDs, up to 150 percent for constant torque VFDs.
 - h. Starting torque up to 150 percent.
 - i. Programmable Constant Torque - Variable torque switching. Drives which require physical modifications to accomplish this are not acceptable.
9. The following, manufacturer installed options shall be furnished with the VFDs as specified:
 - a. AC output contactors.
 - b. Motor overcurrent relay on VFD and on bypass contactors.
 - c. Bypass contactors when specified.

2.03. SYSTEM-SPECIFIC CONTROLS AND ALARMS

- A. General - Field-mounted equipment (remote from the VFD sub-panel) such as start/stop pushbuttons, potentiometers, auxiliary contacts on disconnect switches, etc.

PART 3 EXECUTION

3.01. GENERAL

- A. Supply the VFD(s) with the controls specified herein and shown on the Contract Drawings.
- B. The VFD manufacturer or supplier shall furnish the services of a qualified representative to check and supervise the installation and the preliminary testing for not less than one day, to supervise final testing for not less than one day, and to instruct the owner's operator(s) in proper operation at the time of final acceptance for not less than one day. The representative shall also provide an additional one day of training during the warrant period at a date requested by the Owner. A day is defined as eight hours. All days are actual on-site time. Travel and subsistence is the responsibility of the manufacturer's/ supplier's representative.

- C. The Owner's training shall be videotaped (VHS - long play) with a copy left for the Owner. A full complete session may be made for one system that is typical for all systems. Any specifics which may vary for individual systems shall be covered separately on the video.
- D. Three copies of a complete operations and maintenance manual shall be submitted to the Engineer per Section 01640.
- E. Field wiring shall be per manufacturers' recommendations.

3.02. FIELD TESTING

- A. Field testing shall be in accordance with Section 01640 and as specified herein.
- B. The Contractor shall coordinate VFD testing such that both the Owner and the Engineer are available to witness the testing. The Contractor shall contact both the Engineer and the Owner two weeks prior to the proposed test date. The representative of the equipment run by the VFD (pumps, fans) shall be present during VFD testing.
- C. Shop drawing shall be available during testing.
- D. A copy of the operations and maintenance manual shall be available during testing.
- E. The Contractor shall verify that all systems have been electrically connected and that equipment is ready for operation.
- F. Testing/Verification/Documentation
 - 1. General explanation of each system shall be made.
 - 2. Contractor/manufacturer/supplier shall have a written tabulation of all adjustable/settable parameters as set from the factory. In a separate column, all of the actual field adjusted/set values shall be shown.
 - 3. Demonstrate the following and show how each is set/changed.
 - a. Manual operation both local/remote.
 - b. Minimum or default speed to be set for specific equipment operation.
 - c. Maximum set speed.
 - d. Adjust acceleration/deceleration times for proper equipment operation.
 - e. Restart after power outage.
 - f. Demonstrate starting into rotating motor (shut off circuit breaker and turn right back on).
 - g. Overcurrent/overvoltage (simulate with test equipment).
 - h. Overtemperature/low voltage (simulate with test equipment).
 - i. Phase Loss - Remove on fuse on supply voltage.

- j. Auto operation (from input current or voltage signal).
 - k. Output contacts for alarm/run/status, etc., operate as required, simulate with test lights.
 - l. Units with bypass contactors shall be operated in “bypass mode” demonstrating operation including shutdowns from remote devices.
- G. Unit(s) shall operate without unusual or undue noises or vibrations.

TABLE 16480-1

VARIABLE FREQUENCY DRIVE APPLICATIONS

Units	HP (Each)	FLA (Each)	Type ⁽¹⁾	NEMA Enclosure	Bypass	Input Voltage
Jefferson Valley Pumps 1, 2, and 3	50	65	1	Provide pre-wired on sub-panel for installation in a new MCC compartment. Consolidate with Electrical Contractor.	Yes	480 V, 3 phase

- (1) Type Drive:
- 1 Variable torque centrifugal pumping application.
 - 2 Variable torque drive and conveyor application.
 - 3 Variable torque air fan application.
 - 4 Constant torque air pumping application.
 - 5 Constant torque pumping application.
 - 6 Constant torque drive application.
- (2) VFDs shall be provided by the General Contractor, pre-wired on sub-panels for installation in a new MCC. The General Contractor shall also provide wet well level controls on a sub-panel to be installed in a new MC. The Electrical Contractor shall provide stub-out to MCC bus and power wiring to like side of VFD and bypass circuit breakers. Electrical Contractor to provide wiring from MCC to field devices and equipment. The pump supplier/wet well control supplier shall provide interconnection control wiring between wet well controls and VFDs in the MCC.
- (3) See Section 11320, Dry Pit Submersible Horizontal Centrifugal Pumps, for pump information.

END OF SECTION

SECTION 16484

CONTACTORS AND MOTOR STARTING EQUIPMENT

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Manual motor starters.
- B. Motor starters.

1.02. RELATED SECTIONS

- A. All Division 16 specifications

1.03. REFERENCES

- A. UL listing is required for all factory fabricated assemblies. Individual component listing is also required.
- B. Size equipment per NEMA and UL standards to match motor or equipment controlled.
- C. The following specifications and standards, except as hereinafter modified, are incorporated herein by reference and form a part of this specification to the extent indicated by the references thereto. The issue in effect at time of construction shall be applicable. In text, such specifications and standards are referred to by basic designation only.
 - 1. National Electric Code (NEC).
 - 2. Underwriters Laboratories, Inc. (UL) - UL 508.
 - 3. National Electrical Manufacturers Association (NEMA)
 - a. NEMA 1C 1
 - b. NEMA AB-1 - Molded Case Circuit Breakers
 - 4. American National Standards Institute (ANSI).
 - 5. J.I.C. Standards for Industrial Control.

1.04. SUBMITTALS

- A. Submittals shall be made in accordance with Sections 01300, Submittals, and 16055, Electrical Work.
- B. Shop drawings shall be submitted for all starters and contactors. The submittal shall contain all the information needed to prove conformance with these specifications.
- C. Submit elementaries and block diagrams for systems of relays and/or contactors.
- D. Samples shall be submitted as may be requested by the Engineer.

1.05. QUALITY ASSURANCE

- A. Perform work in accordance with NECA Standard of Installation.

1.06. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum three years' experience.

1.07. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.01. GENERAL

- A. All equipment furnished shall be of one approved manufacturer where possible. Manufacturers are General Electric Company, Square D Company, Cutler-Hammer, or equal.
- B. For control panels with motors less than 1/2 HP, starters may be IEC rated motor protective switches. All other starters shall be NEMA rated starters.
- C. Construction
 - 1. Parts easily removable when subject to wear, arcing damage, or electrical failure.
 - 2. Enclosures - Cold rolled, formed seam welded steel or cast aluminum with suitable legend plates and NEMA enclosures as per Section 16161, Control Panels and Enclosures.
 - 3. Overload Protection
 - a. Magnetic Starters
 - 1) Melting Alloy or Bi metal - For all motors including those with internal protection, of proper size to match the controller. One sensing device per ungrounded motor lead. Exception: Windings used only during motor starting and automatically disconnected when the motor is running may be unprotected. Units shall be "standard," "slow," or "fast" response as required for the type motor and load per the suppliers' recommendations. Size heaters per manufacturer's table supplied with the starter for the actual motor full load current and enclosure indicated on the motor nameplates. Temperature compensating motor starter overloads where or when required.
 - 2) Solid State - Overload relay, self powered, current sensing, phase unbalance and phase loss protection, NC standard trip contacts, visible trip indication, trip test function, power LED. Provide auxiliary NO contact (convertible to NC). Adjust solid state overload settings to match motor manufacturers nameplate motor data.

Manufacturers - Square D, Allen Bradley, or equal.

- b. Manual Starters - Thermal overloads in each phase leg or one for each motor winding. Use Type A for fractional horsepower and Type B for integral horsepower applications.
4. Auxiliary Contacts - Rated as required by interlocking and/or automatic control systems as indicated in these Specifications and/or on the Contract Drawings. Minimum 2 NO and 2 NC auxiliary contacts required.

2.02. MANUAL STARTERS

A. General

1. Contact Mechanism Quick make, quick break toggle action.
2. Contactors - Silver alloy.
3. Enclosures - Adequately sized to contain the starter and all accessories and/or modification. NEMA classification to meet requirements of Section 16161, Control Panels and Enclosures.

B. Fractional HP Type

1. Two pole (unless shown or specified otherwise).
2. Toggle operated (unless shown or specified otherwise).
3. Full voltage.
4. Shall be non-reversing, reversing, or two-speed as shown or specified.
5. Thermal overload device for each phase or motor winding.
6. Lock-off provisions and neon pilot light.
7. Selector switch as required, labeled for function performed.
8. General Electric; Square D; Cutler-Hammer; or equal.

C. Integral HP Type

1. Two- or three-pole polyphase.
2. Thermal overload device for each phase.
3. Full voltage, non-reversing, reversing, or two-speed as shown or specified.
4. Pushbutton operated with handle guard and lock-off.
5. Neon pilot light(s).
6. Auxiliary contacts as required.
7. Low voltage protection to trip unit on power outage when shown or specified.

8. General Electric; Square D; Cutler-Hammer; or equal.

2.03. MAGNETIC STARTERS

A. General

1. Size per NEMA and UL standard to match motor controlled. Exceptions: NEMA Size 1 minimum (except NEMA Size 0 may be used for ventilation equipment 2 HP and less and in a separate H&V control panel) or as shown otherwise.
2. Starter coil voltage shall be 120 VAC unless noted otherwise.
3. Provide auxiliary contacts as required.
4. Provide with melting alloy thermal overloads.

B. Full Voltage Non-Reversing Starting (FVNR)

1. Across-the-line type, rated 600 volts maximum.
2. Equipped with double break silver alloy contacts. (Single break shall be supplied on Size 8.)
3. Straight through wiring.
4. Coils - Of molded construction through NEMA Size 7. Coils on Size 8 starters shall be form wound, taped, varnished and baked. Replaceable from the front without removing the starter from the panel.
5. Suitable for the addition of at least four auxiliary contacts.
6. Cutler-Hammer, Square D, General Electric, or equal.

C. Full Voltage Reversing Starting (FVR)

1. Across-the-line type, rated 600 volts maximum.
2. Contacts - Double break silver alloy.
3. Coils - Molded construction.
4. Suitable for the addition of at least four auxiliary contacts.
5. Mechanical interlock to prevent the operation of both devices at the same time.
6. Cutler-Hammer, Square D, or equal.

2.04. COMBINATION MAGNETIC STARTERS

- A. Factory assembled of UL listed components within a single enclosure containing MCP, magnetic starter, CPT, overloads, and pilot devices as called for.
- B. Handle mechanism permanently connected to switch (operating through approximately a 180-degree arc) and installed in body of enclosure with interlock to prevent unauthorized opening or closing of door with switch on.

- C. Provision for padlocking disconnect handle in off position.
- D. Disconnect handle having clear indication of switch(es) position.
- E. Auxiliary switches where indicated on Contract Drawings.
- F. Magnetic starter, auxiliary controls and motor circuit protector as specified.

PART 3 EXECUTION

3.01. GENERAL

- A. Install according to the requirements of the National Electric Code and as shown or noted on the Contract Documents.
- B. Mount all contactors in an enclosure as individual units or in a control panel as part of a control system.
- C. Enclosures and control panels to comply with Section 16161, Control Panels and Enclosures.

3.02. ENCLOSED STARTER MOUNTING

- A. Height - Per Section 16161, Control Panels and Enclosures.
- B. Methods and Material - Per manufacturer's requirements.

END OF SECTION

SECTION 16486

MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Motor control centers.

1.02. RELATED SECTIONS

- A. All Division 16 Electrical specifications

1.03. REFERENCES

- A. NFPA 70 - National Electrical Code
- B. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type
- C. UL 198E - Class R Fuses
- D. NEMA AB 1 - Molded Case Circuit Breakers
- E. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies
- F. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers
- G. ANSI 255.1

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Shop Drawings - Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time/current curves of all equipment and components; factory elementaries for each compartment; motor control centers structures; and motor control center layout diagrams.
- C. Samples shall be submitted as may be requested by the Engineer.
- D. Test Reports - Indicate field test and inspection procedures and test results.
- E. The Contractor shall furnish a reproducible copy and four prints of the approved as-built wiring diagrams showing all wiring in the distribution and control center.
- F. Manufacturer's Installation Instructions - Indicate application conditions and limitations of use stipulated by product testing agency specified under Article 1.08. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.05. OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700, Record Documents.
- B. Maintenance Data - Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended manufacturer maintenance procedures and intervals.

1.06. QUALITY ASSURANCE

- A. Perform work in accordance with NEMA ICS 2.3.

1.07. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum three years' experience.

1.08. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70, Underwriters Laboratories Publication UL-845, and NEMA Publication ICS 2.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.09. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600, Materials and Equipment.
- B. Deliver in 60-inch maximum width shipping splits, individually wrapped for protection, and mounted on shipping skids.
- C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with NEMA ICS 2.3. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.10. ENVIRONMENTAL REQUIREMENTS

- A. Conform to NEMA ICS 2 service conditions during and after installation of motor control centers.

1.11. FIELD MEASUREMENTS

- A. Verify that field measurements.

1.12. EXTRA MATERIALS

- A. Furnish under provisions of Section 01700, Record Documents.
- B. Provide the following materials, each tagged or conspicuously marked or labeled with the manufacturer's name, part number and name. All parts shall appear on a typed list showing the above plus quantity and location.

1. One box (minimum 10) of each size control power fuses furnished.
2. Twenty-four indicating lamps.
3. Six indicating lamp lens of each color.
4. Two control relays of each type used.
5. Six sets of control relay contacts.
6. Six sets of each N.O. and N.C. starter auxiliary contacts for each size starter provided.
7. Two elapsed time meters.
8. Lamp replacer tool.
9. One fuse puller for each MCC, new or modified.
10. 36-inch wide, 1/4-inch thick corrugated switchboard matting. Lengths equal to each MCC with plus 2 feet. Shall comply with ANSI/ASTM D-178 J6-7 Type 2, Class 2 specifications. Available Lab Safety Supply (1 800 356 0783).
11. Any special tools needed to service the MCCs, but not normally found in a plant mechanic's tool box.
12. Additional spare equipment as called out on MCC schedules on the Drawings.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Square D Company
- B. General Electric

2.02. GENERAL

- A. Provide the following new motor control centers:
 1. Jefferson Valley Pump Station - Ratings and compartments as shown in MCC schedules on the Contract Drawings.
- B. Horizontal Bus - Silver-plated copper with a continuous current rating of 800 amperes. Include copper ground bus entire length of control center and a fully rated neutral.
- C. Vertical Bus - Copper with continuous current rating of 300 amperes running the full working height of the section with bolted connected to horizontal bus.
- D. Integrated Equipment Short Circuit Rating - 65,000 amperes rms symmetrical at 480 volts.
- E. Configuration - Units front mounting only, accessible from the front only.
- F. Enclosure - NEMA ICS 6, Type 1.

G. Dimensions

1. Depth - 20 inches.
2. Vertical Sections - 6 space factors of unit mounting space.
3. Height - 90 inches.

H. Finish - Manufacturer's standard gray enamel.

I. Section Wireways

1. Two horizontal and one vertical wireway.
2. Full width and working height of section.
3. Provide barrier plates, cable supports reusable wire ties, and captive screws.
4. For openings or cutouts in wireways, provide rubber grommet type protectors around openings.

J. Material

1. Exterior Frame - Fabricated from copper bearing reinforced steel plate construction.
2. Bus Supports - High strength glass reinforced alkyd material.

K. Bus Barriers

1. Permit unit plug-on contacts to pass through and engage the vertical bus bars.
2. Provide bottom bus covers below the vertical bus.
3. Unused Plug-On Openings - Provide plastic closing plates.

L. Plug-On Connections

1. Two-point connection to tighten around the vertical bus bar.
2. Material - Silver plated.
3. Cable Connections to the Plug-On Connections - Bolted type.

M. Bucket Alignment - Guide rails within the structure for horizontal and vertical alignment.

2.03. DISCONNECTS

- A. Combination Controllers - Combine motor controllers with thermal magnetic circuit breakers disconnect in common enclosure. Provide means for locking disconnect handle, and means for defeating cover interlock.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify conditions under the provisions of Section 01039, Coordination.
- B. Verify that surface is suitable for motor control center installation.
- C. The manufacturer of this equipment will be permitted to arrange his equipment to the best advantage and will be required to furnish at least the spare compartments as noted on the Drawings.

3.02. PREPARATION

- A. Provide housekeeping pads.

3.03. INSTALLATION

- A. Install motor control centers in accordance with manufacturer's instructions.
- B. Tighten accessible bus connections and mechanical fasteners after placing motor control center.
- C. Install fuses in fusible switches.
- D. Select and install heater elements in motor starters to match installed motor characteristics.
- E. Provide engraved plastic nameplates.
- F. Motor Data - Provide neatly typed label inside each motor starter door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
- G. Wiring Diagrams - Elementary diagram shall be glued inside each compartment door housing a motor controller, relay, or similar equipment. Other compartments shall also have approved final unit wiring diagrams glued on the inside face of door as well as a heater selection table. Compartments containing panelboards shall have a circuit directory mounted inside the door. All diagrams shall reflect all field modifications.
- H. Motor control centers shall be mounted on raised concrete bases unless noted otherwise. Connections to external equipment and connections of the incoming services shall be as shown or as required by the equipment manufacturer.

3.04. FIELD QUALITY CONTROL

- A. Inspect each controller to NEMA ICS 2.

3.05. LABELING AND IDENTIFICATION

- A. All interior relays, timers or other control devices shall be labeled according to its designation on the elementary diagram.
- B. A control center identification nameplate with factory identification numbers and characteristics shall be fastened within every section. Each control center compartment (bucket) shall have its own identification nameplate fastened to the unit saddle. These

nameplates shall have suitable references to factory records for efficient communication with supplier or manufacturer.

3.06. TESTING

- A. Prior to connection of any external feeder or load circuits, MCC breakers shall be electrically tested per Section 16055, Electrical Work.
- B. Make all connections in accordance with the torquing specifications provided by the manufacturer.
- C. All connections shall be given an infrared thermograph scan after the unit is operational and with each unit operating at as near full load as possible.
- D. Contractor shall retorque or redo connections identified as potential problems.
- E. Contractor shall individually adjust all trip units for the specific requirements of each device.
- F. Contractor shall submit a letter of certification that all of the above have been done, are correct, and are fully operational.

END OF SECTION

SECTION 16497
TRANSFER SWITCHES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Automatic transfer switch.

1.02. RELATED SECTIONS

- A. Section 11310 - SUBMERSIBLE GRINDER PUMP STATIONS
- B. All Division 16 Electrical specifications

1.03. REFERENCES

- A. NFPA 70 - National Electrical Code
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems
- E. UL 1008 - Standard for Transfer Switch Equipment
- F. NFPA 110 - Emergency and Standby Power Systems

1.04. SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals.
- B. Shop drawings shall be submitted for all materials furnished under this section.
- C. Furnish the shop drawing for the automatic transfer switch.
- D. The shop drawing shall include, as a minimum, the following equipment specification information. The information shall be highlighted and prove compliance with these specifications.
 - 1. Electrical Ratings - voltage, switch ampere rating, and short circuit ratings.
 - 2. Protective devices and ratings.
 - 3. Layout drawings.
 - 4. Performance functions.
- E. Manufacturer's Instruction - The Contractor shall furnish three copies of a composite instruction book covering this equipment. Each instruction book shall not necessarily be limited to, but shall include as a minimum, the following:

1. Instructions covering overall equipment.
2. Instructions covering all major and serviceable components.
3. Instructions covering all accessories.
4. Recommended spare parts with current prices, applicable to foregoing paragraphs 1, 2, and 3.
5. Complete renewal parts information.
6. Indicate application conditions and limitations of use. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.05. OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Sections 01700, Record Documents, and 16055, Electrical Work.
- B. Operation Data - Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.
- C. Maintenance Data - Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.06. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum three years' experience, and with service facilities within 200 miles of project.
- B. Supplier - Authorized distributor of specified manufacturer with minimum three years' experience. The transfer switch specified herein shall be provided by the same supplier as equipment specified in Section 16620, Packaged Engine Generator Systems.

1.07. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratory as suitable for purpose specified and indicated.
- C. American National Standards Institute (ANSI).
- D. American Society for Testing and Materials (ASTM).
- E. National Electrical Manufacturer's Association (NEMA), latest version.
 1. ICS 1 - General Standards for Industrial Control and Systems
 2. ICS 2 - Standards for Industrial Control Devices, Controllers and Assemblies
 3. ICS 4 = Terminal Blocks for Industrial Control Equipment and Systems
 4. ICS 6 - Enclosures for Industrial Controls and Systems

1.08. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600, Materials and Equipment.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.09. FIELD MEASUREMENTS

- A. Verify field measurements.

1.10. MAINTENANCE SERVICE

- A. Furnish service and maintenance of transfer switch for three years from date of Substantial Completion.

1.11. MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Section 01700, Record Documents.
- B. Provide two of each special tool required for maintenance.

1.12. WARRANTY

- A. Provide manufacturer's standard one-year warranty.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Transfer switches shall be manufactured by or approved for use by the same manufacturer of the generator unit.

2.02. GENERAL

- A. Transfer switches shall be fully rated to protect all types of loads, inductive and resistive, from loss of continuity of power, without derating in the enclosure.
- B. It shall not be possible for load circuits to be connected to normal and alternate sources simultaneously. The switch shall have a manual neutral position for load circuit maintenance. Provide position indicator visible from the front to show the source to which the switch is connected.
- C. Double throw, mechanically and electrically interlocked.
- D. Operated by momentary energization of bi-directional linear induction motors with mechanical latching in both normal and emergency positions.
- E. Vertical pole arrangement.

- F. Neutral switching, when shown, specified or required by the reviewing agency.
- G. Main Contacts
 - 1. Long life, high pressure, silver alloy contacts resistant to burning and pitting.
 - 2. Provide separate arcing surfaces to protect the main contacts.
 - 3. Contacts shall be sized for maximum amperage rating of the standby and/or utility supply service as required.
- H. Arc Interruption
 - 1. Provide magnetic blowout coils and arc barriers on each pole.
 - 2. Provide covers to prevent interphase flashover. Covers shall be transparent for visual inspection.
- I. Connection Lugs - Provide compression type long-barrel, two hole cable lugs for each power cable, phase and neutral; size and conductor type cable as shown on the Contract Documents or required for the equipment. All terminals front connected and space shall be provided for all lugs as required.

2.03. AUTOMATIC TRANSFER SWITCH

- A. Description - NEMA ICS 2, automatic transfer switch.
- B. Configuration - Electrically operated, mechanically held transfer switch.

2.04. SERVICE CONDITIONS

- A. Service Conditions - NEMA ICS 1.
- B. Temperature – 0 to 40 degrees C.
- C. Altitude - 500 feet.

2.05. RATINGS

Pump Station	Voltage	Switched Poles	Continuous Rating (amperes)	Interrupting Capacity	Withstand Rating	Provided By
Walden Woods	208/120, 3 phase, 4 wire, 60 Hertz	3	200	600% of continuous rating	65,00 RMS	General Contract; see Section 11310
Jefferson Valley	480/277, 3 phase, 4 wire, 60 Hertz	3	400	600% of continuous rating	65,00 RMS	Electrical Contract

2.06. PRODUCT OPTIONS AND FEATURES

- A. Solid-state undervoltage sensors to simultaneously monitor all phases of the normal power source and emergency source and arrange system for automatic starting upon failure of or a

drop below the adjustable percentage of the normal source voltage. Field adjustable from 85 to 100 percent of normal source voltage.

- B. Provide a two-second timed start delay, field adjustable from 3 to 6 seconds. Delay time between normal source failure and engine starting. The transfer switch shall control the generator set to allow generator set to start and transfer load within 10 seconds after normal source power failure.
- C. Provide contacts for engine starting.
- D. Transfer loads from normal source power to emergency source when engine-generator reaches 90 percent of its rated voltage.
- E. Retransfer emergency loads from emergency generator to normal source 10 minutes after normal source has reached 90 percent or more of normal voltage. Provide 0 to 30 minute field adjustable timer. (Retransfer delay).
- F. Retransfer emergency loads from emergency generator to normal source instantaneously when normal source has reached 90 percent or more of normal voltage, if emergency generator has failed while supplying load.
- G. Run engine for a period of 5 minutes after retransfer of emergency loads to normal source. Engine generator will then shut down, automatically resetting and leaving all controls ready for the next emergency start condition. (overrun delay)
- H. Use time clock to automatically exercise engine once each 336 hours. Time clock contacts shall simulate loss of normal voltage, start engine, and shut engine down after 60 minutes of operation. A switch option shall be provided to exercise the generator with or without load.
- I. Operating voltage for transfer shall be obtained from the source to which the load is to be transferred.
- J. Provide 0 to 60-second adjustable timer for programmed transition causing the switch to pause in the neutral position during transfer and retransfer for the set period.
- K. Provide voltage supervisory relays on each phase, such that transfer and engine start is affected should any one of the three phase supplies fall below 70 percent on normal voltage.
- L. Provide four (minimum) auxiliary contacts on shaft (field convertible). No common wires for contacts. Bring wires to terminal block, suitably labeled.
- M. Provide indicating lights (door mounted) for the following:
 - 1. Normal switch position (green).
 - 2. Normal source available (white).
 - 3. Emergency switch position (red).
- N. Provide any other accessories as may be required to achieve operation as described in this specification.

2.07. ENCLOSURE

- A. Enclosure – NEMA 12.

- B. Finish - Manufacturer's standard gray enamel.

PART 3 EXECUTION

3.01. GENERAL

- A. Standards and Tests - Equipment covered by these specifications shall be designed, manufactured, assembled, and tested in accordance with the latest revisions of all applicable published ANSI, NEMA, and IEEE standards, and the requirements of the NEC.
- B. The Contractor shall submit shop and field test reports and conduct field tests.
- C. Owner Acceptance - Final acceptance by the Owner or his duly authorized representative of this equipment shall be contingent upon the equipment satisfactorily meeting these specifications and tests stipulated herein.
- D. Rigging - The Contractor shall with his own forces or shall engage a rigging subcontractor as required to unload, move, transport, set in place, erect, etc., the engine-generator set(s) and transfer switch.

3.02. INSTALLATION

- A. Install transfer switches in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplates under the provisions of Section 16055, Electrical Work.
- C. Mounting Height - Per Section 16161, Control Panels and Enclosures.

3.03. MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Section 01400, Quality Control.
- B. The transfer switch shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer during the Owner's normal working hours. The Owner shall supply personnel to assist in the starting and stopping of the existing generator and loads. The Engineer and Owner shall be notified one week in advance in writing and shall witness the tests. Tests to be conducted on-site shall include, but not be limited to, a "cold start" test, a two hour full load test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive loadbank and make temporary connections for full load test, as required. Provide a written report of the test to the Engineer and Owner.

3.04. DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 01660, Testing and Startup.
- B. Demonstrate operation of transfer switch in normal and emergency modes.

END OF SECTION

SECTION 16620

PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Packaged engine generator sets.
- B. Exhaust silencer and fittings.
- C. Battery and charger.
- D. Weatherproof/sound-reducing enclosure.
- E. Fuel piping and fittings.
- F. Subbase fuel tank.
- G. Equipment specified in this section shall be provided by the General Contract. See Section 11310, Submersible Grinder Pump Station. Provide generators for Walden Woods Pump Station.

1.02. RELATED SECTIONS

- A. Section 11310 - SUBMERSIBLE GRINDER PUMP STATION
- B. All Division 16 specifications

1.03. REFERENCES

- A. NEMA AB1 - Molded Case Circuit Breakers
- B. NEMA MG1 - Motors and Generators
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- D. NFPA 30 - Flammable and Combustible Liquids Code
- E. NFPA 70 - National Electrical Code
- F. NFPA 99 - Health Care Facilities
- G. NFPA 101 - Life Safety Code
- H. NFPA 110 - Emergency and Standby Power Systems

1.04. SUBMITTALS

- A. Submit under provisions of Sections 01300, Submittals, and 16055, Electrical Work.
- B. Shop Drawings - Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate

curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams. Indicate weights of all major components.

- C. Product Data - Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators,.
- D. Prototype Test Reports - Submittals will not be reviewed without submission of prototype test report of performance testing.
- E. Manufacturer's Installation Instructions - Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- F. Manufacturer's Performance Affidavit - Certify that Products meet or exceed specified requirements in accordance with Sections 01300, Submittals, and 01640, Equipment-General.
- G. Manufacturer's Field Reports - Submit under provisions of Section 01400, Quality Control. Indicate procedures and findings.

1.05. OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700, Record Documents, and 16055, Electrical Work.
- B. Operation Data - Include instructions for normal operation.
- C. Maintenance Data - Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.06. QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 110.
- B. Maintain one copy of document on site.
- C. Provide:
 - 1. Prototype model test.
 - 2. Factory test.
- D. The manufacturer shall provide documentation demonstrating satisfactory prototype and production test results. Generator sets that have not been prototype tested and Factory Production tested as described herein shall not be acceptable.
- E. Generator set Prototype Tests - Perform the following test and evaluations on a prototype generator set representative of the model specified: Torsiograph Analysis and test, temperature rise test, short circuit test, endurance run test, maximum power test, linear vibration test, cooling system test, maximum motor starting KVA test, and transient response, steady state speed control and voltage regulation test. A summary of the generator set testing results shall be submitted for review. The manufacturer's standard series of components development tests on the generator system, engine and other major

components shall be performed and available for review, but shall not be acceptable as a substitute for a prototype testing on the complete representative generator set prototype.

- F. Factory Test - The unit shall be completely assembled and all preliminary adjustments made before the test is initiated. Genset shall be tested with the complete radiator and fan assembly to be shipped. Outside radiator heat exchanger attachments shall not be acceptable!

1.07. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum 10 years' documented experience, and with service facilities within 200 miles of project.
- B. Supplier - Authorized distributor of specified manufacturer with minimum five years' documented experience.

1.08. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70, NFPA 110, and NFPA 101.
- B. Furnish products listed and classified by Underwriters Laboratories or third-party testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

1.09. PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this section, under provisions of Section 01039, Coordination.

1.10. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600, Materials and Equipment.
- B. Accept unit on site on skids. Inspect for damage.
- C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.11. MAINTENANCE SERVICE

- A. Furnish manufacturer's recommended service and maintenance of engine generator for two years from Date of Substantial Completion.

1.12. WARRANTY

- A. The manufacturer of either the engine or the generator shall warranty the complete standby power system specified herein to be free from defects in materials and workmanship, whether functional or non-functional, and shall replace or repair without cost the Owner any defects which, with normal usage, appear or otherwise manifest themselves within 5 years or 1,500 operating hours of service, commencing from the date of substantial completion. Coverage shall include parts, labor, travel expenses, and labor to remove/reinstall any parts of the equipment. There shall be no deductibles applied to this warranty.

1.13. MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Section 01700, Record Documents.
- B. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal tool box.

1.14. EXTRA MATERIALS

- A. Furnish under provisions of Section 01700, Record Documents.
- B. Provide two of each fuel, oil and air filter element under provisions of Section 01700, Record Documents.

1.15. GENERATOR FUELING

- A. Owner to initially fill fuel tank. Fuel for testing and temporary operations will be the responsibility of the Contractor. Contractor shall refill tank after all testing is completed at no additional cost to the Owner.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Caterpillar.

2.02. PACKAGE ENGINE GENERATOR SYSTEM

- A. Description - NFPA 110, engine generator system to provide source of power for Level 2 applications, and conforming to NFPA 99.
- B. System Capacity - The generators shall be sized to provide power to all loads specified in Section 11310 in the event of loss of utility power at elevation of 500 feet above sea level, standby rating using engine mounted radiator
- C. The generator shall be capable of starting and powering the loads.

2.03. ENGINE

- A. Type - Water-cooled inline or V type, four-cycle, compression ignition diesel internal combustion engine.
- B. No engine power de-rating up to 5,000 feet above sea level at 104 degrees F.
- C. Fuel System - No. 2 fuel oil, maximum sulfur content of 0.3 percent.
- D. Engine Speed - 1800 rpm.
- E. Governor - Isochronous type to maintain engine speed within 0.5 percent, steady state, and 0.5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjustment.
- F. Safety Devices - Engine shutdown on high water temperature, low oil pressure, overspeed, low coolant level, and engine overcrank. Limits as selected by manufacturer.

- G. Engine Starting - DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with Manual Off Remote selector switch on engine generator control panel.
- H. Engine Jacket Heater - Dual thermal circulation-type water heater with integral thermostatic control, sized to maintain engine jacket water temperature to allow system to perform to NFPA 110 standards. Jacket water heater shall be suitable for operation on 208 volts, single phase AC.
- I. Radiator - Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 122 degrees F (50 degrees C). Radiator air flow restriction 0.5 inches of water (1.25 Pa) maximum.
- J. Engine Accessories - Fuel filter, lube oil filter, intake air filter, fuel pump(s), water pump. Include water temperature indication and lube oil pressure indication on engine/generator control panel.
- K. Mounting - Provide unit with suitable vibration isolators to meet International Building Code (IBC).

2.04. ALTERNATOR

- A. Generator - NEMA MG1, three phase, reconnectible brushless synchronous generator with brushless PMG exciter.
- B. Rating - 208Y/120 volts, 60 Hertz at 1800 rpm. Kw rating as required by loads specified in Section 11310.
- C. Insulation Class - H.
- D. Temperature Rise - 125 degrees C.
- E. Enclosure - NEMA MG1, open drip proof.
- F. Voltage Regulation - Include generator mounted volts per hertz exciter regulator to match engine and generator characteristics, with voltage regulation +1 percent from no load to full load. Include manual controls to adjust voltage droop, voltage level (+5 percent) and voltage gain.

2.05. ACCESSORIES

- A. Exhaust Silencer - Critical-type silencer, with muffler companion flanges, tailpipe, rain cap, flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions, and condensate drain with plug type drain valve in accordance with manufacturer's recommendations. The drain shall be piped with copper tubing to the closest sump or waste drain.
- B. Batteries - Heavy duty, diesel starting type lead acid storage batteries, 170 ampere hours minimum (700 cold cranking amps) capacity. Match battery voltage to starting system. Include necessary cables and clamps.
- C. Battery Tray - Treated for electrolyte resistance, constructed to contain spillage.

- D. Battery Charger - Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input.

Provide wall mounted enclosure to meet NEMA 250, Type 1 requirements.

- E. Line Circuit Breaker - NEMA AB 1, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized in accordance with NFPA 70.

- F. Engine Generator Control Panel - NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:

1. Frequency Meter - 45 65 Hz. range, 3.5-inch (89 mm) dial.
2. AC Output Voltmeter - 3.5 inch (89 mm) dial, 2 percent accuracy, with phase selector switch.
3. AC Output Ammeter - 3.5 inch (89 mm) dial, 2 percent accuracy, with phase selector switch.
4. Output voltage adjustment.
5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
6. Engine start/stop selector switch.
7. Engine running time meter.
8. Oil pressure gauge.
9. Water temperature gauge.
10. Auxiliary Relay - 3 PDT, operates when engine runs, with contact terminals prewired to terminal strip.
11. Additional visual indicators and alarms as required by NFPA 110. Level 2 use.
12. Remote Alarm Contacts - Pre wire SPDT contacts to terminal strip for remote alarm functions required by NFPA 110 and as specified.

- G. Weather-Protective/Sound Limiting Enclosure

1. Critical silencer mounted within the enclosure, with rain cap and rain shield.
2. Lockable access doors for control panel and service points.
3. All door hardware, latches and hinges made of stainless steel.
4. Air Louvers - If motorized, the louver shall be temperature controlled to prevent unit from overheating after engine shutdown.

- H. Vibration Isolators - Mount generator on adjustable spring isolators complete with side movement snubbers. At least four such isolators shall be utilized and be sized to load the spring within their proper working range for the unit supplied.
- I. Subbase Fuel Tank - Subbase fuel tank unit with rupture basin (with leak detection alarm) and with single integral pump and level control. Include flexible fuel line connections, fuel gauge, high fuel level (set to 90 percent of fill capacity) and low fuel level alarm contacts, and indicating lights.

Tank shall be sized to permit 48 hours of operation at full load. Provide double wall steel tank with fill vent, leak detector, high level alarm set at 90 percent, overfill prevention valve, overfill monitoring, lockable 2-inch fill cap, stainless steel spill pan with minimum 5-gallon capacity, fuel level gauge, venting to UL 142 in both primary and secondary containments, UL listed, and meet all local and regional Code requirements for aboveground fuel tanks.

PART 3 EXECUTION

3.01. INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02. FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400. Quality Control.
- B. Provide full load test utilizing portable resistive load bank for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown and return to normal. Testing shall include a "cold start" pickup of loads (one shot or step loaded per this section), full load test, and shutdown/cooldown.
- C. Record in 20-minute intervals during four hour test:
 - 1. Kilowatts.
 - 2. Amperes.
 - 3. Voltage.
 - 4. Coolant temperature.
 - 5. Room temperature.
 - 6. Frequency.
 - 7. Oil pressure.
- D. Test all alarm and shutdown circuits by simulating conditions.

3.03. SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. Prepare and start systems under provisions of Section 01400, Quality Control.

- B. The Contractor will arrange for the supplier of the engine generator to furnish the services of qualified service technician(s) to perform the following:

SERVICE	MINIMUM TIME AT PLANT SITE
Observe the installation and test and calibrate the system. ⁽¹⁾	1/2 day (four hours)
Instruct Owner's operators in the operation, maintenance, and repair of the entire system.	Two 1/2-day (four-hour) sessions ⁽²⁾

(1) If manufacturer's representative determines that the installation is not acceptable or corrections to any part of the installation are required, the Contractor shall, at his expense, make all necessary modifications or corrections and reschedule the testing and calibration test. Cost of the rescheduled session is also at the Contractor's expense. A written report of findings shall be delivered in duplicate to the Engineer.

(2) The first session shall be scheduled two weeks in advance of the actual date of instruction. The actual day shall be scheduled with the Engineer and Owner. The second session will be as requested by the Owner at some time during the warranty period.

- C. The Owner's initial instruction session for operation, maintenance, and repair of the entire system shall be videotaped by the Contractor at his expense. Video shall be digital(DVD) and left with the Owner. If the DVD is not of good quality, as determined by the Owner, the Contractor shall have the service technicians redo the instructional session with an additional DVD made for the Owner's use. This second instructional session and videotaping are also at the Contractor's expense.

- D. All times are actual on-site times. All costs, including overtime, travel, and subsistence are the responsibility of the Contractor.

3.04. ADJUSTING

- A. Adjust work under provisions of Section 01700, Record Documents.
- B. Adjust generator output voltage and engine speed.

3.05. CLEANING

- A. Clean work under provisions of 01700 , Record Documents.
- B. Clean engine and generator surfaces. Replace oil and fuel filters after load test.

3.06. DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 01660, Testing and Startup.
- B. Describe loads connected to emergency system and restrictions for future load additions.
- C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency power.

END OF SECTION

SECTION 16900

AUXILIARY CONTROLS AND RELAYS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Pushbutton.
- B. Selector switches.
- C. Indicating pilot lights.
- D. Contact blocks.
- E. Control power transformers.
- F. Fuse blocks.
- G. Relays.
- H. Intrinsically safe barriers.
- I. Alarm horn.

1.02. RELATED SECTIONS

- A. All Division 16 sections

1.03. REFERENCES

NEMA ICS 1	General Standards for Industrial Control Systems
NEMA ICS 2	Standards for Industrial Control Devices, Controllers and Assemblies
NEMA ICS 6	Enclosures for Industrial Controls and Systems
NEMA ST 1	Standard for Specialty Transformers (Except General Purpose Type)

1.04. SUBMITTALS

- A. Submit shop drawings under provisions of Section 01300. Submittals.
- B. Submit shop drawings to NEMA ICS 1 indicating control panel layouts, wiring connections and diagrams, dimensions, support points.
- C. Submit product data under provisions of Section 01300, Submittals.
- D. Submit product data for each component specified. The submittal shall be included as part of the system in which the component is specified.
- E. Submit manufacturer's installation instructions under provisions of Section 01300, Submittals.
- F. Submit samples as requested by the Engineer.

1.06. PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 01700, Record Documents.
- B. Accurately record actual locations of control equipment. Revise diagrams included in Drawings to reflect actual control device connections.

1.07. OPERATION AND MAINTENANCE DATA

- A. Submit operation data under provisions of Section 01700, Record Documents.
- B. Include instructions for adjusting and resetting time delay relays, timers, and counters.
- C. Submit maintenance data under provisions of Section 01700, Record Documents.
- D. Include recommended preventive maintenance procedures and materials.

1.08. QUALIFICATIONS

- A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum 10 years' experience.

PART 2 PRODUCTS

2.01. PILOT DEVICES

A. General

- 1. Pilot devices shall include indicating light, pushbuttons, and selector switches.
- 2. Heavy-duty, industrial type, construction.
- 3. Provide extra large nameplates in accordance with Section 16055, Electrical Work, for all door or enclosure front-mounted devices.
- 4. Controls and relays shall be by one manufacturer wherever possible.
- 5. 30-millimeter diameter.
- 6. Retaining ring and boot type.

B. Pushbuttons and Selector Switches (PB) and (SEL SW)

- 1. Lockout feature as indicated.
- 2. Color - Red for stop or terminate function; black for all others.
- 3. Operators:
 - a. Provide "gloved hand" knobs for selector switches.
 - b. Provide "mushroom head" button on emergency stop pushbuttons.
- 4. Stackable contact blocks.

5. Devices shall be either momentary, maintained, spring return, push-pull, or other operational types as shown or otherwise specified.

C. Indicating Pilot Lights (IL)

1. Glass or plastic lens.
2. 120-volt LED transformer type.
3. Push-to-test type. When six or more pilot lights are used in control panels, a single lamp test switch can be used in lieu of all lamps being push-to-test.
4. Lens color shall be as follows:

FUNCTION	COLOR
Motor running	Red
Malfunction	Amber
Ready	White or Green

5. Manufacturers - General Electric, Square D, or Crouse-Hinds.

2.02. CONTACT BLOCKS

- A. Molded of an amorphous transparent polyamid material with high impact resistance and resistant to carbon tracking.
- B. Contacts - Double break silver type rated at 10 amp at 120 VAC continuous.

2.03. CONTROL POWER TRANSFORMER (CPT)

- A. Standard industrial control type, VA size as required for the powered load.
- B. Dual voltage primary, with 120V ac, single phase secondary. All primary connections fused; size as required for the transformer.
- C. Secondary control fuse with capacity for the control circuit indicated.
- D. DIN rail-mounted type in control panels.
- E. Manufacturer - Square D, General Electric.

2.04. FUSE BLOCKS

- A. General purpose Class H, K, and R phenolic fuse block for dual-element cartridge fuses.
- B. DIN-rail mounted in control panels.
- C. Manufacturer - Buchanan or equal.

2.05. ELAPSED TIME METERS (ETM)

- A. Minimum six digit, non-resettable hour meter panel mounted.
- B. For operation on 120 volts.

- C. Manufacturer - General Electric.
- 2.06. GENERAL PURPOSE CONTROL RELAYS (CR)
- A. Units shall be plug-in type.
 - B. Only for use in manufactured or custom-built control panels.
 - C. Number of poles and arrangement as shown or specified.
 - D. Contacts
 - 1. Shall be rated 10 amps at 240 volts AC.
 - 2. Material shall be silver cadmium oxide.
 - E. Coils shall be rated continuous duty.
 - F. Sockets
 - 1. Supply with relay retainer clip.
 - 2. Terminal connections with captive screw to accept locking fork solderless connectors.
 - 3. Single tier design.
 - G. Manufacturers - Square D Company, Potter-Brumfield, or equal.
- 2.07. ELECTRONIC ALTERNATING RELAY (ALT)
- A. Relay type.
 - B. Contacts - Rated 10 amps at 120 VAC.
 - C. Electronic, continuous duty, capable of duplex or triplex operation.
 - D. UL listed.
 - E. Manufacturer - Diversified Electronics.
- 2.08. INTRINSICALLY-SAFE BARRIERS
- A. Power supply, bistable input amplifier, intrinsically-safe for connections to passive devices located in hazardous areas.
 - B. Relay Output Stage - LED indicator type.
 - C. FM approved. Manufacturers: Pepperi & Fuchs WE Series, Square D.
- 2.09. ELECTRIC ALTERNATOR (ALT)
- A. Relay type designed to provide positive motor alternation in the operation of two motors, two control circuit power sources.
 - B. Contacts - Rated 120V ac, 15A per pole.

- C. Manufacturer - General Electric CR360, Allen Bradley Bulletin 841.
- 2.10. ALARM HORN
- A. Lightweight, compact, wall-mounted, signal device with gain control. UL listed for indoor and outdoor use.
 - B. Operating on 120-volt, 60 Hertz, with a maximum current draw of 0.5 amps.
 - C. Signal Type - Horn, 110 dB at 10 feet.
 - D. Housing - Speaker cone and projector made of spun aluminum. Internal amplification circuitry including gain control contained in diecast aluminum housing.
 - E. Manufacturer - Federal Signal Corp. or equal.

PART 3 EXECUTION

3.01. GENERAL

- A. Identify all auxiliary controls per Section 16055.

3.02. CONTROL POWER TRANSFORMER

- A. Provide individual control power transformers for each control circuit.
- B. Size as required by control circuit.

3.03. FUSE BLOCKS

- A. Size as indicated on Drawings or as required.

3.04. PUSHBUTTONS AND SELECTOR SWITCHES

- A. Units shall be back-mounted wherever possible.

END OF SECTION

SECTION 16950
TESTING AND INSPECTION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Electrical power distribution and control circuit testing.

1.02. RELATED SECTIONS

- A. Section 01010 - SUMMARY OF WORK
- B. Section 01300 - SUBMITTALS
- C. Section 01700 - CONTRACT CLOSEOUT
- D. Section 16055 - ELECTRICAL WORK

1.03. SUBMITTALS

- A. Made in accordance with Sections 01300 and 16055 and as specified herein.
- B. Submit test records and reports for all testing.

1.04. CERTIFICATION OF TESTING

- A. Perform all tests in the presence of a duly authorized representative of the Owner unless waived in writing by the Engineer. When the presence of such representative is so waived, certified results of the tests made and the results thereof shall be furnished by the Contractor.
- B. Perform all tests in the presence of the Engineer. Give the Engineer written notice of all tests at least two weeks in advance.

1.05. TEST EQUIPMENT

- A. Furnish all instruments and a qualified engineer to properly perform all tests required.

1.06. FACTORY-TRAINED SUPERVISION

- A. Provide necessary factory trained supervision to check over equipment for proper functioning before putting the equipment into operation as may be required by these specifications. This shall include establishing a simulated fault on checking out the coordination of the protective devices.
- B. Make necessary adjustments and testing in cooperation with the respective manufacturers and other Contractors when necessary. Perform all tests in accordance with the latest standards of the ANSI, IPCEA, IEEE and NEMA.

1.07. COSTS

- A. Costs of all tests shall be borne by the Contractor and shall be included in the contract price.

1.08. DAMAGES

- A. If damage is indicated or observed during testing or from the review of tabulated data, replace defective or damaged materials and retest at no cost to the Owner.

PART 2 MATERIALS

2.01. TESTING EQUIPMENT

- A. Furnish all test equipment required to correctly perform the system tests.

2.02. SPECIAL EQUIPMENT REQUIREMENTS

- A. 500-volt dc Megger - For maximum 300-volt systems, use a hand crank only.
- B. 1,000-volt dc Megger - For maximum 600-volt systems, use a hand crank only.
- C. 35,000-volt dc Hi-Potential Tester – For maximum 13,800-volt systems.

PART 3 EXECUTION

3.01. GENERAL

- A. After completion of the work, thoroughly test the entire electrical system, including electrical work required for instrumentation, control and power, and adjust electrical system as required.
- B. Test all electrical circuits to insure circuit continuity, insulation resistance, proper splicing, and freedom from improper grounds.
- C. System performance test runs are required. Coordinate test runs of electrical systems with test runs of equipment served thereby (i.e., mechanical, heating, air conditioning, process systems and plumbing).

3.02. GENERAL TESTING METHODS

- A. Panels - Test each panel with mains disconnected from the feeder, branches connected, branch circuit breakers closed, all fixtures in place and permanently connected, lamps removed or omitted from the sockets, and all wall switches closed.
- B. Feeders - Test with the feeders disconnected from the panels.
- C. Individual Power Circuits - Test each individual power circuit at the panel or motor control center with the power equipment connected for proper operation.
- D. Transformers (Low Voltage) - Megohmmeter test all transformers in accordance with the manufacturer's recommendations.
- E. Lighting and receptacle circuits do not need to be megger tested.

3.03. EQUIPMENT TESTING (600 volts and below)

A. Megohmmeter Tests

1. Conduct megohmmeter tests of the insulation resistance of rotating machines and power distribution feeders down to panelboard feeders. The results will be accepted when the megger shows the insulation resistance to be not less than 50 megohms at 20 degrees C using either a 500-volt or 1,000-volt megger. Wait 1 minute between each test for all conductors in the same enclosure and each conductor and ground.
2. Perform megohmmeter testing (Insulation Resistance Test) of all motor power and control wiring after the cables are in place and just prior to final terminations. Record all data as per Exhibit A. Lighting and receptacle panelboard branch circuits are not megohmmeter tested.

B. Voltage and Amperage Testing

1. Check all single and three phase motor amperage while the unit is running at as close to operating load as possible. Record voltage on each line and the amp draw for each leg. Provide results in a typed report format and submit as part of the Contractor's closeout package.
2. Check the load current in each phase of each distribution, lighting and receptacle panelboard feeder and make modifications to the circuit loading to correct load unbalance to within 1 kVA phase to phase for each panelboard.

3.04. GROUNDING SYSTEM

- #### A. Test the grounding system to verify a resistance to ground of 5 ohms or less. If the resistance is greater than 5 ohms, modifications shall be made to the system by adding additional ground rods or plates to bring the resistance test value to 5 ohms or less. Submit a record/report to the Engineer. Include the following:

1. Time, date, temperature, frost information depth (if applicable), and weather conditions.
2. Moisture content of earth at time of measurement (wet, dry, etc.).
3. Ground test equipment, model numbers, and last date of calibration.
4. Detailed description of method used.
5. Plot of "distance from ground grid versus resistance." Resistances shall range from 0-50 ohms with enough points to produce a smooth curve.
6. Maintenance information and recommendations (if applicable).

- #### B. Test all grounding conductors and grounding systems for continuity. Where continuity does not exist, conditions will be corrected by an approved method and the system retested.

3.05. SYSTEM LOAD BALANCING

- #### A. Check the load current in each phase of each distribution panel feeder and make modifications to the circuit loading to correct load unbalance to within 1 kVA phase to phase for distribution panels.

3.06. SYSTEM CHECKS

A. Preliminary

1. Connect all motors to protective devices and controls to give proper motor acceleration and correct motor rotation. Interconnect the control wiring to all the control devices associated with a machine, a group of machines, or other device to produce the correct operation, timing, and/or sequencing of the equipment.
2. Adjust overload elements in motor starters and check for coordination with the actual installed motor characteristics. Replace any overload element that is inadequate.
3. Check all motor nameplates for verification of proper voltage, horsepower, speed, phase, and power factor.

B. Operational

1. Then give the equipment an operational test to determine that all components including motors, controls, protective and switching devices, and auxiliary associated equipment are in operable condition and can function as described and shown on relevant specifications, operating instructions, and drawings.
2. Take motor current reading at full load or as close to full load as the driven machine will develop. If the ammeter reading is over the rated full load current or the proper current for the load at which the machine was operated, determine the reason for the discrepancy and take the necessary corrective action.
3. Remove the cause of any motor operating above full load rating instead of increasing the overload relay trip rating.

3.07. CLOSEOUT PROCEDURES

- A. General - Sequence closeout procedures so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated. Closeout shall be in accordance with Section 01700, and as required herein.
- B. Final Operational Check - Make a check of each item in each system to determine that it is set for proper operation. With the Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During the following test runs, make final corrections or adjustments of systems to refine and improve performances where possible, including noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices to permit observation of actual system performances and shall demonstrate that controls and items requiring service or maintenance are accessible.
- C. Cleaning and Lubrication - After final performance test run of each electrical system, clean system both externally and internally, comply with manufacturer's instructions for lubrication of both power and hand operated equipment, and remove excess lubrication, touch up minor damage to factory-painted finishes and other painting specified as electrical work, and refinish work where damage is extensive.
- D. Operating Instructions - General operating instructions are required. In addition to specific training of the Owner's operating personnel specified in the individual sections, and in addition to preparation of written operating instructions and compiled maintenance manuals specified elsewhere in these specifications, provide general operating instructions for each operational

system and equipment item of electrical work, and coordinate instructions with instructions for mechanical work, and other equipment where associated with electrical systems or equipment.

E. System Description and Operation

1. Perform in the presence of the Owner, the Owner's operating personnel and the Engineer.
2. Describe each basic electrical system and explain identification system, displayed diagrams, signals, alarms and audio visual provisions.
3. Describe interfaces with mechanical equipment, including interlocks, sequencing, startup, shutdown, emergency, safety, system failure, security, and similar provisions.
4. In the presence of the Owner's personnel, display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage and extra materials, meter readings, and similar service items.

3.08. CONTINUED SYSTEM OPERATIONS SUPPORT

- A. Coordinate the Owner's takeover of electrical systems with takeover of mechanical systems, including the provision of skilled electrical operating and maintenance personnel until the time the Owner's personnel take over operation of entire mechanical and electrical plant. Respond promptly with continued consultation and services (beyond takeover date) on electrical systems, matching required continued services on associated mechanical systems and equipment until the end of the warranty period.

3.09. DOCUMENTATION PROCEDURE

- A. Signed commitments are required. The transfer of electrical systems to the Owner for operation will not proceed until guarantees, warranties, performance certifications, maintenance agreements and similar commitments to be signed by Contractor and other entities have been executed and transmitted to and accepted by the Engineer for placement in the Owner's records.

3.10. THERMOGRAPH INSPECTIONS

- A. Perform thermograph inspections on all service terminations, subfeed terminations, major power splices, and motor terminations for motors 5 HP or larger. Testing on major power distribution equipment will be performed with the plant running at a minimum of 70 percent capacity or the highest load that can be operated. Testing on individual pieces of equipment will be performed while the unit is operational at rated load and has operated for at least 30 minutes for continuously operated equipment or near the end of a cycle for equipment that operates on/off. Loads shall be minimum of 40 percent of full load. Readings at overcurrent devices and starters will be for line and load; motors will be connections in motor terminal boxes; and for transformers, primary and secondary terminations. Provide a report of test results to the Owner including indication of any actions taken to resolve abnormal readings. See Exhibit B at the end of this section. All thermographic tests shall be reported on this form.

EXHIBIT A
TESTING AND INSPECTION
ELECTRICAL INSULATION TEST RECORD
INSULATION RESISTANCE TEST

EQUIP. I.D. CKT/MARK NO.	TEST VOLTAGE	PHASE TO GND. MEG OHMS				PHASE TO PHASE MEG OHMS						DATE TESTED
		A	B	C	N	A-B	A-N	B-C	B-N	C-A	C-N	

TEST EQUIPMENT CONTROL NO. _____

REMARKS: _____

PERFORMED BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____

Test Engineer

EXHIBIT B
TESTING AND INSPECTION
THERMOGRAPHIC TERMINATION TEST

EQUIPMENT	AMBIENT ⁽¹⁾	LINE/PRIMARY			LOAD/SECONDARY			LOAD CONDITION (% OF FULL)	COMMENTS ^(2,3)
		1	2	3	1	2	3		

Thermograph Model _____

Date of Test _____ Conducted by _____

Outdoor Temperature _____ Room Temperature _____

Owner/Engineer Witness _____

(1) Ambient is the breaker case temperature, transformer winding temperature, or motor housing temperature. For bus or cabling, it shall be the temperature of the bus or cable a minimum of 24 inches from the splice or termination.

(2)

TEMPERATURE DIFFERENCE	CONDITION	ACTION
1°C to 3°C	Possible deficiency	Investigate, i.e., clean terminations/retorque
4°C to 15°C	Deficiency	Determine problem and repair; retest
16°C and above	Major deficiency	Immediate shutdown; determine problem and repair and retest

(3) Indicate any discrepancies the cause of any temperature differences and indicate action to be taken.

Test Parameters:

- Imaging equipment shall be capable of detecting a minimum temperature difference of 1 degree at 30 degrees C.
- Equipment shall detect and convert emitted radiation to a visual signal.
- Tests to be run during periods of maximum possible loading, but at least 40 percent of rated load.

END OF SECTION

SECTION 17000
INSTRUMENTATION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. This section includes the general work description and requirements for instrumentation provided by this contract.

1.02. GENERAL REQUIREMENTS

- A. It is a requirement of this specification that all Division 17 specifications be provided by a single supplier. This supplier shall have total responsibility for the entire system performance and compatibility of this section, as well as all other Division 17 specifications.

1.03. RELATED SECTIONS

The specifications sections listed below are an integral part of this equipment specification and the Contractor shall be responsible for providing these sections to the equipment suppliers:

- A. Section 01300 - SUBMITTALS
- B. Section 01640 - EQUIPMENT-GENERAL
- C. Section 16055 - ELECTRICAL WORK
- D. All Division 17 specifications.

1.04. REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- B. NEMA ICS 3 - Industrial Systems.
- C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- D. NFPA 70 - National Electrical Code (NEC).
- E. NFPA 79 – NEC (Labeling).
- F. ISA - Standards 5.1 and 5.4.
- G. IEC 1131-3 – Programming Standards.

1.05. SHOP DRAWINGS

- A. All Division 17 specifications shall be submitted in one shop drawing. Requirements of individual specification sections shall be contained within a single section in the shop drawing submittal. Indicate individual specification sections with a protruding tab. Submit material in the format and order as described in paragraph 1.05.B.3.

B. Shop Drawing Submittal Format

1. Shop drawings shall be in a rigid three-ring binder. If necessary, provide multiple binders.
2. Provide title page on the front and sides of the binder. Title page shall include job name, GHD job number, Contractor(s) job number(s), date, "Division 17 Shop Drawing", Contractor and supplier(s) names, addresses, contact persons, and contact numbers.
3. Contents shall be organized accordingly.
 - a. Table of Contents – List of each section. Provide protruding tabs labeled with the pertinent heading for each section listed in the Table of Contents.
 - b. For each Division 17 specification section, provide the following within the respective sections:
 - 1) Date Dependency Affidavit – Affidavit shall certify that the equipment furnished in that specific section is fully 2000 compliant and will not pose any operational or internal time-clock malfunction prior to the year 2100. Affidavit shall be signed by an officer of the equipment manufacturer and be notarized.
 - 2) Table of Conformance.
 - 3) Training itinerary.
 - 4) Bill of Materials (BOM) for installed equipment, BOM for spare parts, and BOM for extra materials. Each BOM shall be grouped and identified separately.
 - 5) Equipment information satisfying specifications. Provide protruding tabs for each piece of equipment. Label each tab with the equipment manufacturer.
 - c. AutoCAD Drawings – Include title block, border, page numbers, and supplier job number. CD containing all Division 17 AutoCAD 2014, or higher, *.dwg files. Sheet/drawing titles shall utilize three lines in the title block and are subject to approval, and instructed change, by the Engineer.
4. AutoCAD drawings shall be 11-inch by 17-inch.
5. Shop drawings not containing the appropriate performance affidavit(s), date dependency affidavit(s), or format will be returned without further review.

C. Shop Drawing Submittal Contents - The following requirements pertain to all of Division 17 specifications and are intended to complement the requirements of Section 01640. Refer to individual Division 17 specifications for further requirements.

1. Date Dependency affidavits for all equipment.
2. Include a complete Table of Conformance to each paragraph, or part, of Part II in the respective specification. Use a Microsoft Word 2010 table format with four columns labeled as "Specification Section", "Equipment Manufacturer", "Equipment Model", "Compliant (Y/N). If No, specify". As a minimum, identify equipment compliance in the

“Compliant (Y/N). If No, specify” column for each article (i.e., 2.02), letter heading (i.e., A, B, C), and each number heading (i.e., 1, 2, 3). For exceptions or deviations, include a narrative description as to how the deviation or exception can benefit the system over that which is specified.

3. Training Itinerary – Detailed itinerary for the training to be provided in Microsoft Word 2010 table format. Itemize the day of training (“Day 1,” “Day 2,” or “Hour 1,” “Hour 2,” etc.) and the lessons to be taught during that period. Further discuss the equipment to be used during training and the proposed location of training for that day. Account for all days of specified training. Provide one training itinerary sheet for each training period. At the top of each sheet provide a header description of the training session and duration of training to be provided.
4. Detailed Bill of Materials in Microsoft Word 2010 table format, or Excel 2010, identifying component name, manufacturer, model number, and quantity supplied. Typical Bills of Materials are not acceptable.
5. Descriptive lists of spare parts and extra materials provided in the same tabular format as the Bill of Materials. Lists shall be exclusive to the spare parts and extra materials requested by the specification section, hence separate from the Bill of Materials for installed equipment. Lists shall be intuitive and specifically created for this project.
6. For individual equipment, submit information satisfying every item discussed in Part II of that specification section. Additionally, submit on all supporting accessories including, but not limited to, terminal blocks, surge and lightning suppression, UPSs, fuses, and cabling.
7. AutoCad 2014 or Higher Drawings - Provide loop and block diagrams. Symbols used and nomenclature shall be in accordance to ISA Standard 5.4. Diagrams shall be specific to the equipment submitted with the options and features specified or otherwise provided. The inclusion of options not specified or provided is unacceptable. Terminal points depicted shall be the terminal points provided with identical terminal point designations as the supplied equipment. Illustrate all available terminals that are not utilized.
8. Proposed nameplate wording. Scaled illustrations for each nameplate provided.
9. Manufacturer’s literature and Web site printouts are independent of the above requests for information and, hence do not satisfy the above shop drawing requirements. All catalog cuts, Web site printouts, manufacturer’s specifications, and drawings shall be clearly marked to allow identification of the specific products used. Cross-out all options and functions not supplied with the equipment.
10. Electrical power requirements, connection requirements, interconnecting cabling, and environmental limitations/restrictions.
11. Dimensions and weights of the equipment with the specified options.

1.06. OPERATION AND MAINTENANCE DATA

- A. The following requirements pertain to all of Division 17 specifications and are intended to complement the requirements of Section 01640 as well as individual Division 17 specifications.

- B. Submit under provisions of Sections 01600 and 01640.
- C. Provide complete sets of hard-covered three-ring bound loose leaf Operation and Maintenance (O&M) Manuals. In addition to "As-Built" system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under Division 17. Binders shall not be larger than 3-inch.
- D. Utilize a Table of Contents listing major headings (blue tabs) and sub-major headings (white tabs). Provide protruding tabs labeled with the pertinent heading for each item listed in the Table of Contents. Tab labels shall be permanently fixed to semi-rigid section dividers. Otherwise, utilize the same format as specified for shop drawing submittals.
- E. Submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing, and maintenance of each component and/or instrument. Indicate application conditions and limitations of use stipulated by the product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- F. In a separate binder, include the configuration settings for each instrument provided in Division 17. Provide a Table of Contents with protruding tabs for each instrument. Label each protruding tab with the equipment name and equipment designation. Indicate the value of all configuration parameters and setpoints, including those that are not utilized in the equipment's field configuration.
- G. Contractor shall review all submitted literature and cross out all options, functions, warranties, etc. not part of the supplied equipment.

1.07. PROJECT RECORD DOCUMENTS

- A. The following requirements pertain to all of Division 17 specifications and are intended to complement the requirements of Section 01640 as well as individual Division 17 specifications.
- B. Submit under provisions of Sections 01600, 01640, and 16055.
- C. Record actual locations of controller cabinets and input and output devices connected to system. Include interconnection wiring and cabling information, and terminal block layouts in controller cabinets.

1.08. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Sections 01600, 01640, and 16055.
- B. Accept products on site in factory containers unless system is completely integrated into a pre-manufactured panel that has been factory tested. Inspect for damage.
- C. Store products in clean, dry area; maintain temperature to NEMA ICS 1 requirements.

1.09. COORDINATION

- A. Refer to Contract Drawings for designations and verify with Owner.
- B. Coordinate demonstration to Owner with the Contractor and the Owner.

1.10. TRAINING

- A. Contractor shall video-record all training sessions. Provide a video recording of each training session on a single DVD. Provide two duplicate DVDs for each training session and distribute one copy to the Owner and one to the Engineer. Provide computer-generated adhesive labels on each DVD. Label each DVD with the training session description, date training occurred, attendees, trainer, contact information, the equipment covered during the training session, and the project title.
- B. Engineer will review their copy for video quality including, but not limited to, picture quality, use of camera angles, and sound recording quality. Video must be clearly audible. If the Engineer deems the video or audio quality as poor, the Contractor shall conduct the training session again (with original attendees present) and re-record the session at no additional cost to the Owner.
- C. Provide a DVD case to hold all training tapes provided for Division 17 specifications.

PART 2 PRODUCTS

2.01. ACCESSORIES

- A. Nameplates
 - 1. Laminated plastic nameplates shall be provided for each instrument in Division 17.
 - 2. Nameplates shall have 5/16-inch high capital, white letters on black background machine engraved. Hang nameplates from process-mounted instruments via metallic chains. Nameplates shall be hung within 12 inches of the equipment.
 - 3. Final wording on nameplate shall be submitted during the shop drawing phase and approved by the Engineer.
 - 4. Nameplates shall be uniformly mounted and of identical form-factor for all equipment that nameplates are provided. Once a nameplate format has been selected, the format shall be utilized for all equipment throughout, thereby excluding providing original equipment manufacturer (OEM) nameplates.
 - 5. Where wire labeling is not conducive to nameplate tagging as specified above, such as in MCC compartments or inside the programmable logic controller (PLC) enclosure, provide wire labeling on computer printed, adhesive tape, and wraparound wiring. Printing that is capable of being rubbed off the wire label is not acceptable.
 - 6. Text on nameplates shall be as follows.
 - a. First Line – Equipment name. Equipment name shall as listed on the Contract Drawings and PLC input/output (I/O) lists.
 - b. Second Line – Equipment designation. Designation shall be in accordance with ISA Standards 5.1 and 5.4 as listed in the PLC I/O lists and on the Contract Drawings.
 - c. Third Line – Wiring destination. Indicate the destination of the wiring (i.e. PLC-1, PLC-2, MCC-PI, etc.).

B. Lightning and Surge Protection (TVSS)

1. Provide lightning and surge protection on the power supply of each instrument provided under Division 17.
2. Provide lightning and surge protection on all analog input and output signal circuits that pass out of doors or are terminated to metallic piping that passes out of doors.
3. TVSS devices mounted on the analog output signal wiring of field-mounted transmitters shall be conduit-mounted utilizing a common chamber, three element, gas tube and clamp incoming transients to a level acceptable to the transmitter it is protecting. Manufacturer shall be Joslyn, Model 1669-01, or equal.
4. TVSS devices protecting analog circuits entering the PLC enclosure shall be din-rail mounted with removable terminal blocks on each side of the device with no interruption of the incoming signal by unplugging the TVSS device. Device shall possess the capability of discharging 1000 Amps evaluated on an 8x20-microsecond waveform. Device shall have an LED to indicate the unit is functioning properly. TVSS device shall be manufactured by M-System Co, Model MDP-24-1, or equal.

PART 3 EXECUTION

3.01. EQUIPMENT MOUNTING

- A. All mounted equipment shall have sufficient clearance from other provided or existing obstructions (including walls, pipes, conduit, or other instruments) to facilitate removal, adjustment, inspection, and calibration of the installed device. Any device that is mounted without sufficient clearance to perform these functions with standard, manufacturer recommended tools shall be removed and remounted at no additional cost to the Owner.
- B. Rotate equipment heads as directed by the Engineer in the punch list for final completion.

END OF SECTION

SECTION 17113

WEB-BASED SCADA SYSTEMS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. The Contractor shall furnish and install a manufacturer-supplied, cellular-based communication system for the purpose of monitoring various equipment from three remote sites. The web-based SCADA system shall be provided complete with all necessary accessories, options, and programming, wired to accommodate all inputs and outputs listed in the Remote Terminal Unit (RTU) input/output (I/O) lists, and ready to communicate via the specified medium(s). In short, this section procures a packaged system including:
 - 1. Manufacturer-supplied RTUs.
 - 2. Enclosures containing manufacturer-supplied RTUs.
 - 3. RTU power equipment and accessories.
 - 4. RTU battery backup.
 - 5. Cellular antennas, mounting masts, and antenna cabling.
 - 6. Software drivers to communicate web-based SCADA data into the plant's traditional supervisory software program.
 - 7. Cellular data-spectrum service plans.
 - 8. Documentation.

1.02. GENERAL REQUIREMENTS

- A. The supplier shall have total responsibility for the entire system performance and compatibility of this section.
- B. For ease of identification, symbols for the various components of the metering system to be furnished and installed are given in the following schedule.

SCHEDULE OF REMOTE TERMINAL UNITS

Pump Station I.D.	RTU Nameplate Designation	Nameplate Designation	RTU Duty
1	Walden Woods Pumping Station RTU	RTU-WWPS	Real-time
2	Jefferson Valley Pumping Station RTU	RTU-JVPS	Real-time
3	Jefferson Park Pumping Station RTU	RTU-JPPS	Real-time

1.03. RELATED SECTIONS

- A. The specifications sections listed below are an integral part of this equipment specification and the Contractor shall be responsible for providing these sections to the equipment suppliers:

1. Section 01300 - SUBMITTALS
2. Section 01600 - MATERIAL AND EQUIPMENT
3. Section 01640 - EQUIPMENT-GENERAL
4. Section 01700 - RECORD DOCUMENTS

1.04. REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- B. NEMA ICS 3 - Industrial Systems.
- C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- D. NFPA 70 - National Electrical Code.
- E. NFPA 79 - Labeling.
- F. Instrumentation Society of America (ISA) - Standards 5.1 and 5.4.
- G. Federal Communication Commission (FCC), Part 15.247.
- H. Underwriters Laboratories (UL) 508.

1.05. DEFINITIONS

- A. System Supplier - The party responsible for all of Division 17 specifications.
- B. Manufacturer-Supplied System - A combination of functional equipment and subsystems furnished (supplied) by an equipment manufacturer specialized in providing such systems. Such systems are installed by the Contractor. When installed in accordance with the manufacturer's requirements, the system becomes fully functional. Such systems are specified as performance-based systems, which mean the manufacturer is responsible for coordinating the compatibility of the supplied equipment such that the system's specified intent may be achieved. It is the Contractor's responsibility to support the manufacturer by installing the equipment and performing in-field testing, troubleshooting, and commissioning.
- C. SCADA - Supervisory control and data acquisition.
- D. RTU - Remote Terminal Unit.
- E. GPRS - General Packet Radio Service. A wireless communication technology commonly used by AT&T for domestic cellular service.
- F. CDMA - Code Division Multiple Access. A wireless communication technology commonly used by Verizon for domestic cellular service.
- G. iDEN - Integrated Digital Enhanced Network. A wireless communication technology commonly used by Nextel (Motorola) for domestic cellular service.
- H. SCADA Node - A computer with an operating system (OS) that facilitates user interaction with supervisory software as well as other software programs that enable the user to manipulate data and generate reports.

- I. RTU I/O Lists – Refer to Tables 17113-1, 17113-2, and 17113-3 at the end of the section.

1.06. SUBMITTALS

- A. Shop Drawings - Submit under provisions of Sections 01300, Submittals, and 01640, Equipment-General. The following submittal material shall be submitted for the Engineer's review and approval prior to fabrication of any equipment. RTUs fabricated prior to the approval of these shop drawings are subject to alteration to conform with the approved shop drawings by the supplier at the supplier's cost.
- B. Shop Drawing Submittal Format
 - 1. Shop drawings shall be in a rigid three-ring binder. If necessary, provide multiple binders.
 - 2. Provide title page on the front and sides of the binder. Title page shall include job name, GHD job number, Contractor(s) job number(s), date, "Division 17 Shop Drawing", Contractor and supplier(s) names, addresses, contact persons, and contact numbers.
 - 3. Contents shall be organized accordingly.
 - a. Table of Contents – List of each section. Provide protruding tabs labeled with the pertinent heading for each section listed in the Table of Contents.
 - b. For each Division 17 specification section, provide the following:
 - 1) Training itinerary.
 - 2) Bill of Materials (BOM) for installed equipment, BOM for spare parts, and BOM for extra materials. Each BOM shall be grouped and identified separately.
 - 3) Equipment information satisfying specifications. Provide protruding tabs for each piece of equipment. Label each tab with the equipment manufacturer.
 - c. AutoCAD Drawings – Include title block, border, page numbers, and supplier job number. CD containing all Division 17 AutoCAD 2014, or higher, *.dwg files. Sheet/drawing titles shall utilize three lines in the title block and are subject to approval, and instructed change, by the Engineer.
 - 4. AutoCAD drawings shall be 11-inch by 17-inch.
 - 5. Shop drawings not containing the appropriate contents or format will be returned without further review.
 - 6. Using AutoCAD 2014, or higher, provide these drawings for each site in the following order. Label all components with manufacturer and complete model numbers on the drawings. Typical drawings are not acceptable.
 - a. For both the RTU and overall enclosure, supply scaled enclosure layout drawings in 11-inch by 17 inch format, detailing locations of all components on the subpanel, door, and all other enclosure faces. Drawing shall display layout of completed assemblies, including, but not limited to, motherboard,

expansion boards, indicating lights, cellular modems, battery backup, power converters, surge protective devices, terminal blocks, disconnect switches, fuses, control relays, receptacles, loop isolators, power supplies, surge suppressors, recorders, acceptable regions for conduit penetrations of both AC and DC wiring separately, and external power. Illustrate handles, hasps, hinges, and dimensions of exterior mounted devices. Identify equipment manufacturer and model numbers on the drawing and cross-referencing with the Bill of Materials.

- b. I/O module detail drawings in 11-inch by 17-inch format, for each I/O module (board) installed in the RTU.
 - c. Include one AutoCAD drawing of the web-based SCADA system network architecture. Detail all RTUs, modems, antennas, host servers, and logical communication hierarchy.
 - d. Provide two copies of all the above specified AutoCAD *.dwg files on CD-ROM. Drawing files must be capable of being used by others and saved to the disk in *.dwg format.
 7. Submit a listing of all the datapoints and datapoint addresses available for this specific project via the provided OPC driver.
 8. Service Plan - Submit a calculated cost of the annual service plan fees, including any and all uplift charges. Itemize costs by site and include an overall total that the Owner will need to pay after the contractor payment period has completed. Itemize all additional charges for expansion boards or options required herein.
 9. Submit the manufacturer's Change Notification Policy and procedure. Document shall detail the manufacturer's documented policy on notifying the client when hardware or services will be changed by the manufacturer.
 10. Contractor shall visit each site location where the RTU is specified to be mounted on a mounting stand on the Contract Drawings identified in the schedule of RTUs.
 - a. Submit color photos of the proposed mounting location of each RTU and antenna mounting location.
 - b. Identify any issues with the installation locations.
 11. Submit a complete copy of all the configuration, or setup, documents the manufacturer will require to be reviewed and completed by the Owner.
- C. Operation and Maintenance Manual - Submit under provisions of Sections 01640 and 01300. The following submittal requirements are to complement the requirements and format set herein.
1. Maintenance, troubleshooting, and replacement of boards and all associated equipment.
 2. All "as built" AutoCAD *.dwg files on CD ROM and 11-inch by 17-inch printed hardcopies.
 3. Warranties - Provide the warranties for the equipment starting the date of activation of the system. Equipment covered, dates of expiration, contacts and procedures to

exercise each warranty, and limitations of warranty shall be explicitly noted. All warranty papers shall be completely filled out by the Contractor with all necessary serial and model numbers.

4. Documented procedures for:
 - a. Requesting hard copies and electronic copies of the Owner's past historical data as collected from the manufacturer's host servers.
 - b. Requesting specific custom queries be run against the historical data and event files collected by the manufacturer's host servers.
 - c. Requesting changes to dialer, report, or display function and appearance.

D. Project Record Documents - Submit under provisions of Sections 01640 and 01300.

1. Revise AutoCAD drawings of individual I/O cards to reflect all scaling. Coordinate with the PLC programmer for each points scaling for RTU-JVPS.
2. Update the Operation and Maintenance Manual AutoCAD, or higher, drawing hardcopies and CD-ROM with the "as-built" drawings.
3. Updated AutoCAD drawings to indicate any changes made during installation or startup of the equipment provided under this section.
4. Updated Bill of Materials reflecting any changes in manufacturers, models, or quantities.
5. Updated Bill of Materials for spare parts supplied.

1.07. QUALIFICATIONS

- A. System Manufacturer - Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
1. The system manufacturer shall provide evidence of, and warrant compliance with, substantially all requirements listed below.
 2. The system manufacturer shall have been in business providing remote facility monitoring and control services through the data side of the cellular system to the municipal water and wastewater industry for at least six consecutive, documentable years.
 3. The system manufacturer shall be the actual manufacturer and operator, or a duly authorized and trained agent of the manufacturing company or a combination of both, who will actually provide, maintain, and warranty the proposed system.
 4. The system manufacturer of the field equipment shall also be the provider of all monitoring-related services associated with the field equipment, and all ongoing service agreements will be with the actual company providing the monitoring service, not a subcontractor or agent.
 5. The system manufacturer shall have a primary central monitoring and control center and a fully redundant, physically separate, backup computer monitoring center. Both

centers shall have the capability of operating all the remote monitoring and control field RTUs independently.

6. The system manufacturer shall offer and provide 24 hours/day, 7 days/week, 365 days/year (24 x 7 x 365) technical support.

1.08. DELIVERY, STORAGE, AND HANDLING

- A. Contractor is responsible for all costs associated with shipping.
- B. Contractor is responsible for preparing the assembled RTUs and associated equipment for shipping and shipping them to the project site.
- C. Deliver, store, protect and handle products to site under provisions of Sections 01600, Materials and Equipment, and Equipment-General.
 1. Shipping to all locations for all equipment provided under this section shall utilize accelerometer or 3 axis dye packets to indicate whether acceleration or deceleration of three times the force of gravity (3G) has been exceeded. If acceleration/ deceleration has been exceeded, Contractor shall pay for disassembly, damage repair, and reassembly of the shipped units. If any damage is apparent from inspection at time of delivery, Contractor is responsible for all costs involved in disassembly, damage repair, reassembly, and additional shipping back to the manufacturer's facility if deemed necessary by Engineer. Accelerometers shall be dye packet devices and shall not be reusable or resettable.
- D. Accept products on site in factory containers unless system is completely integrated into a pre-manufactured panel that has been factory tested. Inspect for damage.
- E. Store products in clean, dry area; maintain temperature to NEMA ICS 1 requirements.

1.09. MAINTENANCE SERVICE

- A. Furnish manufacturer's, or designated authorized representative's, service and maintenance for PLCs a minimum of one year from date of Substantial Completion.
- B. Provide Owner with a toll-free phone number for technical information and assistance on the system indefinitely.
- C. RTU Equipment Replacement During Construction - Contractor shall replace RTU components when directed to do so by the Engineer. Contractor shall provide all costs necessary to return components that are suspect of damage to the manufacturer for testing and are responsible for returning repaired modules and reinstalling in place of the temporary replacement module. When available, temporary replacement modules may be taken from uninstalled spare inventory. When the required temporary replacement modules are not available in the uninstalled spare inventory, Contractor shall obtain the necessary temporary replacement module(s) within 48 hours of directive by the Engineer.

1.10. COORDINATION

- A. Coordinate the compatibility of the power supplies and RTU cards with the new instrumentation, existing systems, and equipment. Coordination shall include, but not be limited to:

1. Power supplies provide powered equipment with adequate voltage and amperage according to the connecting equipment manufacturer's recommendations.
- B. Coordinate instrumentation, communication equipment, and other related equipment with the supplied system to comprise a complete working system.
- C. Contractor shall serve as the liaison between the Owner and manufacturer and take the lead on coordinating the system configuration (setup) documents. Contractor shall include dates on which the documents will be submitted to the Owner on their schedule, and schedule a minimum of four weeks for the Owner to review and complete any necessary configuration documents. Contractor shall assist in providing any additional clarification or instruction the Owner may require to complete the configuration documents.
- D. Contractor shall coordinate all RTU mounting locations and antenna mounting locations on site with the Owner.

1.11. EXTRA MATERIALS

- A. One licensed copy of the OPC software driver as required by the traditional supervisory software system to collect data from the web-based SCADA system's host servers via the internet.
- B. One complete set of cables, software drivers, and other devices as required by RTU manufacturer to configure the RTU locally with a laptop computer.
- C. One complete set of all tools required to service the unit, including instrument screwdrivers, Allen wrenches, and hex wrenches, including the installation and removal of circuit boards.

1.12. SPARE PARTS

- A. Provide the following uninstalled spare parts that are identical to and interchangeable with the original parts. Spare parts shall be furnished in clearly identified containers, protected in accordance with the manufacturer's requirements.
 1. One spare motherboard for each type provided.
 2. One spare expansion board for each type provided.
 3. One spare antenna for each type provided.
 4. Three spare corded plug stepdown transformers as used to step down 120 VAC to the RTUs native power requirements.
 5. Ten spare electronic keys, each with a unique identification.
 6. Two spare backup batteries.
 7. One spare memory battery.
 8. Two spare transformers for each type provided.

PART 2 PRODUCTS

2.01. MICROPROCESSOR-BASED FIELD RTU

A. Data Cellular Radio

1. The RTU shall incorporate a radio that utilizes the data side of any cellular system to transmit the data and alarms monitored, as well as receive manual or automated control commands.
2. Cellular radios from all cellular carriers shall be able to mount in the same mounting port on the motherboard and consequently be field interchangeable by Owner in no more than 10 minutes without the need for specialized equipment or personnel.

B. RTU Enclosure

1. The RTU itself shall be contained within a manufacturer-supplied NEMA 4 enclosure at all sites.
2. All penetrations for conduit entries shall be to the bottom of the enclosure. All fittings shall be water tight with gaskets.

C. UL Approvals - RTU shall be fully UL 508 approved and shall not have approvals "pending."

D. Microprocessor Feature Updates - Microprocessor features such as data transmission rates shall be able to be adjusted through the cellular system with no site visits necessary.

E. RTU Inputs and Outputs

1. RTU shall have a minimum of eight digital inputs. These eight inputs must have end-of-line resistor supervision, or similar supervision, that can detect normal alarm trip inputs and detect input wiring disconnection/shorting as a distinctly different signal and report.
2. RTU shall have an optional expansion board with a minimum of an additional eight digital inputs.
3. The digital inputs shall be user selectable as normally open (NO) or normally closed (NC).
4. At least three of the RTU digital inputs must be capable of being programmed to record and report pump run times in 1-minute increments or less as indicated by a relay opening and closing. If only two pumps are monitored then the unit shall also be capable of recording and reporting simultaneous pump run times.
5. RTU shall have built-in alarms for input wiring fault, AC failure, communication failure and low battery detection.
6. RTU shall have a minimum of two analog inputs measuring 4-20 mA or 1-5 VDC at 10 bit resolution with four alarm thresholds per input.
7. RTU shall have an optional expansion board with a minimum of an additional four analog inputs.

8. RTU shall have an optional expansion board with a minimum of two pulse counter inputs.
9. RTU shall have an electronic key reader input to monitor on-site personnel. The RTU shall utilize an audible tone to verify key reading. Each key in the system shall provide unique identification of the key holder when they are on site vs. when "someone" is on site.
10. RTU shall have a minimum of three digital normally open or closed output relays rated at 1/2 ampere at 120VAC.

F. Status LEDs on Motherboard

1. LEDs above each digital input shall visually display the status of the digital input.
2. Radio signal strength shall be displayed by at least eight LEDs in 5 db increments between -75db and -110db to facilitate accurate antenna placement.
3. Operational and diagnostic status of at least eight criteria shall be displayed by individual LEDs.

G. Power Requirements

1. The RTU shall be powered by 120 volts AC and have a built-in battery backup capable of keeping the RTU powered for 30 hours in case of primary AC failure.
2. All terminations inside the RTU enclosure shall be low voltage AC or DC (28 volts or less).

2.02. COMMUNICATION LINKS

A. Communication System - Wireless communication links shall be through the data side of the cellular system. The voice side of the cellular system and satellite-based links are not acceptable.

B. Cellular Carriers

1. The submitting company shall have direct relationships with the cellular companies and shall not use third parties to affect data transport through the cellular companies.
2. The RTU shall have field interchangeable data cellular radios that shall communicate through third generation GSM (AT&T), or CDMA (Verizon) to maximize the likelihood of reliable communication.
3. If a GSM (AT&T) radio is used, the submitting company shall have PTCRB approval from AT&T to use the radio.
4. The Owner shall not be required to purchase cellular data contracts direct with the carrier(s).

C. Security Protocols

1. All the cellular radios shall make continuous, secure socket connections (SSL) from the radio, through the cellular system, to the submitting company's servers and web pages.

2. The RTU shall utilize a transmission scheme that encrypts the transmitted data utilizing a 128-bit encryption method that meets or exceeds the advanced encryption standard (AES). The 128-bit AES encryption shall be at all stages of data transfer and storage.
3. The cellular radios shall all have private IP addresses.
4. The submitting company shall have established multiple private gateways through the cellular system, completely behind firewalls, with the submitted cellular providers.

D. Data Transmission Rates

1. All alarms shall be transmitted immediately upon occurrence; delays may be added by the Owner at the RTU or the supplier's website.
2. The RTU shall be capable of transmitting non-alarm data continuously and transmit all digital state changes on an as-occurs basis (Real-Time); analog and pulse inputs will be transmitted at least once every 2 minutes. The Owner may choose to utilize any of three types of RTU at any proposed site. The Owner shall be able to change amongst the three transmission rates over the air without any physical hardware changes.
3. The RTU will have an effective, continuous, transfer rate of at least 19,200 baud.

E. Communication Link Structure and Performance Criteria

1. The communication link structure shall be a secure socket connection from the RTU through the cellular system to the supplier's servers, and it shall be a continuous connection, 24 x 7 x 365.
2. Receipt of all data sent from the RTU to the server center shall be acknowledged by the server center back to the RTU in real time for every data packet sent. Such structure is called end-to-end data acknowledgement.
3. The SSL shall be from the RTU through the cellular system direct to the system supplier; no third parties shall receive the data from the cellular carrier and then pass it to the system supplier.
4. The above-mentioned SSL shall be monitored for end-to-end uptime with interruptions as small as 15 seconds being captured.
5. Both end-to-end uptime and the number of times the link was disconnected/reconnected shall be reported for each RTU continuously with daily summary statistics posted on the Owners website. All end-to-end uptime history of each RTU shall be available on the Owners website from when it first powered up to the present. Weekly management summaries of each RTU's end-to-end uptime shall be automatically emailed to the Owner.

2.03. CENTRALIZED SERVER CENTERS: HARDWARE AND SOFTWARE REQUIREMENTS

A. Server Center Physical Structure

1. The server center housing shall be able to withstand a direct hit from at least a F-3 tornado and continue operations.

2. The server center housing shall have at least six separate and redundant, on-site power generating facilities to back up the local utility power such that there can be stand-alone operation of the center for at least 24 hours.
 3. Entrance to the facility shall be controlled by armed guards at all entrances 24 x 7 x 365.
- B. Server Center Redundancy Structure - The server center shall house the manufacturers' completely redundant and hot linked:
1. Servers.
 2. Interconnects.
 3. Databases.
 4. Power supplies.
 5. Inbound cellular connections.
 6. Outbound internet hubs and providers.
- C. Database Structure
1. All data from the RTUs shall be held for Owner access indefinitely.
 2. All databases shall be backed up and archived daily.
 3. The databases shall be capable of interfacing and transferring, on a continuous basis, all RTU data to an OPC-compliant database for access by other OPC-compliant human-machine interface (HMI) software packages.
 - a. Client side OPC software shall run as an executable or NT service.
 - b. Client side OPC software shall, on a user-definable interval, establish a socket connection to static IP address(s) at providers' server center.
 - c. OPC software shall retrieve all changed OPC tag values and close the socket. OPC software shall be set up so the Owner's OPC computers' firewalls may be programmed to only allow Internet traffic to/from the designated service providers' IP addresses and port numbers.
 - d. OPC software shall allow for multiple Owner OPC software packages to establish, concurrently, OPC connections so as to provide for redundant HMI database operation at Owner locations. The OPC software shall have documented compatibility with GE iFIX and Wonderware (supervisory software packages).
 - e. Owner's firewalls will not be programmed to accept socket connections.
- D. System Security - All data links shall be behind firewalls, 128-bit encrypted, and never accessible, addressable or viewable via the general public Internet.
- E. System Software - The system software shall collect and display:

1. Alarms including individuals accepting alarms.
2. RTU electronic key reads with user names, time of read, and site name.
3. Pump running status.
4. Pump run times with historical graphs.
5. Individual pump flow estimates.
6. Automatic daily analysis of pump runtimes for abnormalities with automatic Owner notification of such abnormalities.
7. Pump starts with hourly analysis of excess pump starts with automatic notifications of excess pump starts.
8. Minute-by-minute radio health checks with automatic notification of non-reporting or poorly reporting RTUs.
9. Performing and displaying volumetric inflow/outflow calculations from RTU-supplied data for each pump cycle as they occur. Such volumetric calculations will utilize real-time pump start/stop data with simultaneously gathered level transducer data to perform the inflow/outflow and pump GPM calculations.

2.04. ALARM SYSTEM STRUCTURE AND SOFTWARE

A. Alarm Delivery Formats

1. Alarms shall be delivered in the following formats:
 - a. Phone (voice call), fax, pager (numeric or alphanumeric, short alpha or long alpha format), text message, email, or any combination of the above simultaneously.
2. Alarms shall be able to be acknowledged by phone, text message, two-way pager, email or on the Owner's website.
3. Voice alarm acknowledgement shall be adjustable to be able to mimic the format of dialers.
4. Alarms will be called out on alarm and upon return to normal conditions.
 - a. Return to normal alarms can be adjusted to call the alarm callout group or a different callout group.

B. Alarm Callout Formats

1. Alarm callout groups shall be able to be setup to automatically switch between callout groups at different hours of the day and/or different days of the week.
2. Alarm callout groups shall be able to have multiple teams within each group to easily facilitate rotation of teams of on-call personnel.

C. Alarm Message Formats

1. All alarms shall have the alarm condition, time, alarm location and pump status at the time of the alarm in each message.
2. Alarm message format shall be adjustable to include just the above information when calling a phone where it is known who will answer the phone, or be adjustable to add an introductory message asking for a specific person when calling a phone where it is not known who will answer the phone (like a home phone).
3. Alarms shall be able to be delivered individually or be able to be grouped into one message so that multiple, simultaneous alarms (like AC Fail at multiple sites) can be delivered and acknowledged in one phone call.

D. Alarm Dispatch Logs - Each alarm shall have a full log of each notification attempt of that alarm documenting the following:

1. Date, time, and alarm condition.
2. If each notification attempt was a success or failure and, if an attempt was a failure, the reason (i.e., line busy, call dropped, etc.).
3. A recording of each voice notification attempt so the specific reason for a notification failure can be known.
4. Date, time, and name of person who acknowledged the alarm.

E. Voice Alarm Delivery Capacity - Manufacturer shall provide at least 20 outbound lines to deliver voice alarms so as not to delay delivery of current alarms.

2.05. REMOTE DATA ACCESS

A. Remote Data Access Format

1. Data monitored by the system shall be remotely accessed by a simple web browser. The system shall provide individual web pages for the User to access via any web browser.
2. To access the web pages, the User shall enter a Username and Password.
 - a. The User can set up any of three levels of access to the web pages:
 - 1) Read Only - Can see but cannot make any changes.
 - 2) Read/Write - Can see and can make changes.
 - 3) Read/Write/Control - Can see, make changes, and effect control functions.
3. The system supplier shall provide two separate websites for the Owner. One shall be designed to be viewed on a traditional laptop or desktop computer. The other shall be designed to be viewed on a web-enabled cell phone or PDA. Website shall facilitate trending of data, and will be designed to minimize the data sent so as to minimize the page loading times and size of the data plans necessary to view the site on a web-enabled cell phone or PDA.

4. In addition to the above websites, the Owner shall be provided, at no additional charge, with a customizable software interface that will display real-time status and graphic trending of data collected by the RTU.
 - a. The software shall be downloadable from the customer service website.
 - b. The software shall automatically update itself every time the User accesses the software.
 - c. The software shall require NO programming to customize.

- B. Remote Access Security - In addition to the Username and Password structure described above, all access of the User website shall be logged. Such logging data to included date, time and duration of access, Username and Password of user to access the site, and IP address of the accessing computer. The log will be accessible through the User website.

- C. Automated Administrative Reports and Alerts
 1. The User website shall produce and automatically deliver weekly reports which summarize alarms and responses, pump runtimes and flow estimates, weekly end-to-end uptime percentages of each RTU, and all electronic key uses at the RTU sites.
 2. The website shall be capable of sending two different categories of notifications: alarms and alerts. Alarms are for conditions that the User decides they want to be notified about immediately. Alerts are conditions that need attention, but are not so time sensitive that they cannot wait till the next morning.
 - a. The alarms callout list and the alert callout list shall be able to be separate and distinctly different.
 3. The user website shall analyze daily pump run times as compared to a moving 30-day average of that pump's most recent runtimes and automatically alert the User if the pump runs outside the normal runtime variation pattern.
 4. The User website shall analyze hourly pump runtimes and automatically compare it to two User set thresholds. If the alert threshold is exceeded, an alert will be sent the following morning. If the alarm threshold is exceeded, an alarm will send immediately.
 5. The User website shall send an alert the first morning that units are in communications fail even though alarms have been sent at the time the RTUs went off-line. Such alerts are a reminder to management that they still have units that are off line.

2.06. RTU LOCATIONS

- A. RTUs shall be located at the remote sites listed in the RTU schedule at the end of this section and shall be mounted in accordance with the Contract Drawings and field verified with the Owner. Site addresses are listed on the Contract Drawings. Field verify remote site locations and existing conditions.

2.07. RTU I/O LIST

- A. RTUs shall be capable of monitoring all signals identified in Tables 17113-1, 17113-2, and 17113-3. All signal wiring shall be terminated within the RTU on the module points identified on the I/O lists.

2.08. ADDITIONAL FEATURES

- A. Enclosures shall be latching, gasketed, and pad-lockable, 28 keyed-alike padlocks.
- B. Provide DIN-rail mounted DC power supplies, terminal blocks, and DIN-rail as necessary.
- C. Provide all wiring, terminations, and equipment necessary within the enclosure to interconnect the components to provide a complete and functional system.

2.09. ANTENNAS

- A. General Description - Provide low profile antennas, low-loss antenna cabling, and associated appurtenances as required to achieve the maximum possible signal strength at each RTU location.
- B. Provide a low profile antenna for each RTU as required to achieve the overall communications requirements of the system (refer to RTU communication system quality requirements). Antennas shall be dual band tamper resistant and suitable for outdoor environments.
- C. Antennas shall be attached as directed by the Owner and mounted to existing structures, such as buildings and other Client-owned poles. Particular attention shall be given to the correct installation of the antennas to give adequate protection from nearby lightning strikes.
- D. System supplier shall provide all mounting equipment as required to support the antennas at the elevations and orientations required. Provide adequate support and protection for transmission lines and be provided complete with all necessary mounting accessories.
- E. Cable
 - 1. Adequate lengths of low loss cable shall be provided for connection to the antenna to the radio transceiver at each site.
 - 2. Transmission line shall be terminated only with connectors rated for the required service.
 - 3. Installer is responsible for cable damage due to neglect of manufacturer stated bending radius.
- F. Installation
 - 1. Provide 316 stainless steel mounting hardware, including, but not limited to, nuts, bolts, washers, lock-washers, and U-bolts.
 - 2. Provide all hardware necessary to mount the antenna to the outside of the manufacturer's enclosure.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify that required utilities are available, in proper location, and ready for use.

- C. Beginning of installation means installer accepts conditions.
- D. Verify grounding of system.

3.02. PANEL FABRICATION

- A. Install in accordance with manufacturer's instructions.
- B. Wire Labeling
 - 1. All wiring shall be labeled within 1.0 inch of stripped sheathing.
 - 2. Wire label text shall be visible in its installed location without manual manipulation.
 - 3. Wire shall carry the same wire number for an entire contiguous segment.
 - 4. Wires shall be labeled via machine-generated print on polyester or polyvinyl film.
 - 5. In the event that labels begin to fall off or text begins to smudge, or otherwise begin to become illegible, within one year of panel delivery to the site, the Contractor shall remove all labels within the panel with new labels at the Contractor's own expense. In this case, the Engineer must approve replacement labels.

3.03. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. All electrical work performed in fabrication and installation of RTU systems shall be in full accordance with the requirements as shown on the Contract Drawings.
- C. Contractor is responsible for positioning all antennas and testing communication strength in the field.
- D. Cellular Communication Requirements With Host Servers - Each RTU shall communicate with the manufacturer's host servers with a 92 percent hit rate of successful communication transactions within a 24-hour period for 15 consecutive days. Should this quality stipulation not be obtained one month after the last RTU is brought on-line, the system supplier shall provide replacement RTUs, labor, wiring, power, antenna mounting modifications, and all necessary supporting equipment at their own expense until this stipulation is obtained during a 24-hour period for 15 consecutive days.

3.04. SYSTEM PROGRAMMING

- A. All RTU programming shall be performed by the manufacturer under this specification section. As a minimum, programming shall be complete and shall include:
 - 1. Complete configuration of the web access interface.
 - 2. Web interface for full display, as used by desktop computers, and a PDA formatted interface.
 - 3. Configuration of all adjustable alarm setpoints.
 - 4. Runtimes and start counts for each equipment runtime input.

5. Configuration of analog signal scaling and configuration of engineering units.
 6. Complete dialer system configuration, including customized contact lists, alarm messages, and dialer function.
 7. Configuration of all user-configurable parameters as coordinated with the Owner.
 8. Configuration of all names, site descriptions, and alarm descriptions as agreed upon with Owner.
 9. Configuration of all reports as agreed upon with Owner.
 10. Trend configuration
- B. Provide unlimited technical support over the duration of the project to the programmer of the traditional SCADA system for assistance with configuring the OPC driver required by the supervisory software to collect data from the web-based SCADA system's host servers via the internet.

3.05. SYSTEM VALIDATION

- A. Scope of Testing
1. All signals specified in the I/O lists.
 2. All signals added during the shop drawing and/or construction phases.
 3. Cellular communications to the hosted website.
- B. Prerequisites to commencing system validation:
1. Equipment to be tested shall be installed in its final location.
 2. Equipment to be tested shall be powered by its permanent and final source of power.
 3. Field wiring shall be pulled from the field devices to the equipment to be tested and shall be encased in the appropriate conduits.
 4. Field wiring shall be labeled in the field, as well as inside the equipment to be tested.
 5. Field devices are installed, commissioned as specified, powered, and all terminations have been completed.
 6. All pending field orders associated with the equipment and workmanship of the systems to be tested shall be resolved.
- C. Validation
1. The Contractor shall develop and populate a worksheet for each Remote Site identified in the Schedule of Remote Terminal Units with all signals to be tested. Each worksheet shall indicate the Pump Station I.D, Station Name, and Address.
 - a. All worksheets for validation shall be submitted to the Engineer for approval at least two weeks in advance of System Validation. System Validation shall not commence prior to approval.

2. The Contractor shall Complete all testing of each signal and identify the person(s) performing the test.
 3. Each signal shall be verified by the Contractor to ensure that the interconnecting wiring is complete and correct, and connected to the proper terminals at the points of termination.
 4. Removal of a wire from a termination point within a previously tested circuit nullifies any previous testing of the circuit and necessitates retesting of the circuit following the complete point-to-point testing requirements in its entirety.
- D. Method of Testing – In general, each signal shall be tested
1. Discrete Inputs – Manipulate the field element to evoke the signal excitation (change of state) indicative of the wired signal. Signals may jumped only where it is impossible to evoke signal excitation without damaging or disassembling the field device in a manner not approved by the device manufacturer. For example, equipment shall be started/stopped, floats shall be manipulated, alarm outputs shall be forced at the instrument using self-test features. Verify signal excitation at the RTU and at the Owners Hosted Website.
 2. Analog Inputs – Coordinate with the Owner, to cause wet well level to increase and decrease. Verify accurate reading via measuring depth in the wet well with a pole. Verify signal values using the Owner’s Hosted Website. Verify signals read positive process values, i.e. verify polarity
 3. All Alarm and data shall be validated in through the manufacturer’s website.
 - a. Alarms shall call out with the appropriate setpoints.
 - b. Derived data shall be witnessed thru the website.
 - c. Display of all data shall be witnessed thru the website.
 4. System validation shall not be considered complete until each signal has been successfully tested and items above are satisfied.
- E. Schedule – System validation shall occur on the same day as commissioning of the RTU. Contractor shall coordinate system validation two weeks in advance with the Owner and Engineer.

3.06. TRAINING

- A. Provide systems demonstration under provisions of Sections 01600 and 01640.
- B. Manufacturer shall physically visit the Town of Yorktown and provide one 8-hour training session to the plant staff and Engineer on use, maintenance, and development within the web-based SCADA system.
- C. Training shall include, but not be limited to, demonstration of the following:
 1. Alarm function.
 2. Dialer function.

3. Accessing reports.
 4. Managing dialer system.
 5. Demonstrate changing of all setpoints.
 6. Demonstrate actions upon alarm.
 7. Demonstrate actions upon power loss.
 8. Replacement of RTU components. Bring demonstration unit and perform actual replacements
 9. Maintenance topics.
- D. Coordinate training date with Engineer. Provide training materials to a minimum of 10 attendees.

3.07. CERTIFICATION OF TESTING

- A. Unless waived in writing by the Engineer, all tests shall be made in the presence of a duly authorized representative of the Owner. When the presence of such representative is so waived, certified results of the tests made and the results thereof shall be furnished by the Contractor.
- B. All tests shall be performed in the presence of the Owner. Written notice of all tests shall be given the Owner at least two weeks in advance.

3.08. TEST EQUIPMENT

- A. The Contractor shall furnish all instruments and a qualified engineer to properly perform all tests required.

3.09. FACTORY TRAINED SUPERVISION

- A. The Contractor shall include in his work the providing of necessary factory trained supervision to check over equipment for proper functioning before putting the equipment into operation as may be required by these specifications. This shall include establishing a simulated fault on checking out the coordination of the protective devices.
- B. Point-to-point test of all wiring.
- C. Functional test of all equipment, modes, alarms, controls.

END OF SECTION

Module	I/O Type	Module Point	Description	Signal Location	Signal Source	Remarks
Base Board	Digital Inputs					
	DI-1	1	Pump 1 Running	Pump Station	Pump CP	
	DI-2	2	Pump 2 Running	Pump Station	Pump CP	
	DI-3	3	Pump 1 Failure	Pump Station	Pump CP	
	DI-4	4	Pump 2 Failure	Pump Station	Pump CP	
	DI-5	5	High Level Float	Pump Station	Pump CP	
	DI-6	6	Low Level Float	Pump Station	Pump CP	
	DI-7	7	ATS on Utility Power	Pump Station	Pump CP	
	DI-8	8	ATS on Generator Power	Pump Station	Pump CP	
	Analog Inputs					
	AI-1	1	Wet Well Level	Pump Station	Pump CP	
	AI-2	2	<i>Installed Spare Point</i>			
	Relay Outputs					
	R-1	1	<i>Installed Spare Point</i>			
R-2	2	<i>Installed Spare Point</i>				
R-3	3	<i>Installed Spare Point</i>				
Digital Expansion Board	Digital Inputs					
	DI-1	1	ATS Failure	Pump Station	Pump CP	
	DI-2	2	Generator Running	Pump Station	Pump CP	
	DI-3	3	Generator Failure	Pump Station	Pump CP	
	DI-4	4	Back-up float control panel on	Pump Station	Pump CP	
	DI-5	5	Generator Low Fuel Level	Pump Station	Pump CP	
	DI-6	6	<i>Installed Spare Point</i>			
	DI-7	7	<i>Installed Spare Point</i>			
	DI-8	8	<i>Installed Spare Point</i>			

Module	I/O Type	Module Point	Description	Signal Location	Signal Source	Remarks
Base Board	Digital Inputs					
	DI-1	1	Pump 1 Running	Pump Station	Relay in PLC Enclosure	
	DI-2	2	Pump 2 Running	Pump Station	Relay in PLC Enclosure	
	DI-3	3	Pump 3 Running	Pump Station	Relay in PLC Enclosure	
	DI-4	4	Pump 1 Failure	Pump Station	Relay in PLC Enclosure	
	DI-5	5	Pump 2 Failure	Pump Station	Relay in PLC Enclosure	
	DI-6	6	Pump 3 Failure	Pump Station	Relay in PLC Enclosure	
	DI-7	7	Wet Well Float Level High	Pump Station	Relay in PLC Enclosure	
	DI-8	8	Grinder Running	Pump Station	Relay in PLC Enclosure	
	Analog Inputs					
	AI-1	1	Influent Flow	Pump Station	Signal Isolater in PLC Enclosure	
	AI-2	2	Wet Well Level	Pump Station	Signal Isolater in PLC Enclosure	
	Relay Outputs					
R-1	1	<i>Installed Spare Point</i>				
R-2	2	<i>Installed Spare Point</i>				
R-3	3	<i>Installed Spare Point</i>				
Digital Expansion Board	Digital Inputs					
	DI-9	1	ATS on Utility Power	Pump Station	Relay in PLC Enclosure	
	DI-10	2	ATS on Generator Power	Pump Station	Relay in PLC Enclosure	
	DI-11	3	Ultrasonic Failure	Pump Station	Relay in PLC Enclosure	
	DI-12	4	Backup Float Control Panel System On	Pump Station	Relay in PLC Enclosure	
	DI-13	5	Grinder Failure	Pump Station	Relay in PLC Enclosure	
	DI-14	6	PLC Fault	Pump Station	PLC-JVPS	
	DI-15	7	Common Pump Station Alarm	Pump Station	PLC-JVPS	
DI-16	8	Generator Running	Pump Station	Relay in PLC Enclosure		

Module	I/O Type	Module Point	Description	Signal Location	Signal Source	Remarks
Base Board	Digital Inputs					
	DI-1	1	Pump 1 Running	Pump Station	Pump CP	
	DI-2	2	Pump 2 Running	Pump Station	Pump CP	
	DI-3	3	Pump 1 Failure	Pump Station	Pump CP	
	DI-4	4	Pump 2 Failure	Pump Station	Pump CP	
	DI-5	5	High Level Float	Pump Station	Pump CP	
	DI-6	6	Low Level Float	Pump Station	Pump CP	
	DI-7	7	ATS on Utility Power	Pump Station	Pump CP	
	DI-8	8	ATS on Generator Power	Pump Station	Pump CP	
	Analog Inputs					
	AI-1	1	Wet Well Level	Pump Station	Pump CP	
	AI-2	2	<i>Installed Spare Point</i>			
	Relay Outputs					
	R-1	1	<i>Installed Spare Point</i>			
R-2	2	<i>Installed Spare Point</i>				
R-3	3	<i>Installed Spare Point</i>				
Digital Expansion Board	Digital Inputs					
	DI-1	1	ATS Failure	Pump Station	Pump CP	
	DI-2	2	Generator Running	Pump Station	Pump CP	
	DI-3	3	Generator Failure	Pump Station	Pump CP	
	DI-4	4	Back-up float control panel on	Pump Station	Pump CP	
	DI-5	5	Generator Low Fuel Level	Pump Station	Pump CP	
	DI-6	6	<i>Installed Spare Point</i>			
	DI-7	7	<i>Installed Spare Point</i>			
DI-8	8	<i>Installed Spare Point</i>				

SECTION 17300

ULTRASONIC LEVEL SENSORS

PART 1 GENERAL

1.01. DESCRIPTION OF WORK

- A. The Contractor shall furnish and install, ready to operate, the following level sensing systems, complete with all necessary accessories to monitor level as indicated herein in compliance with the following specifications and as shown on the Contract Drawings.
 - 1. It is a requirement of this specification that the elements of the system be provided by a single supplier. This supplier shall have total responsibility for the equipment and services specified in this section, as well as all other Division 17 specifications.
 - 2. For ease of identification, designations for the various components of the metering systems to be furnished and installed are given below:

TABLE 17300-1

SCHEDULE OF ULTRASONIC OPEN CHANNEL FLOWMETERS

Service Nameplate Designation	Equipment Designation	Output
Influent Screenings Parshall Flume Flow	FIT-1101	Flow in mgd

1.02. RELATED SECTIONS

- A. Section 01300 - SUBMITTALS
- B. Section 01600 - MATERIAL AND EQUIPMENT
- C. Section 01640 - EQUIPMENT GENERAL
- D. Section 16055 - ELECTRICAL WORK
- E. All Division 17 Specifications

All electrical equipment and wiring shall be in full compliance with Division 16, Electrical Specifications.

1.03. REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- B. NEMA ICS 3 - Industrial Systems.
- C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- D. NFPA 70 - National Electrical Code.

1.04. SUBMITTALS

- A. Shop Drawings - Submit under provisions of Sections 01640 and 01300.
 - 1. Refer to Section 17000 for shop drawing format and content.
 - 2. Scaled AutoCAD drawings illustrating the actual mounting locations for each transmitter. Indicate centerline of the ultrasonic beam, and any nearby obstructions.
 - 3. Scaled AutoCAD drawings illustrating the actual mounting locations for each capacitance probe. Indicate the transmitter location, probe location, and the distance from the probe tip to the floor.
- B. Operation and Maintenance Manual - Submit under provisions of Sections 01640 and 01300.
 - 1. Refer to Section 17000 for operation and maintenance manual format and content.
- C. Project Record Documents - Submit under provisions of Sections 01640 and 01300.
 - 1. Refer to Section 17000 for project record documents format and content.

1.05. COORDINATION

- A. Contractor is responsible to verify with the supplier that the ultrasonic transducer and transmitter are mounted in locations that do not compromise their integrity. Echo obstructions (tank wall, mixer, ladder rungs, etc.) and temperature limitations shall be considerations. Any such deviation from that which is specified shall be brought to the Engineer's attention during shop drawing submittals.

1.06. WARRANTY

- A. Two-year warranty covering the transmitter and transducer.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. The level sensing equipment shown in Table 17300-1 shall be the following or equal:
 - 1. Transmitter - Siemens Model Hydromanger 200 or Pulsar Ultra Series.

2.02. EQUIPMENT DESIGN, TABLE 17300-1

- A. Ultrasonic Open Channel Flow Transmitters
 - 1. The system electronics for the level transmitter shall measure and convert the time lapse between transmitted and received ultrasonic signals to calculate level through a flume. The transmitter shall utilize a programmable head versus flow curve of up to 16 points to define flow rate within the accuracy specified herein.
 - 2. The electronics shall also compensate the liquid level signal for the time delay variation caused by temperature changes.

- a. Level transmitter shall transmit 4 mADC at zero flow and 20 mADC at maximum flow. Maximum flow shall be field adjustable.
- 3. The transmitters shall be capable of sending its output signal into a load of 500 ohms.
- 4. Operating temperature range of the electronics shall be -20 to 50 degrees C (-4 to 122 degrees F).
- 5. Memory shall employ a 3 volt battery such that configuration parameters and alarm setpoints are not lost upon power loss. A backup capacitor shall be utilized to maintain memory during battery replacement.
- 6. Wall-mounted polycarbonate NEMA 4X enclosure.
- 7. Configuration and interrogation shall be performed using integral pushbuttons with user prompts through an integral digital display. Shall also be configured by an infrared intrinsically safe handheld HART communicator.
- 8. Echo profiling and false echo rejection using diagnostic software.
- 9. Field configurable to drive 4-20 mA output underspan (3.8 mA) or overspan (22.5 mA) upon failure.
- 10. Integral digital display field configurable to read in engineering units, including gpm and mgd. Configure to display units shown in Table 17300-1. The 4-20 mA output shall be directly proportional to the flow.
- 11. Five multi-purpose relays consisting of Form "C", rated 5 amps at 240 VAC non-inductive. Configure one Form C to energize upon Loss of Echo.

B. Performance Requirements

- 1. The systems shall have accuracy of ± 1 mm/m with calculated error less than 0.02 percent.
- 2. Blanking distance shall not exceed 10 inches.
- 3. Resolution of transmitter display – 0.2 mm (0.007 inch)
- 4. Resolution of transmitter analog output shall be no greater than 5 micro amps.
- 5. Power Requirements – 120 VAC, 20 watt draw maximum.

2.03. ACCESSORIES

- A. Nameplates - Refer to Section 17000. Wording of nameplate shall be as specified in Table 17300-1.
- B. Mounting Hardware
 - 1. Provide stainless steel mounting hardware in accordance with the manufacturer's suggestion to mount equipment in locations as described in the Contract Documents. All bolts shall be epoxy grouted in concrete. Provide transducer wiring in rigid conduit from the transmitter to the mounting surface of the mounting bracket. Provide

3/4-inch flexible conduit from the mounting surface of the mounting bracket to the transducer mounting location.

2. Provide Siemens, Model FMS-220 Extended Channel Bracket mounting kits, or the supplied manufacturer's equal, for FIT-1101.
- C. Cabling - Provide power, and signal, cable and conduit to locate transmitters in locations listed in Table 17300-1 and the Contract Documents.
- D. Transducer Cabling - Provide manufacturer-supplied cabling in contiguous lengths between each transducer and the associated transmitter. Splices are not acceptable in lengths less than 300 feet unless otherwise specified on the Contract Drawings.
- E. Lightning and Surge Protection - Provide lightning and surge protection for the equipment listed in Table 17300-1.
- F. Hand-Held Programming Devices - Provide one for each transmitter provided in Table 17300-1. Provide one for each transmitter provided in Table 17300-1.

2.04. CONTROLS

- A. All electrical equipment and wiring shall be in full conformance with Division 16, Electrical Specifications.
- B. Refer to Contract Drawings for wiring requirements.

PART 3 EXECUTION

3.01. INSTALLATION

- A. Install in accordance with manufacturer's requirements.
- B. All electrical work performed in fabrication and installation of the transmitters shall be in full accordance with the requirements of the Division 16 specifications.
- C. Mount all equipment provided herein in accordance with the Contract Drawings.

3.02. MANUFACTURER'S OR SYSTEM INTEGRATOR'S FIELD SERVICES

- A. Final Acceptance - Include 1/2 day for a manufacturer authorized service representative to test equipment to demonstrate that:
 1. The transmitter and transducer has been properly installed, properly calibrated, and is functioning as specified.
 2. Configuration and setpoints are not lost upon power loss. This shall be tested by disconnecting the transmitter from power for 30 minutes.

Profile echo using manufacturer's diagnostic software and suppress all undesirable return echos.

Configure internal failure to drive signal overspan or underspan as directed by the Engineer or Owner in the field. Prior to manufacturer's representatives startup services, the unit shall be

configured to drive the signal to a value that is safe for personnel, safe for adjoining equipment, and appropriate for the process which may not, in select cases, be to stop the process.

- B. Installation - Include one day for a manufacturer authorized service representative to verify proper mounting of the equipment, including mounting technique, mounting surface, and functional location.

Verify acceptable venting for measurement in closed vessels.

- C. Training - Provide one day of instruction to be conducted at the project site with a manufacturer's representative. Notify the Engineer and Owner in writing a minimum of two weeks in advance. Training shall include calibration, troubleshooting, and maintenance.

3.03. CERTIFICATION OF TESTING

- A. Unless waived in writing by the Engineer, all tests shall be made in the presence of a duly authorized representative of the Owner. When the presence of such representative is so waived, certified results of the tests made and the results thereof shall be furnished by the Contractor.
- B. All tests shall be performed in the presence of the Owner. Written notice of all tests shall be given the Owner at least two weeks in advance.
- C. Final Acceptance - Manufacturer's representative shall be at the project site for 1/2 day to verify that the equipment meets the specification requirements per this section.

END OF SECTION

SECTION 17375

LEVEL MEASUREMENT (SUSPENDED PRESSURE TRANSDUCER TYPE)

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. The Contractor shall furnish and install, ready to operate, the following level sensing systems, complete with all necessary accessories to monitor level as indicated herein in compliance with the following specifications and as shown on the Contract Drawings.
 - 1. It is a requirement of this specification that the elements of the system be provided by a single supplier. This supplier shall have total responsibility for the equipment and services specified in this section, as well as all other Division 17 specifications.
 - 2. For ease of identification, designations for the various components of the metering systems to be furnished and installed are given below:

TABLE 17375-1

SCHEDULE OF SUSPENDED PRESSURE TRANSDUCERS

Service Nameplate Designation	Equipment Designation	Approximate Span	Output
Jefferson Valley Pump Station Wet Well Level	LT-1001	0 – 9 feet	Feet

1.02. RELATED SECTIONS

- A. Section 01300 - SUBMITTALS
- B. Section 01600 - MATERIAL AND EQUIPMENT
- C. Section 01640 - EQUIPMENT-GENERAL
- D. Section 16055 - ELECTRICAL WORK
- E. All Division 17 Specifications

All electrical equipment and wiring shall be in full compliance with Division 16 Electrical Specifications.

1.03. REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- B. NEMA ICS 3 - Industrial Systems.
- C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- D. NFPA 70 - National Electrical Code.

1.04. SUBMITTALS

- A. Shop Drawings – Submit under provisions of Sections 01640 and 01300.
 - 1. Refer to Section 17000 for shop drawing format and content.
 - 2. Scaled AutoCAD drawings illustrating the actual mounting locations for each transmitter. Indicate dimensions of mounting area, centerline of the transducer cable, distances from the centerline of the transducer cable and the walls, and any nearby obstructions. Indicate distance from transducer to floor.
- B. Operation and Maintenance Manual – Submit under provisions of Sections 01640 and 01300.
 - 1. Refer to Section 17000 for operation and maintenance manual format and content.
- C. Project Record Documents – Submit under provisions of Sections 01640 and 01300.
 - 1. Refer to Section 17000 for project record documents format and content.

1.05. WARRANTY

- A. Two-year warranty covering the transmitter and transducer.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. The suspended pressure transducer-type level sensing equipment shown in Table 17375-1 shall be the following or equal:
 - 1. Endress+Hauser, Model Deltapilot S.
 - 2. Ametek, Model Levelmate with model 575 level transmitter.

2.02. EQUIPMENT DESIGN

- A. Pressure Sensors/Transducer
 - 1. Sensor shall be housed in a 316 stainless steel housing and shall be suspended less than 1 foot above the bottom of the wet well.
 - 2. Sensor shall transmit pressure signals to the transmitter via flexible extension cable clad in polyethylene.
 - 3. Sensor shall utilize solid-state diffused silicon sensor technology to translate pressure to a 4-20 mADC linear signal.
 - 4. Sensor shall be compensated for atmospheric pressure by means of a capillary that leads from a Goretex filter in the transmitter housing directly to the sensor/transducer.
 - 5. Stainless steel sensor housing shall have a removable cover with a set of perforations to protect the sensing port from damage.
 - 6. Provide stainless steel cable to suspend the sensor and to provide tension relief.

7. All fasteners shall be 316 stainless steel or non-metallic.
- B. Level Transmitter
1. Housed in a NEMA 4X enclosure located in the pump station.
 2. Transmit a 4-20 mADC signal directly proportional to level in the wet well.
 3. Integral 3-1/2 digit, backlit LCD display for indication and interrogation. Display shall be viewable through the NEMA 4X enclosure via a polycarbonate window. Calibration via dip switches is not acceptable.
 4. Provide labeled terminal strips for all external electrical connections.
 5. Provide two Form C contacts for programmable setpoint control. Setpoints shall be programmable via the LCD display.
 6. Hastelloy C diaphragm.
 7. FM approved intrinsically safe.
 8. Continuous temperature compensation for measuring cell fill.
- C. Performance Requirements
1. The systems shall have a minimum accuracy of ± 0.1 percent of range.
 2. Sensor shall not be subject to loss of accuracy due to immersion in wastewater sludge with concentrations up to 6 percent.
 3. Response time not to exceed 600 ms.
 4. Linearity – 0.2 percent of measurement range.
 5. Turndown – 10:1.
 6. Temperature Operating Range - -4 to 140 degrees F.
 7. Power Requirements - 24 VDC.

2.03. ACCESSORIES

- A. Nameplates – Refer to Section 17000. Wording of nameplate shall be as specified in Table 17375-1.
- B. Mounting Hardware – Provide stainless steel mounting hardware as necessary to mount equipment in locations as described in the Contract Documents.
- C. Cabling – Provide power, and signal, cable and conduit to locate transmitters in locations listed in Table 17375-1 and the Contract Documents according to Section 17000.
- D. Lightning and Surge Protection – Provide lightning and surge protection for the equipment listed in Table 17375-1 in accordance with Section 17000.
- E. Provide a 4-inch diameter perforated Schedule 80 PVC pipe to serve as a stilling well to reduce turbulence and lateral movement. Locate stilling well as detailed on the Contract

Drawings. Transducer shall be secured by a minimum of six points about its diameter to eliminate all lateral movement. Transducer shall be removable by pulling the suspension cable out of the stilling well from ground level while the stilling well remains in place in the wet well. Secure the stilling well to the wet well wall at three foot intervals. All straps used for attaching the stilling well to the side of the well shall be stainless steel. All fasteners shall be stainless steel epoxy-grouted type with stainless steel nuts.

2.04. CONTROLS

- A. All electrical equipment and wiring shall be in full conformance with Division 16, Electrical Specifications.
- B. Refer to Contract Drawings for wiring requirements.

PART 3 EXECUTION

3.01. INSTALLATION

- A. Install in accordance with manufacturer's requirements/suggestion.
- B. All electrical work performed in fabrication and installation of the transmitters shall be in full accordance with the requirements of the Division 16 specifications.
- C. Mount all equipment provided herein in accordance with Section 17000.
- D. Verify the integrity of the wall to which the stilling well is mounted. If the wall exhibits corrosion or other disrepair, provide a sound mounting surface.

3.02. MANUFACTURER'S OR SYSTEM INTEGRATOR'S FIELD SERVICES

- A. Allow for a manufacturer authorized service representative to test equipment to demonstrate that:
 - 1. The transmitter and transducer are properly installed, properly calibrated, and is functioning as specified.
 - 2. Configuration and setpoints are not lost upon power loss. This shall be tested by disconnecting the transmitter from power for 30 minutes.
- B. Training – Provide one hour of instruction for four persons to be conducted at the project site with a manufacturer's representative. Notify the Engineer and Owner in writing a minimum of two weeks in advance. Training shall include calibration, trouble shooting, and maintenance.

3.03. CERTIFICATION OF TESTING

- A. Unless waived in writing by the Engineer, all tests shall be made in the presence of a duly authorized representative of the Owner. When the presence of such representative is so waived, certified results of the tests made and the results thereof shall be furnished by the Contractor.
- B. All tests shall be performed in the presence of the Owner. Written notice of all tests shall be given the Owner at least two weeks in advance.

END OF SECTION